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UNITED STATES DISTRICT COURT
DISTRICT OF NEW JERSEY

SEASONAL SPECIALTIES, LLC, Plaintiff, v. NATIONAL CHRISTMAS PRODUCTS, INC. D/B/A NATIONAL TREE COMPANY, Defendant.	Civil Action No.: _____ (Filed Electronically) **COMPLAINT FOR PATENT INFRINGEMENT** **JURY TRIAL DEMANDED**

Plaintiff Seasonal Specialties, LLC ("Seasonal"), for its Complaint against National Christmas Products, Inc. d/b/a National Tree Company ("National"), alleges as follows:

THE PARTIES

1. Seasonal is a Minnesota limited liability company with its principal place of

business located at 11455 Valley View Road, Eden Prairie, Minnesota 55344.

2. On information and belief, National is an S Corporation organized under the laws of the State of New Jersey, with its principal place of business at 2 Commerce Dr., Cranford, New Jersey 07016.

JURISDICTION AND VENUE

3. This Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a) because this is an action for patent infringement arising under the laws of the United States, 35 U.S.C. § 1 *et seq.*, and more particularly, 35 U.S.C. §§ 271 and 281.

4. This Court has personal jurisdiction over National because National, on information and belief, is subject to specific and general jurisdiction in the State of New Jersey. National is organized under the laws of the State of New Jersey. National's principal place of business is located in the State of New Jersey. National or its agents, on information and belief, have transacted business in New Jersey by selling the accused products to customers in New Jersey. The exercise of personal jurisdiction comports with National's right to due process because National has purposefully availed itself of the privilege of conducting activities within New Jersey such that it should reasonably anticipate being haled into court here.

5. Venue is proper in this Judicial District under 28 U.S.C. § 1400(b) because National resides in the Judicial District and has, upon information and belief, committed acts of patent infringement nationally, including in the State of New Jersey and this Judicial District.

NATURE OF THE ACTION

6. This is an action arising under the United States patent laws, Title 35 of the United States Code, §§ 100-299, including 35 U.S.C. §§ 271, 281-285, for infringement of U.S. Patent No. 9,554,437 ("'437 patent") and U.S. Patent No. 10,080,265 ("'265 patent") (collectively, "the

Patents-in-Suit" or "Steady-On Patents"), of which Seasonal is the assignee, directed to various embodiments of lighting devices.

7. The Patents-in-Suit claim an invention for changing the function of a low cost special function bulb controller to switch between having a visual appearance of steady-on illumination and a pre-programmed special visual appearance.

8. National has improperly sold, offered to sell, imported, and, on information and belief, induced others to use, import, sell, and offer to sell lighting products that infringe Seasonal's Patents-in-Suit.

BACKGROUND

9. Seasonal is engaged in the business of, among other things, developing and selling decorative lighting products, including decorative LED lighting products manufactured for sale and use during the holiday season.

10. Seasonal has developed a number of novel and commercially successful decorative lighting products, such as pre-lit holiday trees and light strings, and improvements to the manufacturing and technology relating to such products.

Steady-On Invention

11. Decorative lighting, such as holiday lighting, includes strings of bulbs (often LEDs), spaced out along a pair of wires. Special lighting effects, such as twinkling and flashing, give the visual impression that the bulbs are shimmering, and are desirable to consumers.

12. To create these visual effects, bulbs can be directly wired. However, to control bulbs in such a manner requires multiple conductors to each bulb. Alternatively, bulbs may contain their own microcontroller. The disadvantage of this construction, however, is the difficulty selecting between modes of the lights, such as being steadily illuminated in one mode, and another

mode where the bulb performs a special effect programmed according to a microcontroller connected to an individual bulb. In an alternative construction, bulbs may include addressable circuits which allow individual control of bulbs, but this alternative increases cost considerably.

13. Seasonal's engineers invented a system for changing the function of a low-cost special function bulb controller to switch between having a visual appearance of steady-on and a pre-programmed special visual appearance. The invention is hereafter referred to as the "Steady-On Invention."

14. The Steady-On Invention uses a first circuit for controlling power to a bulb that produces a predetermined special visual lighting effect. '437 patent at 4:21-37. The first circuit powers up starting from an initial steady-on illuminated state (which may be for an extremely short period of time that looks like part of the predetermined special visual lighting effect), followed by the programmed special lighting effect generated by the controller, before repeating the predetermined-cycle, re-starting with the initial steady-on state. *Id*.

15. A second circuit periodically interrupts flow of current to the first circuit controlling power to the bulb. '437 patent at 4:38-52. The interruption frequency is sufficient to cause the first circuit to reset to its initial steady-on state of illumination, and then continues to remain in a steady-on state as long as power continues to be interrupted. The special lighting effect bulb remains steady-on until the power interruption is discontinued, thereby returning the first circuit to its pre-programmed special lighting effect cycle generated by the controller.

16. The Steady-On Invention permits selectable steady-on and special lighting effect modes in a lighting product, without the need for special wires, other than two power conductors to the bulbs. '437 patent at 4:53-56.

PATENTS-IN-SUIT

Steady-On Patents

17. Seasonal has been awarded two patents relating to the Steady-On Invention: the '437 patent and the '265 patent..

18. Seasonal is the assignee possessing all rights, title, and interest in the '437 patent, entitled "Decorative Light String Switchable Between Different Illumination States," which issued on January 24, 2017. A true and correct copy of the '437 patent is attached as **Exhibit A**. Seasonal has standing to sue for infringement of the '437 Patent.

19. The '437 patent includes independent claims 1 and 11. Illustrative claim 11 recites:

> 11. A method of switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, comprising the steps of:
>
> a. electrically powering illumination element;
>
> b. in communication with said illumination element, controlling the flow of current to the element to produce a predetermined special illumination visual lighting effect in the illumination element, controlling said element so that when it is powered up starting with an initial steady on illuminated state in the element and then proceed to said special lighting effects occurring after the steady-on power up and periodically repeating said special lighting effect for a predetermined period of time, and
>
> c. periodically interrupt the flow of current to said illumination element, at an interruption frequency sufficient to cause the steady-on state without

proceeding to said special lighting effects, and thereby producing a plurality of steady-on illumination pulses in the illumination element.

20. Seasonal is also the assignee with all rights, title, and interest in the '265 patent, entitled "Decorative Light String Switchable Between Different Illumination States," which issued on September 18, 2018. A true and correct copy of the '265 patent is attached as **Exhibit B**. Seasonal has standing to sue for infringement of the '265 patent.

21. The '265 patent includes independent claim 1, which recites:

1. A system for switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, comprising:

a. an electrically powered illumination element;

b. a first switching circuit in communication said illumination element for controlling the flow of current to the element, said first circuit containing a controller for controlling the power to said illumination element to produce a predetermined special illumination visual lighting effect in the illumination element, said first circuit initiating said lighting effect when powered up starting from an initial on illuminated state in the element and proceeding to other special lighting effects occurring after the on power up and periodically repeating said special lighting effect for a predetermined period of time, and

c. a second switching circuit, configured to periodically interrupt the flow of current to said first circuit, at an interruption frequency sufficient to

> cause the first circuit to reset to its on state without proceeding to said other special lighting effects, and thereby producing a plurality of on illumination pulses in the illumination element, so that a viewer perceives the illumination element as always on.

22. Seasonal implemented the Steady-On Invention into lighting products that it has offered for sale and sold, and that practice the claims of the Steady-On Patents, including LED 3 Color Effect + twinkling light string products. Products practicing the Steady-On Patents have the advantage of easily switching between steady on and special lighting effects, such as twinkling, multi color, and alternating stages of each.

23. Seasonal marked products using the patented invention with the numbers of the Steady-On Patents.

24. Seasonal promotes the advantages of the Steady-On Invention in packaging and descriptive materials for products practicing the claims of the Steady-On Patents. Products using the Steady-On Invention have been commercially successful. There is a connection between the commercial success of the products using the patented technology and the advantages provided by the Steady-On Invention, including efficiencies in not having to use additional wiring or higher cost addressable LEDs.

NATIONAL'S INFRINGEMENT

Infringement of the Steady-On Patents

25. National has introduced to the market, without Seasonal's authorization, decorative lighting products using the invention claimed in the Steady-On Patents, including the products sold under the name "Dunhill Fir Tree" (the "Dunhill Trees").

26. Information about National's Dunhill Trees describes them as containing "900 Dual

Color LED lights." The Dual Color LED lights have two colors ("Bi-Color")—Warm White and Multi Color. Some of the Dual Color LED lights are special illumination LEDs that can selectively fade in and out from steady on mode to off, in both colors. Each special illumination LED contains an integrated circuit ("IC"). Other LEDs on the product are standard non-switching LED bulbs, similar to the description in the patents. *See* '265 patent 4:17-20. The standard non-switching LEDs (if provided) do not contain an IC.

27. The Dunhill Trees contain a mode selector connected to a circuit board that allows users to change between "Steady On" or "Fading" modes for the special illumination LEDs, as well as between Warm White and Multi-Color modes. When a user selects the "Steady On" mode, the IC on the circuit board interrupts current to the IC in the special illumination LED (first switching circuit). The interruption in power causes the IC on the special illumination LED to reset the steady-on-to-fading on/off cycle and return to a "Steady On" state. When a user selects a "Steady On" mode, the IC on the circuit board (second circuit) produces a series (a plurality) of interrupting pulses to the IC (first circuit) on the special illuminating LEDs sufficient to keep the LEDs in a "Steady On" state, and not proceeding to the "Fading" state in the steady-on-to-fading cycle.

28. National had knowledge of Seasonal's Steady-On Patents before the filing of this action. National has had direct knowledge of the Steady-On Patents since receiving actual notice of infringement from Seasonal. National has had constructive knowledge of the Steady-On Patents because Seasonal marks products with the patent numbers.

29. Upon information and belief, National has in the past and/or is currently offering for sale, importing into the United States, and inducing others to use within the United States, the Dunhill Trees that infringe both of the Steady-On Patents.

30. National makes, offers for sale, sells, and imports the claimed Steady-On Invention and induces others, including retailers like Amazon and Home Depot, to offer for sale, sell, and use the same.

31. National undertook and continues its infringing actions despite that it knew and/or should have known that its actions constituted an unjustifiably high risk of infringement, and that its activities infringed the Steady-On Patents, which were duly issued and are presumed valid. For example, since at least receiving actual notice of infringement from Seasonal, National has been aware of the unjustifiably high risk that its actions constituted and continue to constitute infringement of the Steady-On Patents, and that the Steady-On Patents are valid. On information and belief, National could not reasonably, subjectively believe that its actions do not constitute infringement of the Steady-On Patents, and it could not reasonably, subjectively believe that the Steady-On Patents are invalid. Despite this knowledge and subjective belief, and the unjustifiably high risk that its actions constitute infringement, National has continued its infringing activities. As such, National willfully infringes the Steady-On Patents.

COUNT I

INFRINGEMENT OF THE '437 PATENT

32. Seasonal repeats the allegations in the preceding Paragraphs as if fully restated in Count I of this Complaint.

33. **Direct Infringement.** National has been and still is directly infringing, either literally or under the doctrine of equivalents, at least one claim of the '437 patent by importing, using, selling, and/or offering to sell in the United States, infringing products, including the Dunhill Trees.

34. The service of this Complaint upon National constitutes actual knowledge of

infringement as alleged here. The marking of products incorporating the Steady-On Patents constitutes constructive notice of infringement.

35. Despite such knowledge, National continues to use, sell, offer for sale, and/or import into the United States, products that infringe the ’437 patent. On information and belief, National continues to induce retailers, and end users and others, to sell and use the Dunhill Trees in the customary and intended manner that infringes the ’437 patent.

36. **Induced Infringement.** National actively, knowingly, and intentionally has been and continues to induce infringement of the ’437 patent, literally or under the doctrine of equivalents, by selling the Dunhill Trees to customers, both retailers and end users, for sale and specific use in a manner that infringes one or more claims of the ’437 patent.

37. **Contributory Infringement.** National actively, knowingly, and intentionally has been and continues to materially contribute to its own customers’ infringement of the ’437 patent, literally or under the doctrine of equivalents, by selling the Dunhill Trees to its customers for sale and use by end users in a manner that infringes one or more claims of the ’437 patent. The Dunhill Trees are not staple articles of commerce suitable for substantial non-infringing use.

38. **Exhibit C** includes a chart comparing claims 1-5, 10, and 11 of the ’437 patent to National’s Dunhill Fir Tree product.[1] As set forth in this chart, the Dunhill Fir Tree product practices the technology claimed in the '437 patent.

39. Seasonal incorporates by reference the allegations in the claim chart in Exhibit C.

40. Seasonal has been damaged by National’s infringement of the ’437 patent. Unless

[1] Seasonal’s claim charts exhibited hereto compare the claims of the Steady-On Patents to the 7.5ft model of the Dunhill Tree, for illustrative purposes. To clarify, Seasonal maintains that National’s other Dunhill Tree models (e.g., its 9ft and 10ft models) infringe the Steady-On Patents for the same reasons as set forth in the claim charts exhibited hereto.

restrained and enjoined by this Court, National will continue to infringe ’437 patent, resulting in substantial, continuing, and irreparable damage to Seasonal.

41. Seasonal is further informed, and on this basis alleges, that National’s infringement of ’437 patent has been and continues to be deliberate and willful and, therefore, this is an exceptional case warranting an award of enhanced damages for up to three times the actual damages awarded and attorneys’ fees pursuant to 35 U.S.C. §§ 284-285. As noted above, National has had knowledge of the ’437 patent or at least was willfully blind to its infringement, and yet has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for Seasonal’s patent rights. Thus, National’s infringing actions have been and continue to be consciously wrongful.

42. Seasonal has complied with the notice requirements of 35 U.S.C. § 287(a) with respect to the ’437 patent.

COUNT II

INFRINGEMENT OF THE ’265 PATENT

43. Seasonal repeats the allegations in the preceding Paragraphs as if fully restated in Count II of this Complaint.

44. **Direct Infringement.** National has been and still is directly infringing, either literally or under the doctrine of equivalents, at least one claim of the ’265 patent by importing, using, selling, and/or offering to sell in the United States, infringing products, including the Dunhill Trees.

45. The service of this Complaint upon National constitutes actual knowledge of infringement as alleged here. The marking of products incorporating the Steady-On Patents constitutes constructive notice of infringement.

46. Despite such knowledge, National continues to use, sell, offer for sale, and/or import into the United States, products that infringe the '265 patent. On information and belief, National continues to induce retailers, and end users and others, to sell and use the Dunhill Trees in the customary and intended manner that infringes the '265 patent.

47. **Induced Infringement.** National actively, knowingly, and intentionally has been and continues to induce infringement of the '265 patent, literally or under the doctrine of equivalents, by selling the Dunhill Trees to customers, both retailers and end users, for sale and specific use in a manner that infringes one or more claims of the '265 patent.

48. **Contributory Infringement.** National actively, knowingly, and intentionally has been and continues to materially contribute to its own customers' infringement of the '265 patent, literally or under the doctrine of equivalents, by selling Dunhill Trees to its customers for sale and use by end users in a manner that infringes one or more claims of the '265 patent. The Dunhill Trees are not staple articles of commerce suitable for substantial non-infringing use.

49. **Exhibit D** includes a chart comparing claims 1-5 and 10 of the '265 patent to National's Dunhill Fir Tree product. As set forth in this chart, the Dunhill Fir Tree product practices the technology claimed in the '265 patent.

50. Seasonal incorporates by reference the allegations in the claim chart in Exhibit D.

51. Seasonal has been damaged by National's infringement of the '265 patent. Unless restrained and enjoined by this Court, National will continue to infringe '265 patent, resulting in substantial, continuing, and irreparable damage to Seasonal.

52. Seasonal is further informed, and on this basis alleges, that National's infringement of '265 patent has been and continues to be deliberate and willful and, therefore, this is an exceptional case warranting an award of enhanced damages for up to three times the actual

damages awarded and attorneys' fees pursuant to 35 U.S.C. §§ 284-285. As noted above, National has had knowledge of the '265 patent or at least was willfully blind to its infringement, and yet has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for Seasonal's patent rights. Thus, National's infringing actions have been and continue to be consciously wrongful.

53. Seasonal has complied with the notice requirements of 35 U.S.C. § 287(a) with respect to the '265 patent.

DEMAND FOR JUDGMENT

WHEREFORE, Seasonal demands judgment as follows:

A. That National be adjudged to have infringed the '437 patent;

B. That the '437 patent be adjudged valid and enforceable;

C. That National be adjudged to have infringed the '265 patent;

D. That the '265 patent be adjudged valid and enforceable;

E. An accounting of all damages not presented at trial;

F. Awarding Seasonal all appropriate damages under 35 U.S.C. § 284 for National's past infringement, and any continuing or future infringement of the Patents-in-Suit, up until the date such judgment is entered, including pre- or post-judgment interest, costs, and disbursements as justified under 35 U.S.C. § 284;

G. Declaring that National's infringement is willful and increasing the amount of damages by three times the amount assessed or found, as allowed pursuant to 35 U.S.C. § 284;

H. Declaring this case exceptional within the meaning of 35 U.S.C. § 285 and that Seasonal be awarded its reasonable attorneys' fees against that it incurs in prosecuting

this action;

I. Ordering that National, its officers, and agents, servants, employees, and attorneys, and those persons in active concert or participation with them who received actual notice of the Order by personal service or otherwise, be preliminarily and permanently enjoined from further infringement of the Patents-in-Suit; and

J. An award of such other further relief as this Court may deem just and proper.

JURY TRIAL DEMAND

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure and the Seventh Amendment to the Constitution of the United States, Seasonal hereby demands a trial by jury on all issues triable in the above action.

Dated: August 25, 2023

By s/ Sarah A. Sullivan

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Seasonal Specialties, LLC

CERTIFICATION PURSUANT TO L. CIV. R. 11.2 & 40.1

Pursuant to Local Civil Rules 11.2 and 40.1, I hereby certify that the matter in controversy is related to the following action because the matter in controversy involves the same Plaintiff and two of the same patents:

(1) The action filed on August 3, 2023, and pending in the United States District Court for the Central District of California: *Seasonal Specialties, LLC v. LEDup Enterprises, LLC*, No. 2:23-cv-06318-SB-AS.

Dated: August 25, 2023

By s/ Sarah A. Sullivan

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EXHIBIT A

US009554437B2

(12) **United States Patent**
Altamura et al.

(10) **Patent No.: US 9,554,437 B2**
(45) **Date of Patent: Jan. 24, 2017**

(54) **DECORATIVE LIGHT STRING SWITCHABLE BETWEEN DIFFERENT ILLUMINATION STATES**

(71) Applicant: **Seasonal Specialties, LLC**, Eden Prairie, MN (US)

(72) Inventors: **Steven Altamura**, Scarsdale, NY (US); **Christine Werner**, St. Louis Park, MN (US); **Weng Yunbing**, Taizhou (CN); **Chen YongTai**, WenLin (CN)

(73) Assignee: **Seasonal Specialties LLC**, Eden Prairie, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/879,351**

(22) Filed: **Oct. 9, 2015**

(65) **Prior Publication Data**

US 2016/0105937 A1 Apr. 14, 2016

Related U.S. Application Data

(60) Provisional application No. 62/061,836, filed on Oct. 9, 2014.

(51) **Int. Cl.**

H05B 39/09	(2006.01)
H05B 41/36	(2006.01)
F21S 10/00	(2006.01)
F21S 10/02	(2006.01)
H05B 33/08	(2006.01)

(52) **U.S. Cl.**
CPC ***H05B 33/0842*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,749,646	A *	5/1998	Brittell	F21S 10/02 362/231
5,871,271	A *	2/1999	Chien	A42B 3/044 362/103

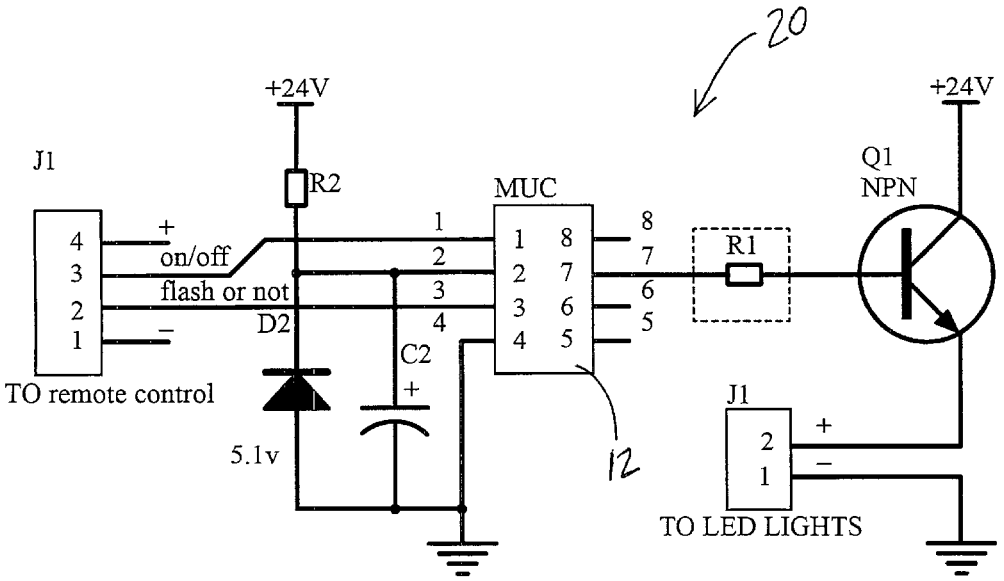
* cited by examiner

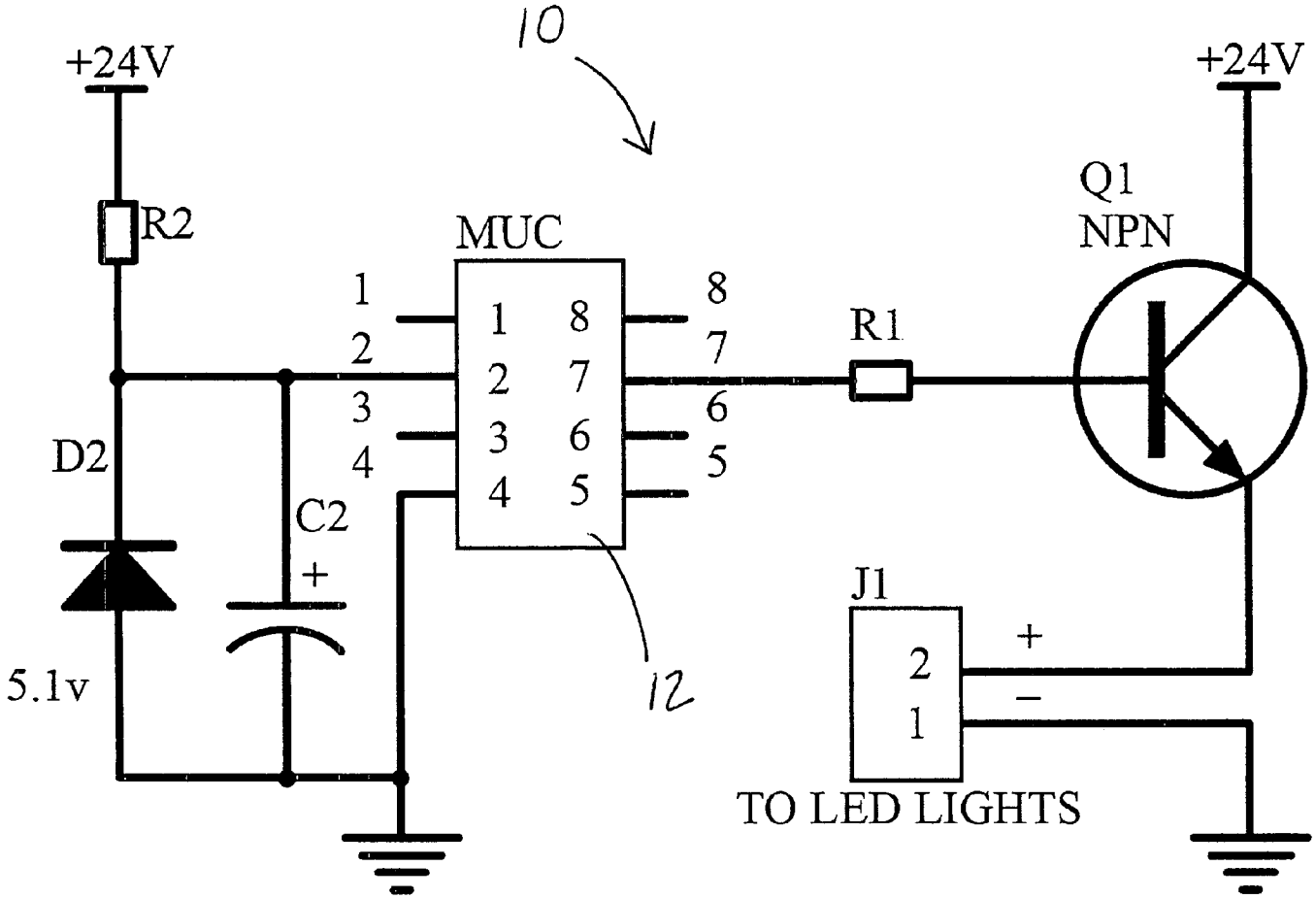
Primary Examiner — Douglas W Owens
Assistant Examiner — Dedei K Hammond
(74) *Attorney, Agent, or Firm* — Altera Law Group, LLC

(57) **ABSTRACT**

A system and method of creating a steady ON and a special effects light effect from a bulb without providing any special wiring thereto. In one embodiment, the bulb contains an illumination element and a controller which produces the special effect in the element. By interrupting the flow of current to the controller periodically, the controller is initialized to its initial steady ON condition. A plurality of steady ON pulses at a high frequency will appear as a steady ON light, instead of pules, thereby producing a steady ON appearance without special wiring. When the current is allowed to flow continuously, the controller produces the special effect. A second embodiment uses parallel polarized light element which produce different effect when power is applied in opposite polarities, thereby providing two effects with no special wiring.

11 Claims, 7 Drawing Sheets

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D2
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C2
+
MUC
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2
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4 5
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7
6
5
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NPN
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2
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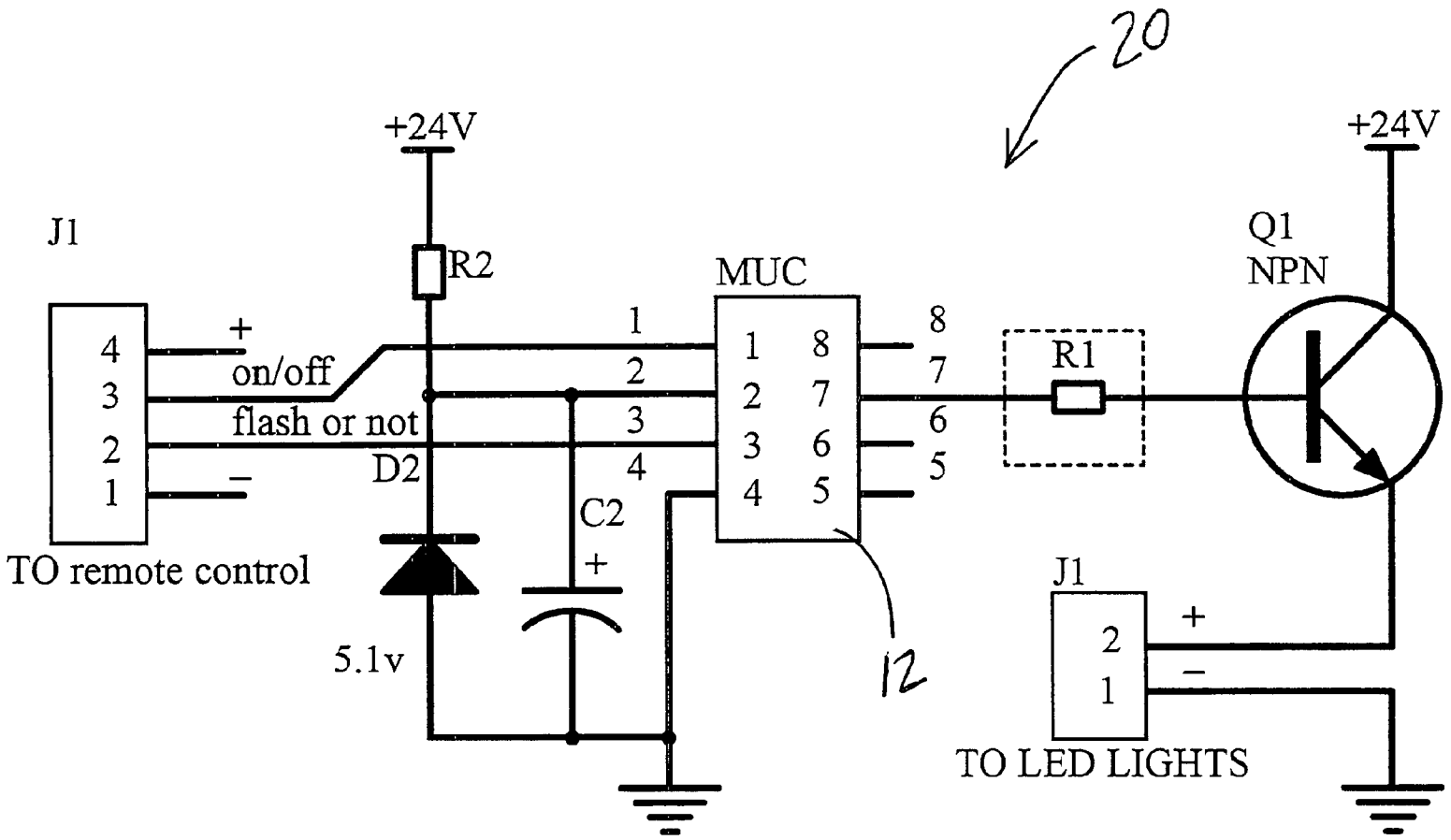
+
–
TO LED LIGHTS

Fig. 1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R2
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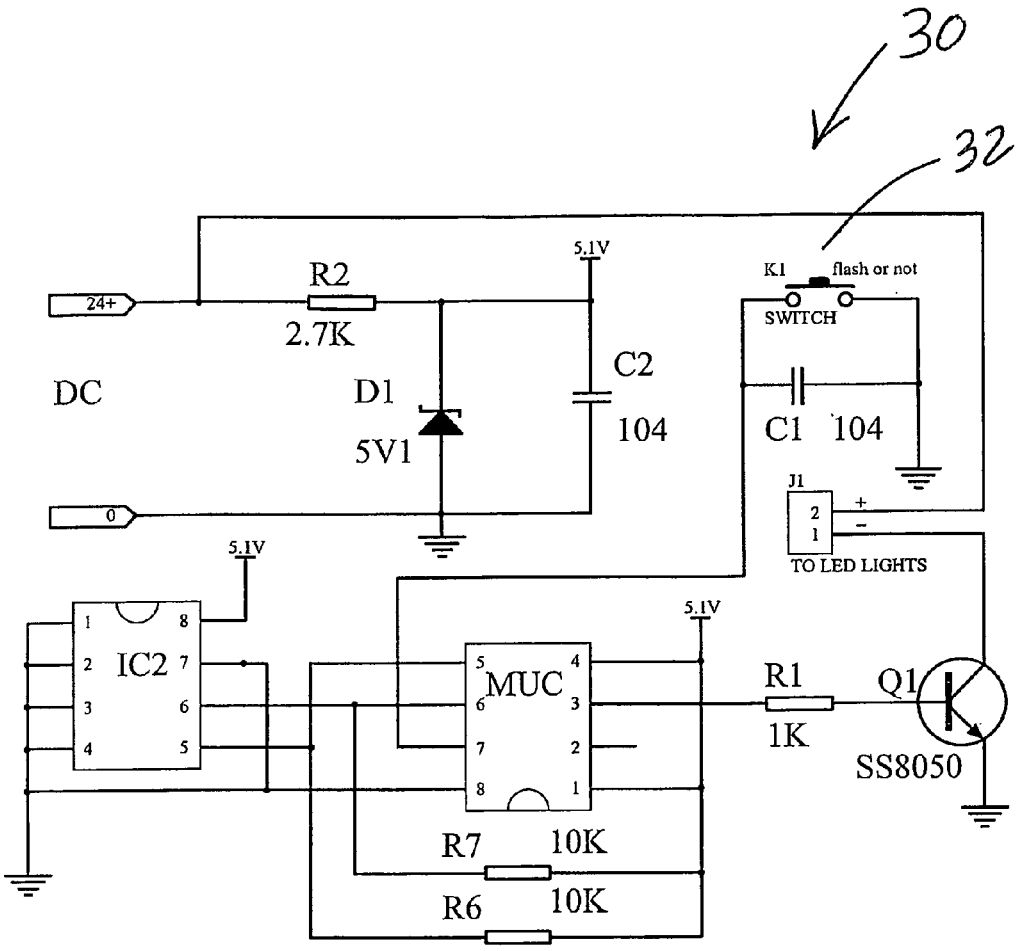
1
+
on/off
flash or not
–
1
2
3
4
1 8
2 7
3 6
4 5
8
7
6
5
R1
D2
C2
+
TO remote control
5.1v
12
J1
2
1
+
–
TO LED LIGHTS

Fig. 2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32
24+
DC
0
R2
2.7K
D1
5V1
5.1V
C2
104
K1
flash or not
SWITCH
C1
104
J1
2
1
+
-
TO LED LIGHTS
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IC2
MUC
R1
1K
Q1
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R7
10K
R6
10K

Fig. 3

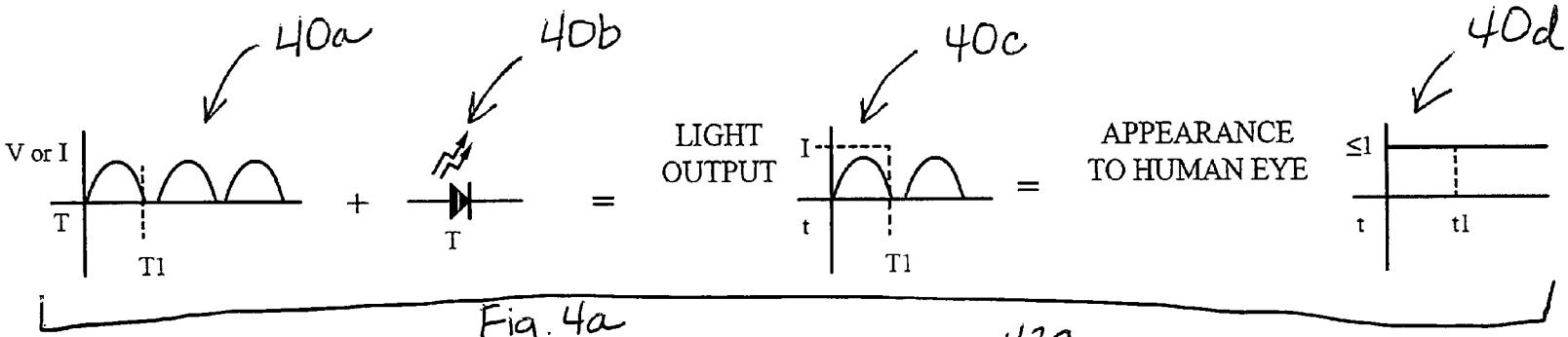
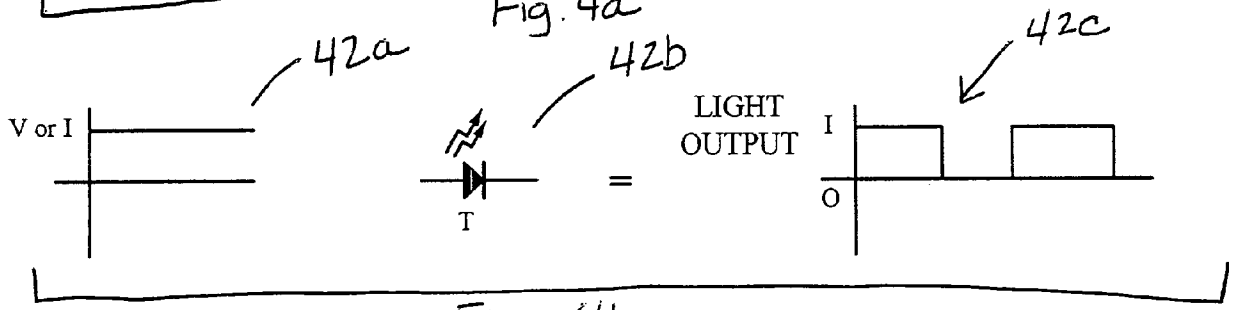

40a
40b
40c
40d
V or I
T
T1
+
T
=
LIGHT OUTPUT
I
t
T1
=
APPEARANCE TO HUMAN EYE
≤1
t
t1

Fig. 4a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42b
42c
V or I
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=
LIGHT OUTPUT
I
O

Fig. 4b

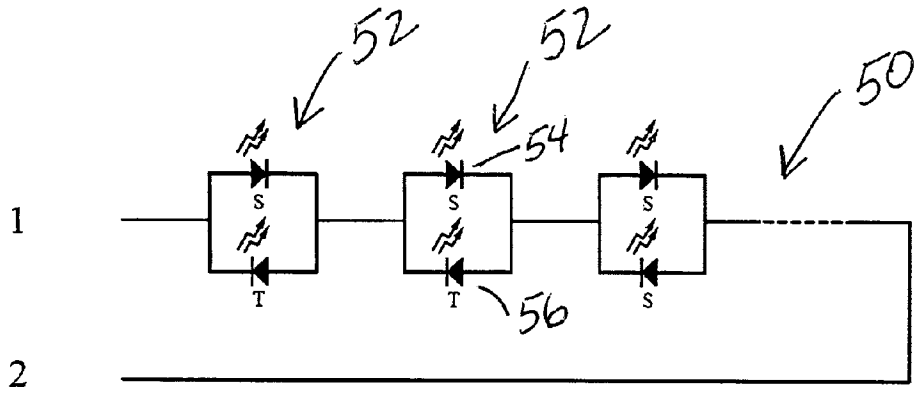

Fig. 5

1	2	CONDITION
+	−	ALL STEADY ON
−	+	SOME OR ALL TWINKLE

Fig. 6

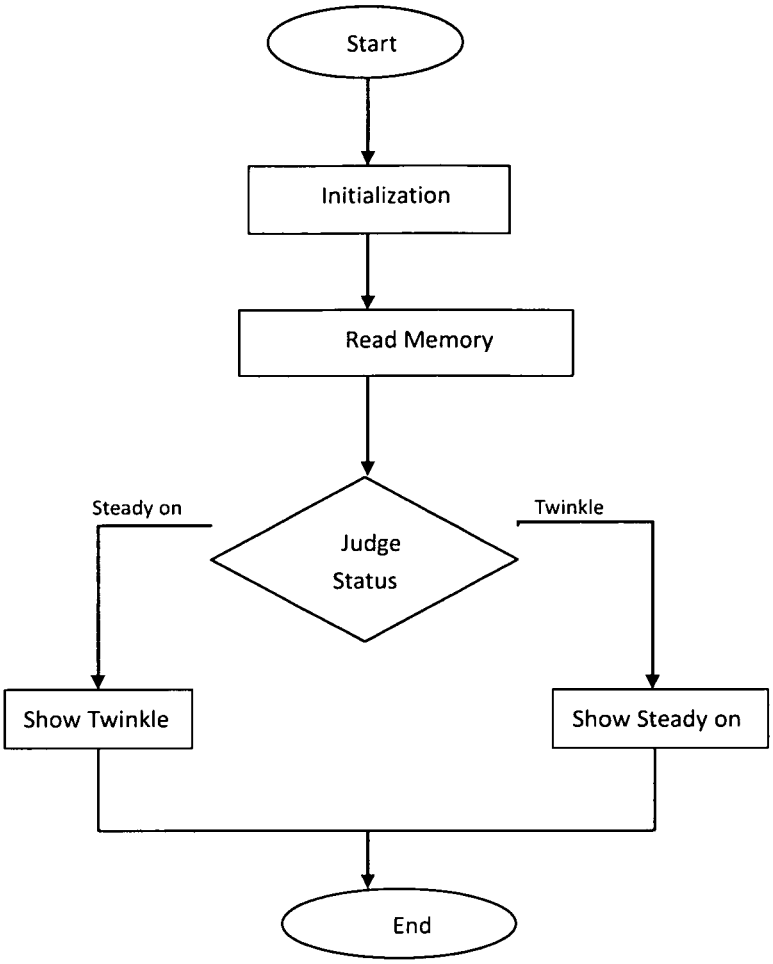
Start
Initialization
Read Memory
Judge Status
Steady on
Twinkle
Show Twinkle
Show Steady on
End

Figure 7

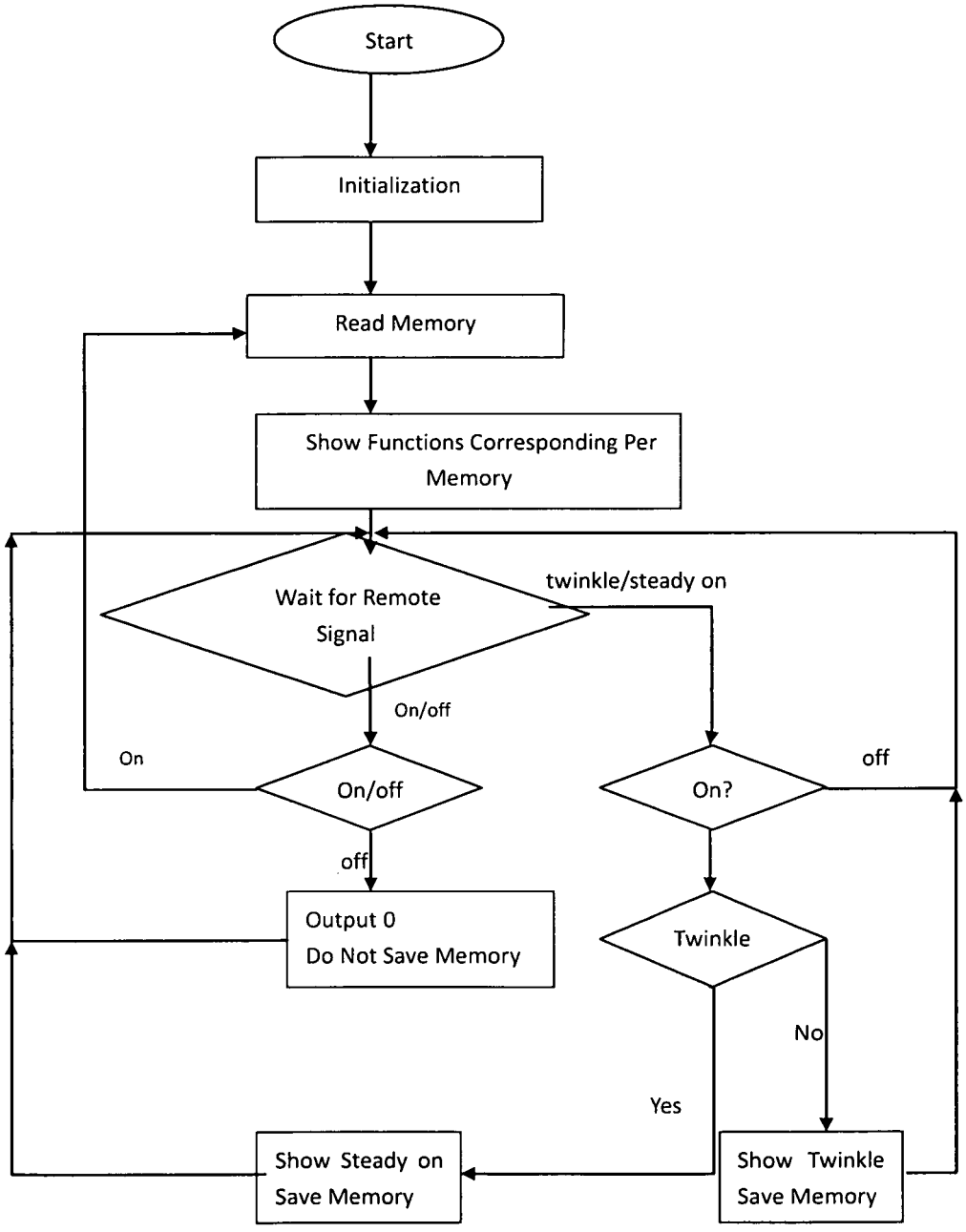
Start
Initialization
Read Memory
Show Functions Corresponding Per Memory
Wait for Remote Signal
twinkle/steady on
On/off
On
On/off
off
On?
off
Output 0
Do Not Save Memory
Twinkle
No
Yes
Show Steady on
Save Memory
Show Twinkle
Save Memory

Fig. 8

DECORATIVE LIGHT STRING SWITCHABLE BETWEEN DIFFERENT ILLUMINATION STATES

INCORPORATION BY REFERENCE

This application incorporates by reference in its entirety provisional application Ser. No. 62/061,836 filed 9 Oct. 2014 entitled Convertible Twinkle Light String Switchable To Steady-On Light String for which it also claims priority.

TECHNICAL FIELD

This disclosure relates to decorative lighting strings of lights having a plurality of bulbs spaced along the string.

BACKGROUND

Decorative lighting, such as holiday lighting includes strings of bulbs spaced out along a pair of wires. The bulbs may be incandescent or now more frequently, LEDs. Light strings can be made much more interesting if they can switch illumination state, color, or other special effects. Twinkling is particularly attractive. Twinkling or flashing as the bulbs change from on to off, at different frequencies or different illumination slopes to give the visual impression that the bulbs are shimmering.

To create these special effects, the bulbs can be directly wired to a power source which controls the current flow in such a way as to pulse/twinkle or create other special lighting effects. To control bulbs in such a manner, would either require multiple conductors to each bulb for individual control or multiple conductors creating different circuits to alternatingly spaced bulbs to create simulate random sequencing of changing color, shimmering, or flashing.

Alternatively, the bulbs may contain their own microcontroller built into each or some of the bulbs or lamp holders, such that normal wiring can be used, however, the disadvantage to this construction is that the user is not able to select the mode of those lights, such as all being steady illuminating in one mode, and another mode where they perform their intended function of the microcontroller electrically connected to those individual bulbs.

In an alternative construction, bulbs may include addressable circuits which allow digital control signals to be sent to all bulbs in a wired string, and the signal intended by a particular bulb can be decoded by IP or other addressing, to control only that bulb. Such an addressable solution is expensive because it requires advanced logic be provided at the power source and each bulb must have a decoder.

Therefore, to obtain the benefits of control of function and illumination method of bulbs without additional wiring, sophisticated, or expensive circuits has not been possible.

It has been shown in the market that people would like the option to have single light set that can offer both a steady on lighting effect and other lighting effects, such as a twinkling effect that can be user selected, so that depending on the mood of the user, or event, the lights can either be set to be steady on or twinkle, color changing, or other switchable effects.

Twinkling can be described as a change in brightness (ramping up/down, dimming) or a switching on/off and changing the frequency of the switching or both including the separate control of red, green and blue LEDs in a single lamp structure to create color changing effects that include fading or flashing.

SUMMARY

The following summary is intended to assist the reader in understanding the full disclosure and the claims. The claims define the scope of the invention, not this summary.

There is disclosed a system for switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, having

a. an electrically powered illumination element;

b. a first switching circuit in communication said illumination element for controlling the flow of current to the element, said first circuit containing a controller for controlling the power to said illumination element to produce a predetermined special illumination visual lighting effect in the illumination element, said first circuit initiating said lighting effect when powered up starting from an initial steady on illuminated state in the element and then proceeding to other special lighting effects occurring after the steady on power up and periodically repeating said special lighting effect for a predetermined period of time; and

c. a second switching circuit in communication with said first circuit, configured to periodically interrupt the flow of current to said first circuit, at an interruption frequency sufficient to cause the second circuit to reset to its steady on state without proceeding to said other special lighting effects, and thereby producing a plurality of steady on illumination pulses in the illumination element.

Also disclosed is wherein said interruption frequency is at least sufficient to create the visual appearance in the illumination element of a steady on light.

Also disclosed is wherein said interruption frequency is at least sufficient to provide a plurality of light pulses from the illumination element which appear of substantially uniform intensity.

Also disclosed is wherein said interruption frequency is at least beyond the frequency of a human to observe flicker in the illumination element.

Also disclosed is wherein said interruption frequency includes periodically energizing and reenergizing the second circuit to at least sufficiently create the visual appearance in the illumination element of a steady on illumination.

Also disclosed is wherein said special function is a twinkle light effect.

Also disclosed is wherein said special function is a blinking light effect.

Also disclosed is wherein said special function is a color changing effect.

Also disclosed is wherein said special function is a color hue changing effect.

Also disclosed is wherein steady on includes a momentary illumination at a substantially uniform light output.

Also disclosed is a system for switchably converting a special effect lighting system to switch from a steady on light output to a special effect light output having

a. a light string including:

1. a first illumination element which illuminates when energized when powered in a first polarity and not a second opposite polarity;

2. a second illumination element connected in parallel with said first element and configured to output light with a special lighting effect when power is applied in the second polarity only;

b. a switching circuit connected to said elements, said circuit applying power to said string in said first polarity so only said first element will illuminate, and, then apply power in said second polarity, thereby illuminating only said second illumination element with said special effect.

Also disclosed is wherein said first element illuminates when power is applied in either polarity.

Also disclosed is wherein said first and second elements illuminate alternately when Alternating Current (AC) power is applied thereto.

Also disclosed is wherein the circuit is a reversing switch.

Also disclosed is wherein said special effect is light twinkling.

Also disclosed is wherein said special effect is color changing.

Also disclosed is wherein said special effect is color hue changing.

Also disclosed is a method of switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, having any or all of the steps of in any order:

a. electrically powering illumination element;

b. in communication said illumination element, controlling the flow of current to the element to produce a predetermined special illumination visual lighting effect in the illumination element, controlling said element so that when it is powered up starting with an initial steady on illuminated state in the element and then proceed to said special lighting effects occurring after the steady on power up and periodically repeating said special lighting effect for a predetermined period of time, and

c. periodically interrupt the flow of current to said first circuit, at an interruption frequency sufficient to cause a steady on state without proceeding to said special lighting effects, and thereby producing a plurality of steady on illumination pulses in the illumination element.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1** illustrates an exemplary circuit **10** for which can be connected to light string (not shown) at connector J**1**.

FIG. **2** shows an alternative circuit **20** which is differs from FIG. **1** in that it has an input for a wired or wireless remote control at connector.

FIG. **3** shows a further variant **30** of the circuit in FIG. **2** with a switch **32** to control whether the reset pulses are sent or not.

FIGS. **4***a* and **4***b* illustrate a group of sub figures which illustrate the visual effect.

FIG. **5** illustrates the light string **50**.

FIG. **6** illustrates the power conditions and results.

FIG. **7** is a flow chart of the MCU/MUC controller in FIG. **1** and FIG. **2**.

FIG. **8** is a flow chart of the MCU/MUC controller in FIG. **2** and FIG. **3**.

DETAILED DESCRIPTION

Embodiment 1

In this embodiment, a light string can be controlled to operate specially configured bulbs to switch from one state to another without the need to reverse polarity of the power supply, adding additional control wires, or use of addressable bulbs and a controller. A "bulb" in this instance is an illumination element, such as an LED, incandescent lamp or equivalent which produces light in response to electrical current. It may also include a circuit or chip which controls the function of the illumination element. The two may be combined into a single unit or physically separated. The chip may be integral to the illumination element, in a socket for the element or entirely separated though electrically connected.

The "state" switching can be from on to off, or special effects versions thereof, such as twinkling, pulsing, flashing or other brightness varying effects, color changing, hue changing or other optical effects as determined by the type of control circuits and bulb types provided.

It is possible to include mixture of state controllable/switching bulbs with standard non switching bulbs since the visual effect can be achieved with less than all bulbs being controlled.

More generally, there is disclosed a system for switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, having an electrically powered illumination element and a first switching circuit in communication said illumination element for controlling the flow of current to the element. The first circuit containing a controller for controlling the power to said illumination element to produce a predetermined special illumination visual lighting effect in the illumination element. The first circuit preferably is configured to power up starting from an initial steady on illuminated state, even for a brief period of time at a relatively uniform level of illumination. Then the rest of the special lighting effects are generated by the controller after the steady on power up the special effects are periodically repeated.

There is preferably a second switching circuit in communication with said first circuit, configured to periodically interrupt the flow of current to said first circuit, at an interruption frequency (i.e. on/off switching rate) sufficient to cause the second circuit to reset to its steady on state without or generally before the controller proceeds to the other special lighting effects. By using a switching (on/off) frequency at least higher than what the human eye can perceive as a pulse, the switching will produce a plurality of steady on illumination pulses in the illumination element, but the user will see a substantially steady light. When the second circuit provides a steady current, the illumination elements will produce their special effects, such as twinkling, according the predetermined configuration of the controller.

Thus, no special wires are required to provide these two controller states other than two power conductors to the bulbs.

The interruption frequency is at least sufficient to provide a plurality of light pulses from the illumination element which appear of substantially uniform intensity. The steady on period can also be a period where the intensity is gradually diminishing, but in a train of pulses, it will be seen by a human viewer as steady on.

The preferred interruption frequency is at least beyond the frequency of a human to observe flicker in the illumination element.

In this embodiment, the state switchable bulbs include a circuit which controls the current to the illumination element (usually an LED) to cause the desired effect. Such a circuit

includes a timing device which repeats the special effect on a cyclical basis, the effect being triggered by the timer. If the current is continuously applied to that bulb, the circuit will continuously produce the special effect (such as twinkling and/or color changing) by cycling through preprogrammed steps of changing the current supplied to the illumination element. By interfering with the cycle, it is possible to have such a circuit act as if it was not producing the special effect, but rather, attempting to initialize the effect, by repeatedly being restarted. This is accomplished by sending a reset signal to the circuit, making it think that it must restarted from its beginning state (such as on or a specific starting color/hue) and before it can proceed to the special effect state (such as dimming, color/hue change), sending another reset signal/pulse to the circuit. This has the effect of restarting the circuit from its initial state again. By repeatedly sending a reset pulse, the effect is either a continuous unchanged light output, or a series of short on pulses of light, with short off periods therebetween. The visual effect by a human viewer is that the light is on continuously due to the slow reaction time of the human eye and integration of the light over time. It is also possible to reset the special effects timer in the circuit, by disconnecting and reconnecting power to the entire circuit. This will have the effect of a reset since the circuit will reinitialize in a start state every time it receives power from a zero power state and initiate a timing sequence to restart from on state. The frequency of reset signals required will depend on the circuit construction, but for some devices a 50-60 Hz reset pulse rate has proven effective in creating the visual effect on an always on state while for other devices the required pulse rate may be several kilohertz, such as 50-60 kHz. In the preferred embodiment, using a bulb having a chip made by Zhejiang Newday Photoelectric Technology Co., Ltd.

Model YL11, Linhai, Taizhou City, China, the preferred pulse rate is 60 hz or at least 60 hz, but not more than 1 kHz. With other chips, the preferred range is at least as high as needed to prevent flicker being perceived by a human viewer, typically 60+ Hz and less than the maximum switching rate of the chip, in this case approximately 1 kHz. Above the switching rate, the reset to the initialization (start) state may not be reliable.

Voltage or current changes or both are sent in pulses to the bulbs, at a rate that is quick enough to reset the circuit/micro IC inside the twinkle LED that causes it to twinkle. By doing this it tricks the twinkle LED and IC into not turning on and off as the IC keeps resetting so that the LED appears that it is steady illuminating. The pulses happen so quickly that the human eye is not able to detect the bulb is flashing, similar to operation of an LED light set on 60 Hz without rectification where the human eye integrates the light and thinks it is steady on. In this disclosure, it could be as slow as 50-60 Hz, but will be fast enough to reset the micro IC in the twinkle LED to keep it from turning off long enough that the human eye will detect it and cause it to appear as in a steady-on state. During this pulsed voltage and or current sequence, if not fast enough it may appear that the lights are slightly dimmer than when steady on, but if fast enough will appear at the same brightness as when operating on normal power. Both states can be preferential depending on the lighting effect desired by the lighting designer.

To cause the set to twinkle (or other special effect), one would either have to slow down the pulses so that the IC only resets during the normal off period of the twinkle LED or provide a filtered or unfiltered DC or rectified AC power to the LEDs. This can be done with a range of voltages and power sources such as low voltage transformers or direct line voltage and frequency with or without frequency altering circuitry or periodic alternating the current or voltage.

This pulsing voltage or current can be performed a variety of ways including pulse with modulating circuit (PWM) or other methods to create a pulsed output quick enough to reset the circuit/IC in the twinkling or other special effect LED.

Bulbs can be wired in series or parallel, or in series parallel combinations and operated at line voltage or low voltage.

This embodiment uses the same amount of wire and LEDs as a regular set, only adding a low cost controller to the set, saving on the extra wires, larger bundles, heavier sets, higher cost, reduces the resources needed to manufacture such a set and makes it easier to decorate with than existing products, or the high cost of addressable circuitry on each bulb, a separate data wire, and a processor to send signals to control each bulb. So resetting of the chip trigger occurs when the chip associated with the illumination element is powered up. When the chip receives current, it will always start from a high brightness/color/hue etc. condition and then switch to lesser light output, in accordance with the predetermined special effect function, and then the brightness/hue/color rise/change again. By repeatedly applying power to the chip, the chip resets to its initialized state which is high illumination (or other special effects) so that the chip illuminates the element in its start or high illumination mode.

An alternative construction uses a chip which can decode a modulated signal to cause the reset. This is more complex, but if a modulated reset signal is sent to the chip on top of the power, the chip will reset but in this embodiment the chip could remain powered up at all times, instead of flashing, albeit rapidly. The illumination element will not pulse at all.

FIG. **1** illustrates an exemplary circuit **10** for which can be connected to light string (not shown) at connector J**1**. The light string can be a series or parallel wired bulbs (illumination elements+circuit components). It is only necessary that each bulb receives current to operate the illumination element and circuit.

The MUC/MCU microcontroller unit, IC chip **12** is of a type known in the art for supplying and controlling current to the light string at j**1**. The function of the chip is explained in the flow chart in FIG. **7**. Output pin **7** is PWM output.

FIG. **2** shows an alternative circuit **20** which differs from FIG. **1** in that it has an input for a wired or wireless remote control at connector J**2** which will switch power on/off, and "flash" (i.e. special effects) on/off. The flash switch activates IC **12** to send rapid reset pulses to the bulb strings connected at J**1** so that the special effects timers in the bulbs is rapidly reset thereby appearing to generate a contact on appearance by preventing the "twinkle" effect from occurring in the bulbs.

FIG. **3** shows a further variant **30** of the circuit in FIG. **2** with a switch **32** to control whether the reset pulses are sent or not. FIG. **8** is a flow chart of the MCU/MUC controller in FIG. **3**. Output pin **3** is the PWM output.

FIGS. **4***a* and **4***b* illustrate a group of sub figures which illustrate the visual effect. Illustration **40***a* shows a varying voltage or current input to the bulb light string. A pure DC input is also possible. Illustration **40***b* is a schematic illustration on a bulb which in this case is an LED with a twinkle chip incorporated therein. This circuit/chip has been discussed previously as one commercially available and which provides a special effect on the illumination element when power is continuously applied to the chip. Twinkle, pulse, color, hue and other effects are available.

Illustration **40***c* is the actual light output at the illumination element when the special effect chip is reset at a rate fast enough to prevent the chip from executing its normal special effect. The light output mimics the power input, as if the chip was non-existent. The result, shown in illustration **40***d*, is that the human view perceives the light output as steady. This is from a chip which has no special provision for producing a steady light output, but the rapid resetting of the chip function has effectively "tricked" the chip and hence the viewer into seeing solid illumination when it should be providing some other special effect.

FIG. **4***b* show the "normal" result of the special effect chip in the light string when continuous current is applied at **42***a*. The bulb **42***b* produces some special effect, in this case pulsing or twinkling as shown in **42***c*.

Embodiment 2

Embodiment 2 provides a similar result to the first embodiment but employs an entirely different solution. FIG. **5** illustrates the light string **50** and FIG. **6** illustrates the power conditions and results. In FIG. **5** a plurality of bulbs **52** (circuit elements and illumination elements combined) are shown in series, though parallel or a combination of series/parallel is equally possible. Bulbs **52** combine elements **54** "S", solid or always on LED with element **56** "t" a twinkle LED with twinkle (or other special function) circuit. Note that they are in parallel with reverse polarity. That means when power is applied in one direction, the **54** element will illuminate, but in with reverse power, the other element **56** will illuminate but with special function. FIG. **6** illustrates polarity and the result.

Thus, to make this circuit produce special effects, the polarity of the power need only be reversed. Of course, a mixture of T and S bulbs can be provided in the light string **50** to produce assorted outputs.

Alternatively, on inputs 1 and 2, a low frequency power source could be applied to provide a combination effect of the steady illuminating light source and the special effect light source at the same time. In other words, if AC is applied to inputs 1-2, the result will be the same as reversing polarity. The positive and negative wave forms will provide the reversing of polarity. In such case, the special effect is controlled by the frequency of the waveform.

Each bulb could be an LED and chip in the same housing, or in two separate housings next to each other to give the appearance when lit of one bulb, or combined in a refractive or translucent cover.

The bulb pairs can be wired in parallel or in series to other bulb pairs.

A simple controller or mechanical switching device is needed to be able to reverse the polarity of the bulb pairs so that one the polarity is in one direction, the set illuminates steady on, and when in the other direction, the set has a twinkle or other special effect function to it.

In first direction, all steady on bulbs are properly biased for current flow, while the twinkle bulbs are reversed biased.

In the other direction, all twinkle bulbs are properly biased for current flow. Depending on the application, if not all the bulbs were intended to twinkle, some of the twinkle bulbs could be substituted with steady on bulbs to create the effect desired.

This method uses the same amount of wire a regular set, adding a second set of LEDs and a low cost controller, saving on the extra wires, larger bundles, heavier sets, higher cost, reduces the resources needed to manufacture such a set and makes it easier to decorate with than existing products, or the high cost of addressable circuitry on each bulb, a separate data wire, and a processor to send signals to control each bulb.

For both embodiments the user selector of the operational mode (all steady on or all/partial twinkle/special effect) can be a variety of methods, including, but not limited to a selector switch, remote control, wireless control (WiFi, Bluetooth, ZigBee, etc.), app control, sound actuated, motion actuated, gesture actuated, etc.

The description of the invention and its applications as set forth herein is illustrative and is not intended to limit the scope of the invention. Variations and modifications of the embodiments disclosed herein are possible and practical alternatives to and equivalents of the various elements of the embodiments would be understood to those of ordinary skill in the art upon study of this patent document. These and other variations and modifications of the embodiments disclosed herein may be made without departing from the scope and spirit of the invention.

The invention claimed is:

1. A system for switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, comprising:

a. an electrically powered illumination element;

b. a first switching circuit in communication said illumination element for controlling the flow of current to the element, said first circuit containing a controller for controlling the power to said illumination element to produce a predetermined special illumination visual lighting effect in the illumination element, said first circuit initiating said lighting effect when powered up starting from an initial steady-on illuminated state in the element and then proceeding to other special lighting effects occurring after the steady-on power up and periodically repeating said special lighting effect for a predetermined period of time, and

c. a second switching circuit in communication with said first circuit, configured to periodically interrupt the flow of current to said first circuit, at an interruption frequency sufficient to cause the second circuit to reset to its steady on state without proceeding to said other special lighting effects, and thereby producing a plurality of steady-on illumination pulses in the illumination element.

2. The system of claim **1** wherein said interruption frequency is at least sufficient to create the visual appearance in the illumination element of a steady-on light.

3. The system of claim **2** wherein said interruption frequency is at least sufficient to provide a plurality of light pulses from the illumination element which appear to have substantially uniform intensity.

4. The system of claim **2** wherein said interruption frequency is at least more than the frequency of a human eye to observe flicker in the illumination element.

5. The system of claim **2** wherein said interruption frequency includes periodically energizing and reenergizing the second circuit to at least sufficiently to create the visual appearance in the illumination element of a steady-on illumination.

6. The system of claim **2** wherein said special visual function is a twinkle light effect.

7. The system of claim **2** wherein said special visual function is a blinking light effect.

8. The system of claim **2** wherein said special visual function is a color changing effect.

9. The system of claim 2 wherein said special visual function is a color hue changing effect.

10. The system of claim 2 wherein steady-on includes a momentary illumination at a substantially uniform light output.

11. A method of switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, comprising the steps of:

a. electrically powering illumination element;

b. in communication with said illumination element, controlling the flow of current to the element to produce a predetermined special illumination visual lighting effect in the illumination element, controlling said element so that when it is powered up starting with an initial steady on illuminated state in the element and then proceed to said special lighting effects occurring after the steady-on power up and periodically repeating said special lighting effect for a predetermined period of time, and

c. periodically interrupt the flow of current to said illumination element, at an interruption frequency sufficient to cause the steady-on state without proceeding to said special lighting effects, and thereby producing a plurality of steady-on illumination pulses in the illumination element.

* * * * *

EXHIBIT B

US010080265B2

(12) **United States Patent**
Altamura et al.

(10) **Patent No.: US 10,080,265 B2**
(45) **Date of Patent: *Sep. 18, 2018**

(54) **DECORATIVE LIGHT STRING SWITCHABLE BETWEEN DIFFERENT ILLUMINATION STATES**

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(73) Assignee: **Seasonal Specialties, LLC**, Eden Prairie, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **15/412,441**

(22) Filed: **Jan. 23, 2017**

(65) **Prior Publication Data**

US 2017/0135168 A1 May 11, 2017

Related U.S. Application Data

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(60) Provisional application No. 62/061,836, filed on Oct. 9, 2014.

(51) **Int. Cl.**

H05B 39/09	(2006.01)
H05B 33/08	(2006.01)
F21S 10/00	(2006.01)
F21S 10/02	(2006.01)

(52) **U.S. Cl.**

CPC ***H05B 33/0818*** (2013.01); ***H05B 33/0845*** (2013.01); ***H05B 33/0857*** (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

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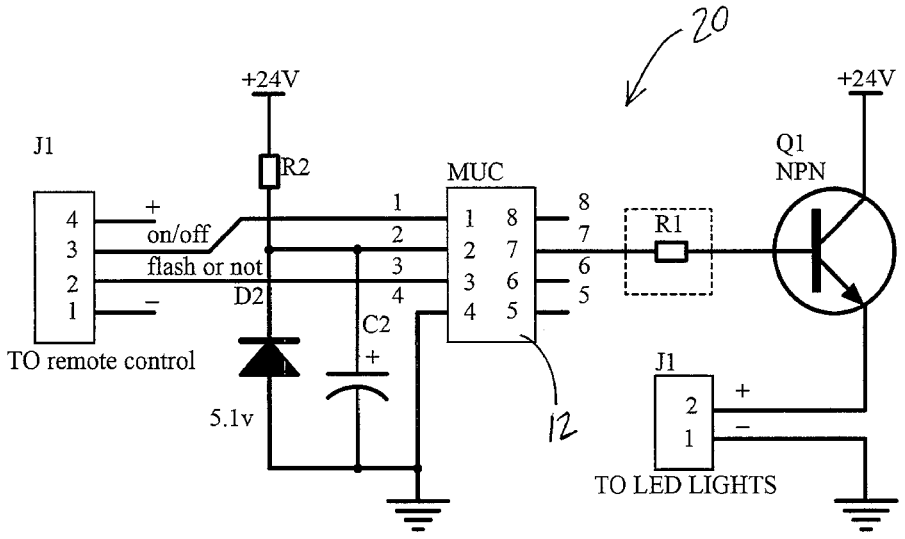
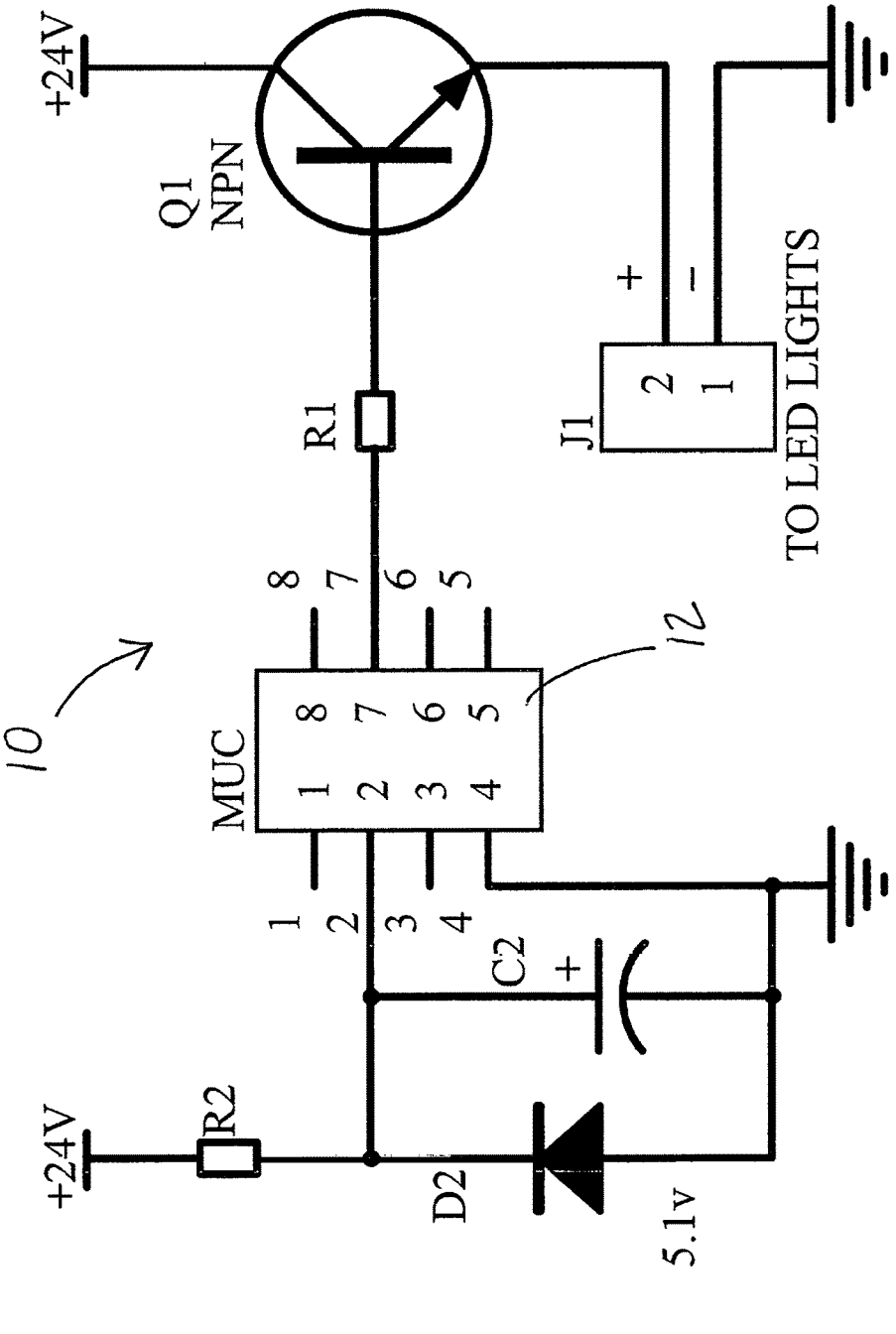
(74) *Attorney, Agent, or Firm* — Altera Law Group, LLC

(57) **ABSTRACT**

A system and method of creating a steady ON and a special effects light effect from a bulb without providing any special wiring thereto. In one embodiment, the bulb contains an illumination element and a controller which produces the special effect in the element. By interrupting the flow of current to the controller periodically, the controller is initialized to its initial steady ON condition. A plurality of steady ON pulses at a high frequency will appear as a steady ON light, instead of pules, thereby producing a steady ON appearance without special wiring. When the current is allowed to flow continuously, the controller produces the special effect. A second embodiment uses parallel polarized light element which produce different effect when power is applied in opposite polarities, thereby providing two effects with no special wiring.

20 Claims, 7 Drawing Sheets

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Q1
NPN
R1
J1
+
-
2
1
TO LED LIGHTS
8
7
6
5
10
12
MUC
1
2
3
4
C2
+24V
R2
D2
5.1v

Fig. 1

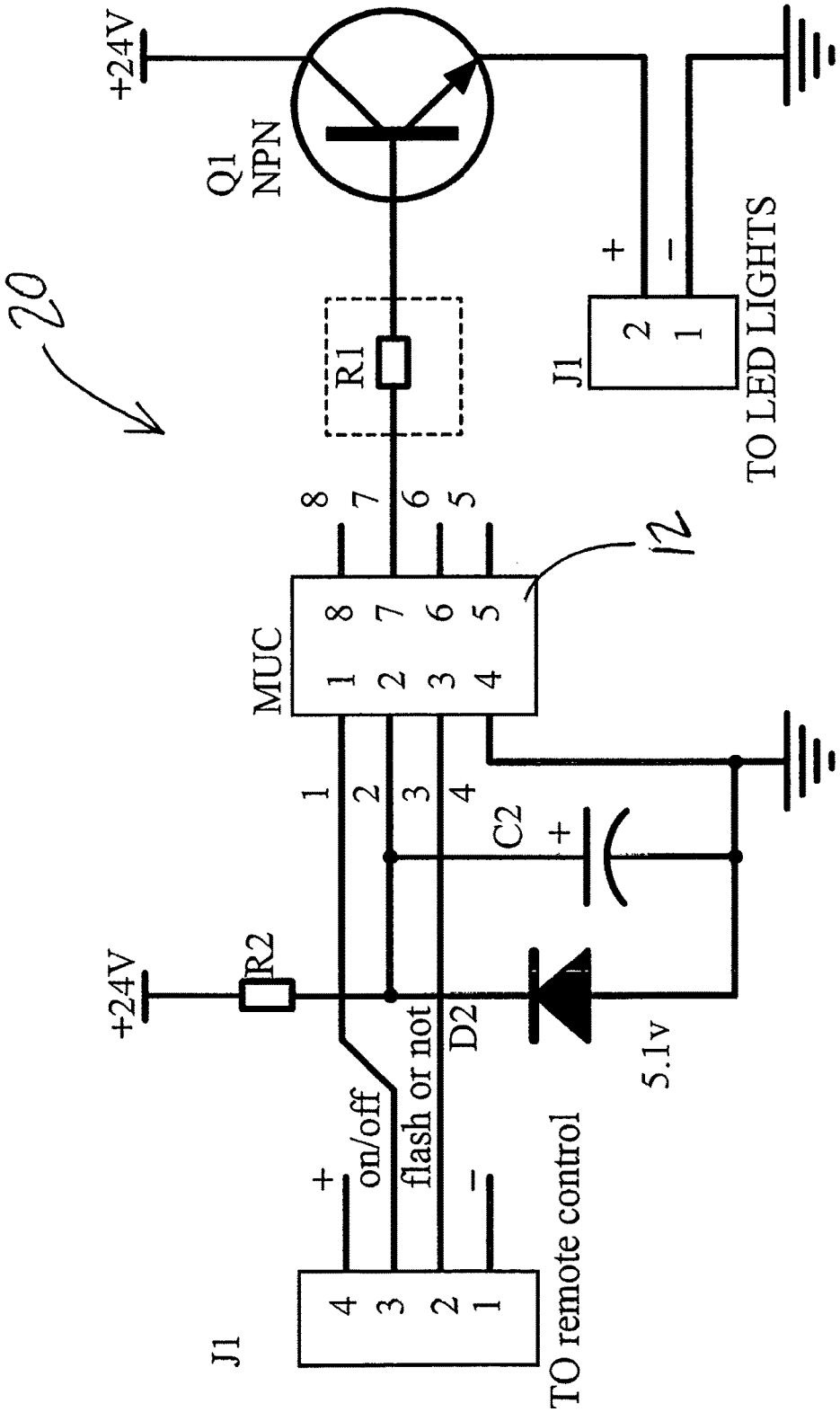
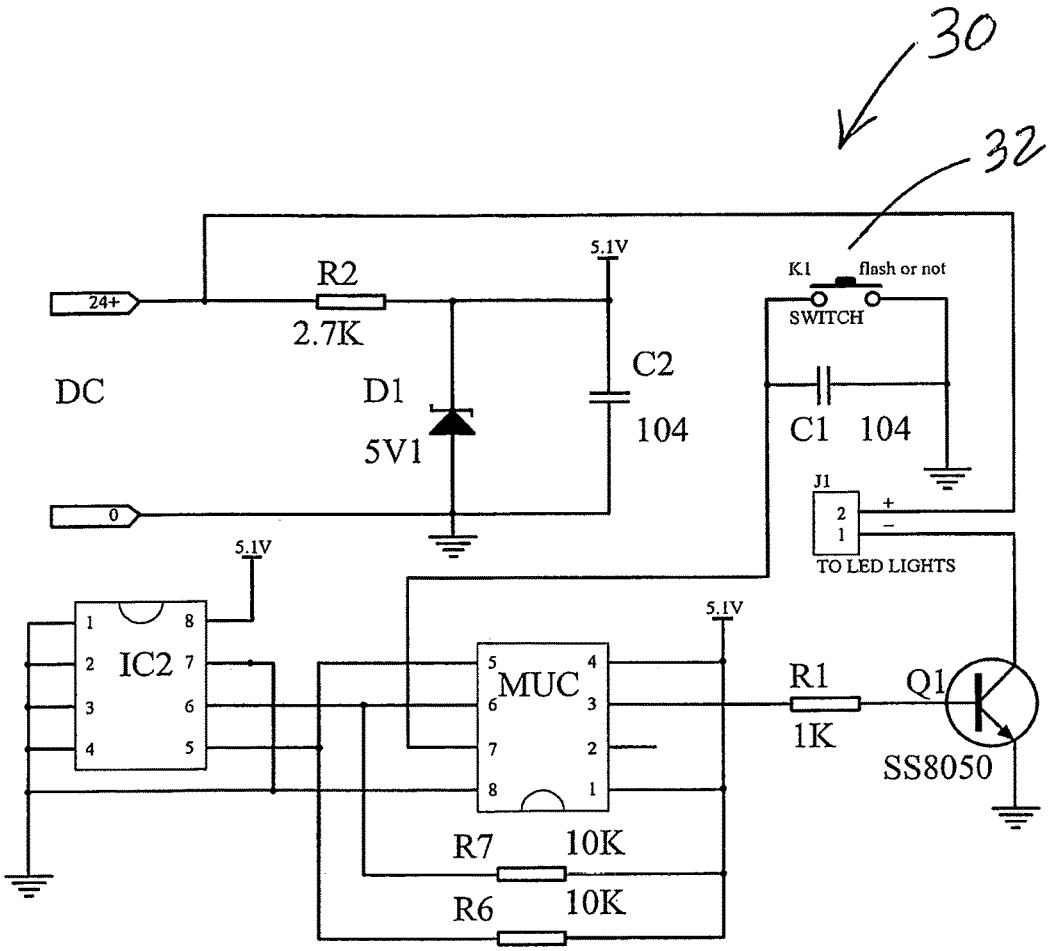

20
+24V
Q1
NPN
R1
J1
2
1
+
–
TO LED LIGHTS
8
7
6
5
12
MUC
1
2
3
4
C2
+24V
R2
D2
5.1v
J1
4
3
2
1
+
on/off
flash or not
–
TO remote control

Fig. 2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32
24+
R2
2.7K
5.1V
K1
flash or not
SWITCH
DC
D1
5V1
C2
104
C1
104
0
J1
2
1
+
−
TO LED LIGHTS
5.1V
IC2
MUC
5.1V
R1
1K
Q1
SS8050
R7
10K
R6
10K

Fig. 3

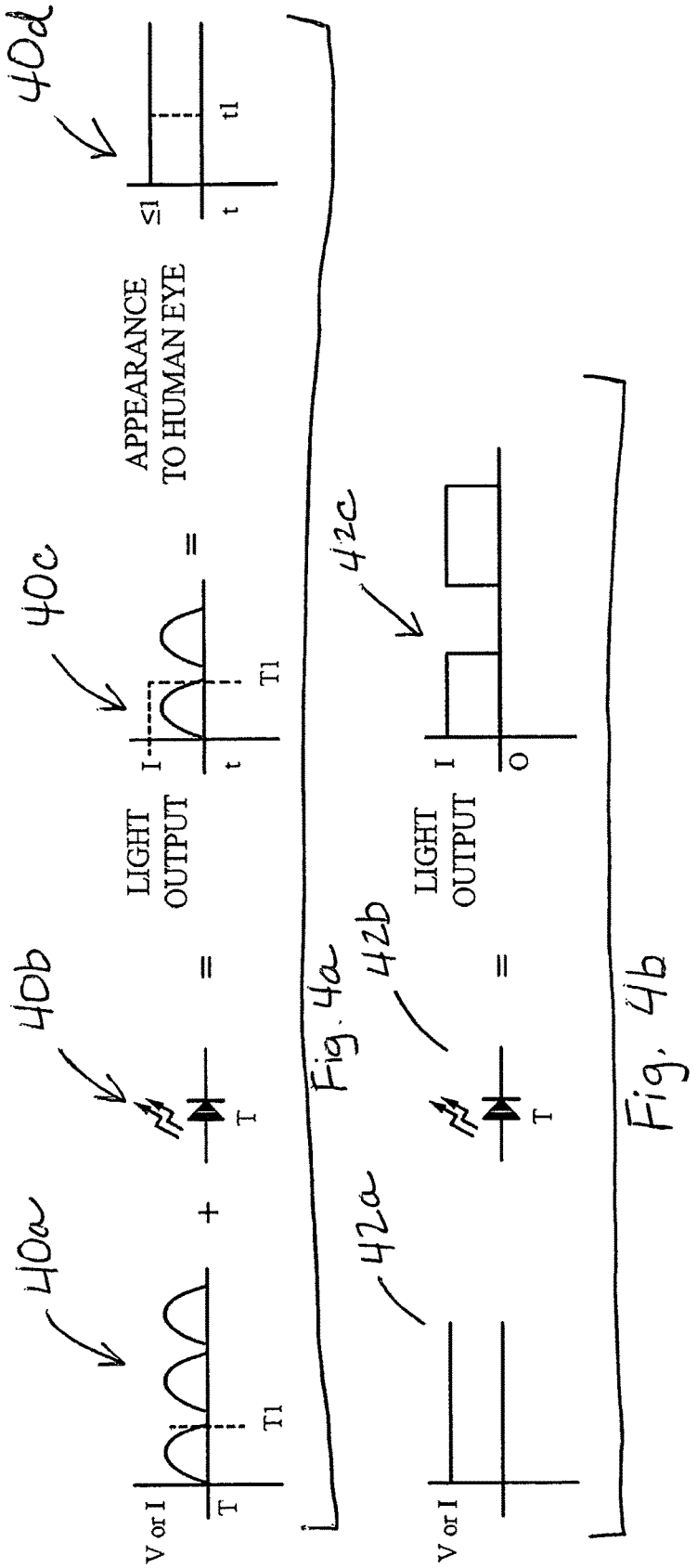

40a
V or I
T
T1
+
40b
T
=
LIGHT OUTPUT
40c
I
t
T1
=
APPEARANCE TO HUMAN EYE
40d
≤1
t
t1
42a
V or I
=
42b
T
LIGHT OUTPUT
42c
I
O

Fig. 4a

Fig. 4b

CONDITION	ALL STEADY ON	SOME OR ALL TWINKLE
2	−	+
1	+	−

Fig. 6

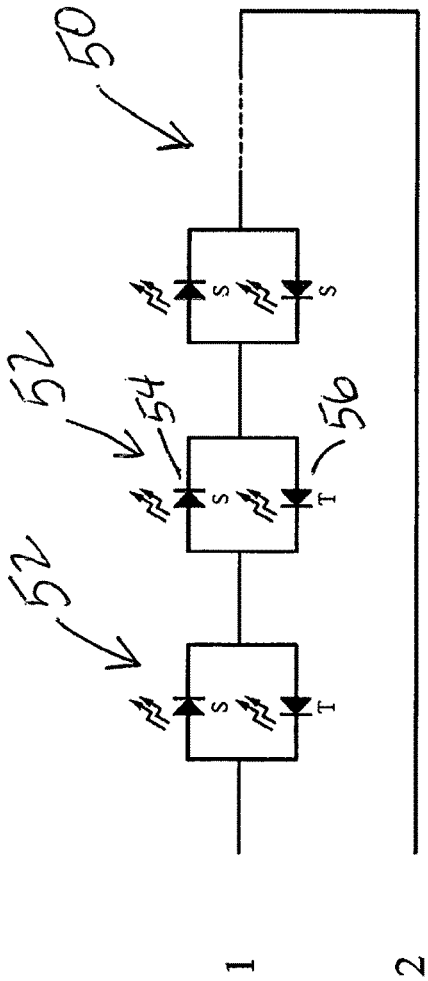


Fig. 5

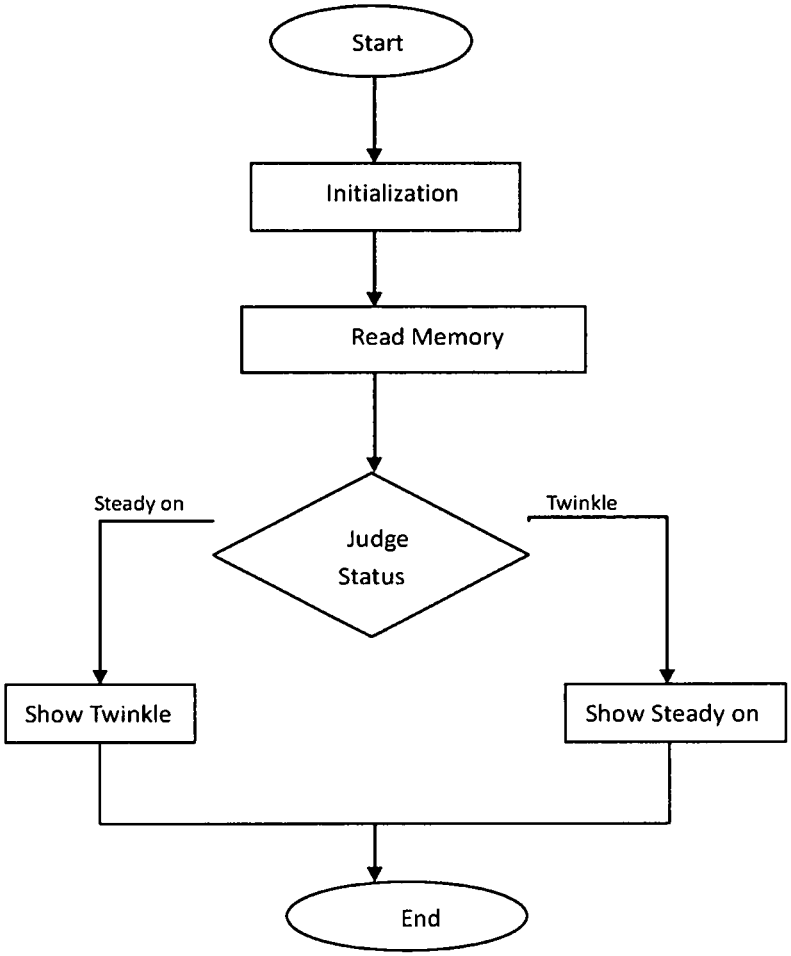

Start
Initialization
Read Memory
Judge Status
Steady on
Twinkle
Show Twinkle
Show Steady on
End

Figure 7

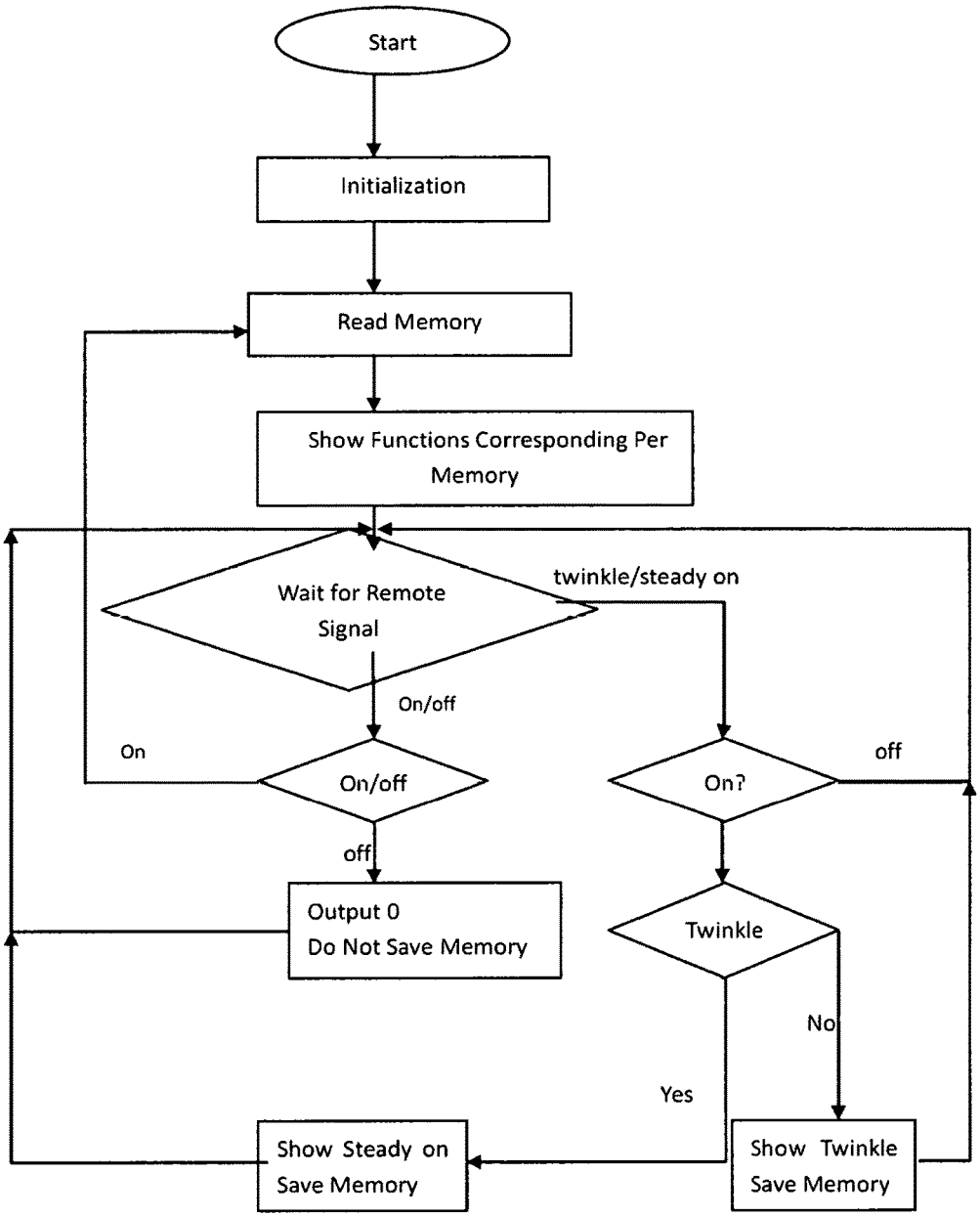

Start
Initialization
Read Memory
Show Functions Corresponding Per Memory
Wait for Remote Signal
twinkle/steady on
On/off
On
On/off
off
On?
off
Output 0
Do Not Save Memory
Twinkle
No
Yes
Show Steady on Save Memory
Show Twinkle Save Memory

Fig. 8

DECORATIVE LIGHT STRING SWITCHABLE BETWEEN DIFFERENT ILLUMINATION STATES

INCORPORATION BY REFERENCE

This application incorporates by reference in its entirety provisional application Ser. No. 62/061,836 filed 9 Oct. 2014 entitled Convertible Twinkle Light String Switchable To Steady-On Light String for which it also claims priority.

TECHNICAL FIELD

This disclosure relates to decorative lighting strings of lights having a plurality of bulbs spaced along the string.

BACKGROUND

Decorative lighting, such as holiday lighting includes strings of bulbs spaced out along a pair of wires. The bulbs may be incandescent or now more frequently, LEDs. Light strings can be made much more interesting if they can switch illumination state, color, or other special effects. Twinkling is particularly attractive. Twinkling or flashing as the bulbs change from on to off, at different frequencies or different illumination slopes to give the visual impression that the bulbs are shimmering.

To create these special effects, the bulbs can be directly wired to a power source which controls the current flow in such a way as to pulse/twinkle or create other special lighting effects. To control bulbs in such a manner, would either require multiple conductors to each bulb for individual control or multiple conductors creating different circuits to alternatingly spaced bulbs to create simulate random sequencing of changing color, shimmering, or flashing.

Alternatively, the bulbs may contain their own microcontroller built into each or some of the bulbs or lamp holders, such that normal wiring can be used, however, the disadvantage to this construction is that the user is not able to select the mode of those lights, such as all being steady illuminating in one mode, and another mode where they perform their intended function of the microcontroller electrically connected to those individual bulbs.

In an alternative construction, bulbs may include addressable circuits which allow digital control signals to be sent to all bulbs in a wired string, and the signal intended by a particular bulb can be decoded by IP or other addressing, to control only that bulb. Such an addressable solution is expensive because it requires advanced logic be provided at the power source and each bulb must have a decoder.

Therefore, to obtain the benefits of control of function and illumination method of bulbs without additional wiring, sophisticated, or expensive circuits has not been possible.

It has been shown in the market that people would like the option to have single light set that can offer both a steady on lighting effect and other lighting effects, such as a twinkling effect that can be user selected, so that depending on the mood of the user, or event, the lights can either be set to be steady on or twinkle, color changing, or other switchable effects.

Twinkling can be described as a change in brightness (ramping up/down, dimming) or a switching on/off and changing the frequency of the switching or both including the separate control of red, green and blue LEDs in a single lamp structure to create color changing effects that include fading or flashing.

SUMMARY

The following summary is intended to assist the reader in understanding the full disclosure and the claims. The claims define the scope of the invention, not this summary.

There is disclosed a system for switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, having

a. an electrically powered illumination element;

b. a first switching circuit in communication said illumination element for controlling the flow of current to the element, said first circuit containing a controller for controlling the power to said illumination element to produce a predetermined special illumination visual lighting effect in the illumination element, said first circuit initiating said lighting effect when powered up starting from an initial steady on illuminated state in the element and then proceeding to other special lighting effects occurring after the steady on power up and periodically repeating said special lighting effect for a predetermined period of time; and

c. a second switching circuit in communication with said first circuit, configured to periodically interrupt the flow of current to said first circuit, at an interruption frequency sufficient to cause the second circuit to reset to its steady on state without proceeding to said other special lighting effects, and thereby producing a plurality of steady on illumination pulses in the illumination element.

Also disclosed is wherein said interruption frequency is at least sufficient to create the visual appearance in the illumination element of a steady on light.

Also disclosed is wherein said interruption frequency is at least sufficient to provide a plurality of light pulses from the illumination element which appear of substantially uniform intensity.

Also disclosed is wherein said interruption frequency is at least beyond the frequency of a human to observe flicker in the illumination element.

Also disclosed is wherein said interruption frequency includes periodically energizing and reenergizing the second circuit to at least sufficiently create the visual appearance in the illumination element of a steady on illumination.

Also disclosed is wherein said special function is a twinkle light effect.

Also disclosed is wherein said special function is a blinking light effect.

Also disclosed is wherein said special function is a color changing effect.

Also disclosed is wherein said special function is a color hue changing effect.

Also disclosed is wherein steady on includes a momentary illumination at a substantially uniform light output.

Also disclosed is a system for switchably converting a special effect lighting system to switch from a steady on light output to a special effect light output having

a. a light string including:

1. a first illumination element which illuminates when energized when powered in a first polarity and not a second opposite polarity;

2. a second illumination element connected in parallel with said first element and configured to output light with a special lighting effect when power is applied in the second polarity only;

b. a switching circuit connected to said elements, said circuit applying power to said string in said first polarity so only said first element will illuminate, and, then apply power in said second polarity, thereby illuminating only said second illumination element with said special effect.

Also disclosed is wherein said first element illuminates when power is applied in either polarity.

Also disclosed is wherein said first and second elements illuminate alternately when Alternating Current (AC) power is applied thereto.

Also disclosed is wherein the circuit is a reversing switch.

Also disclosed is wherein said special effect is light twinkling.

Also disclosed is wherein said special effect is color changing.

Also disclosed is wherein said special effect is color hue changing.

Also disclosed is a method of switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, having any or all of the steps of in any order:

a. electrically powering illumination element;

b. in communication said illumination element, controlling the flow of current to the element to produce a predetermined special illumination visual lighting effect in the illumination element, controlling said element so that when it is powered up starting with an initial steady on illuminated state in the element and then proceed to said special lighting effects occurring after the steady on power up and periodically repeating said special lighting effect for a predetermined period of time, and

c. periodically interrupt the flow of current to said first circuit, at an interruption frequency sufficient to cause a steady on state without proceeding to said special lighting effects, and thereby producing a plurality of steady on illumination pulses in the illumination element.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1** illustrates an exemplary circuit **10** for which can be connected to light string (not shown) at connector J**1**.

FIG. **2** shows an alternative circuit **20** which is differs from FIG. **1** in that it has an input for a wired or wireless remote control at connector.

FIG. **3** shows a further variant **30** of the circuit in FIG. **2** with a switch **32** to control whether the reset pulses are sent or not.

FIGS. **4***a* and **4***b* illustrate a group of sub figures which illustrate the visual effect.

FIG. **5** illustrates the light string **50**.

FIG. **6** illustrates the power conditions and results.

FIG. **7** is a flow chart of the MCU/MUC controller in FIG. **1** and FIG. **2**.

FIG. **8** is a flow chart of the MCU/MUC controller in FIG. **2** and FIG. **3**.

DETAILED DESCRIPTION

Embodiment 1

In this embodiment, a light string can be controlled to operate specially configured bulbs to switch from one state to another without the need to reverse polarity of the power supply, adding additional control wires, or use of addressable bulbs and a controller. A "bulb" in this instance is an illumination element, such as an LED, incandescent lamp or equivalent which produces light in response to electrical current. It may also include a circuit or chip which controls the function of the illumination element. The two may be combined into a single unit or physically separated. The chip may be integral to the illumination element, in a socket for the element or entirely separated though electrically connected.

The "state" switching can be from on to off, or special effects versions thereof, such as twinkling, pulsing, flashing or other brightness varying effects, color changing, hue changing or other optical effects as determined by the type of control circuits and bulb types provided.

It is possible to include mixture of state controllable/switching bulbs with standard non switching bulbs since the visual effect can be achieved with less than all bulbs being controlled.

More generally, there is disclosed a system for switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, having an electrically powered illumination element and a first switching circuit in communication said illumination element for controlling the flow of current to the element. The first circuit containing a controller for controlling the power to said illumination element to produce a predetermined special illumination visual lighting effect in the illumination element. The first circuit preferably is configured to power up starting from an initial steady on illuminated state, even for a brief period of time at a relatively uniform level of illumination. Then the rest of the special lighting effects are generated by the controller after the steady on power up the special effects are periodically repeated.

There is preferably a second switching circuit in communication with said first circuit, configured to periodically interrupt the flow of current to said first circuit, at an interruption frequency (i.e. on/off switching rate) sufficient to cause the second circuit to reset to its steady on state without or generally before the controller proceeds to the other special lighting effects. By using a switching (on/off) frequency at least higher than what the human eye can perceive as a pulse, the switching will produce a plurality of steady on illumination pulses in the illumination element, but the user will see a substantially steady light. When the second circuit provides a steady current, the illumination elements will produce their special effects, such as twinkling, according the predetermined configuration of the controller.

Thus, no special wires are required to provide these two controller states other than two power conductors to the bulbs.

The interruption frequency is at least sufficient to provide a plurality of light pulses from the illumination element which appear of substantially uniform intensity. The steady on period can also be a period where the intensity is gradually diminishing, but in a train of pulses, it will be seen by a human viewer as steady on.

The preferred interruption frequency is at least beyond the frequency of a human to observe flicker in the illumination element.

In this embodiment, the state switchable bulbs include a circuit which controls the current to the illumination element (usually an LED) to cause the desired effect. Such a circuit

includes a timing device which repeats the special effect on a cyclical basis, the effect being triggered by the timer. If the current is continuously applied to that bulb, the circuit will continuously produce the special effect (such as twinkling and/or color changing) by cycling through preprogrammed steps of changing the current supplied to the illumination element. By interfering with the cycle, it is possible to have such a circuit act as if it was not producing the special effect, but rather, attempting to initialize the effect, by repeatedly being restarted. This is accomplished by sending a reset signal to the circuit, making it think that it must restarted from its beginning state (such as on or a specific starting color/hue) and before it can proceed to the special effect state (such as dimming, color/hue change), sending another reset signal/pulse to the circuit. This has the effect of restarting the circuit from its initial state again. By repeatedly sending a reset pulse, the effect is either a continuous unchanged light output, or a series of short on pulses of light, with short off periods therebetween. The visual effect by a human viewer is that the light is on continuously due to the slow reaction time of the human eye and integration of the light over time. It is also possible to reset the special effects timer in the circuit, by disconnecting and reconnecting power to the entire circuit. This will have the effect of a reset since the circuit will reinitialize in a start state every time it receives power from a zero power state and initiate a timing sequence to restart from on state. The frequency of reset signals required will depend on the circuit construction, but for some devices a 50-60 Hz reset pulse rate has proven effective in creating the visual effect on an always on state while for other devices the required pulse rate may be several kilohertz, such as 50-60 kHz. In the preferred embodiment, using a bulb having a chip made by Zhejiang Newday Photoelectric Technology Co., Ltd.

Model YL11, Linhai, Taizhou City, China, the preferred pulse rate is 60 hz or at least 60 hz, but not more than 1 kHz. With other chips, the preferred range is at least as high as needed to prevent flicker being perceived by a human viewer, typically 60+ Hz and less than the maximum switching rate of the chip, in this case approximately 1 kHz. Above the switching rate, the reset to the initialization (start) state may not be reliable.

Voltage or current changes or both are sent in pulses to the bulbs, at a rate that is quick enough to reset the circuit/micro IC inside the twinkle LED that causes it to twinkle. By doing this it tricks the twinkle LED and IC into not turning on and off as the IC keeps resetting so that the LED appears that it is steady illuminating. The pulses happen so quickly that the human eye is not able to detect the bulb is flashing, similar to operation of an LED light set on 60 Hz without rectification where the human eye integrates the light and thinks it is steady on. In this disclosure, it could be as slow as 50-60 Hz, but will be fast enough to reset the micro IC in the twinkle LED to keep it from turning off long enough that the human eye will detect it and cause it to appear as in a steady-on state. During this pulsed voltage and or current sequence, if not fast enough it may appear that the lights are slightly dimmer than when steady on, but if fast enough will appear at the same brightness as when operating on normal power. Both states can be preferential depending on the lighting effect desired by the lighting designer.

To cause the set to twinkle (or other special effect), one would either have to slow down the pulses so that the IC only resets during the normal off period of the twinkle LED or provide a filtered or unfiltered DC or rectified AC power to the LEDs. This can be done with a range of voltages and power sources such as low voltage transformers or direct line voltage and frequency with or without frequency altering circuitry or periodic alternating the current or voltage.

This pulsing voltage or current can be performed a variety of ways including pulse with modulating circuit (PWM) or other methods to create a pulsed output quick enough to reset the circuit/IC in the twinkling or other special effect LED.

Bulbs can be wired in series or parallel, or in series parallel combinations and operated at line voltage or low voltage.

This embodiment uses the same amount of wire and LEDs as a regular set, only adding a low cost controller to the set, saving on the extra wires, larger bundles, heavier sets, higher cost, reduces the resources needed to manufacture such a set and makes it easier to decorate with than existing products, or the high cost of addressable circuitry on each bulb, a separate data wire, and a processor to send signals to control each bulb. So resetting of the chip trigger occurs when the chip associated with the illumination element is powered up. When the chip receives current, it will always start from a high brightness/color/hue etc. condition and then switch to lesser light output, in accordance with the predetermined special effect function, and then the brightness/hue/color rise/change again. By repeatedly applying power to the chip, the chip resets to its initialized state which is high illumination (or other special effects) so that the chip illuminates the element in its start or high illumination mode.

An alternative construction uses a chip which can decode a modulated signal to cause the reset. This is more complex, but if a modulated reset signal is sent to the chip on top of the power, the chip will reset but in this embodiment the chip could remain powered up at all times, instead of flashing, albeit rapidly. The illumination element will not pulse at all.

FIG. **1** illustrates an exemplary circuit **10** for which can be connected to light string (not shown) at connector J**1**. The light string can be a series or parallel wired bulbs (illumination elements+circuit components). It is only necessary that each bulb receives current to operate the illumination element and circuit.

The MUC/MCU microcontroller unit, IC chip **12** is of a type known in the art for supplying and controlling current to the light string at j**1**. The function of the chip is explained in the flow chart in FIG. **7**. Output pin **7** is PWM output.

FIG. **2** shows an alternative circuit **20** which differs from FIG. **1** in that it has an input for a wired or wireless remote control at connector J**2** which will switch power on/off, and "flash" (i.e. special effects) on/off. The flash switch activates IC **12** to send rapid reset pulses to the bulb strings connected at J**1** so that the special effects timers in the bulbs is rapidly reset thereby appearing to generate a contact on appearance by preventing the "twinkle" effect from occurring in the bulbs.

FIG. **3** shows a further variant **30** of the circuit in FIG. **2** with a switch **32** to control whether the reset pulses are sent or not. FIG. **8** is a flow chart of the MCU/MUC controller in FIG. **3**. Output pin **3** is the PWM output.

FIGS. **4***a* and **4***b* illustrate a group of sub figures which illustrate the visual effect. Illustration **40***a* shows a varying voltage or current input to the bulb light string. A pure DC input is also possible. Illustration **40***b* is a schematic illustration on a bulb which in this case is an LED with a twinkle chip incorporated therein. This circuit/chip has been discussed previously as one commercially available and which provides a special effect on the illumination element when power is continuously applied to the chip. Twinkle, pulse, color, hue and other effects are available.

Illustration **40***c* is the actual light output at the illumination element when the special effect chip is reset at a rate fast enough to prevent the chip from executing its normal special effect. The light output mimics the power input, as if the chip was non-existent. The result, shown in illustration **40***d*, is that the human view perceives the light output as steady. This is from a chip which has no special provision for producing a steady light output, but the rapid resetting of the chip function has effectively "tricked" the chip and hence the viewer into seeing solid illumination when it should be providing some other special effect.

FIG. **4***b* show the "normal" result of the special effect chip in the light string when continuous current is applied at **42***a*. The bulb **42***b* produces some special effect, in this case pulsing or twinkling as shown in **42***c*.

Embodiment 2

Embodiment 2 provides a similar result to the first embodiment but employs an entirely different solution. FIG. **5** illustrates the light string **50** and FIG. **6** illustrates the power conditions and results. In FIG. **5** a plurality of bulbs **52** (circuit elements and illumination elements combined) are shown in series, though parallel or a combination of series/parallel is equally possible. Bulbs **52** combine elements **54** "S", solid or always on LED with element **56** "t" a twinkle LED with twinkle (or other special function) circuit. Note that they are in parallel with reverse polarity. That means when power is applied in one direction, the **54** element will illuminate, but in with reverse power, the other element **56** will illuminate but with special function. FIG. **6** illustrates polarity and the result.

Thus, to make this circuit produce special effects, the polarity of the power need only be reversed. Of course, a mixture of T and S bulbs can be provided in the light string **50** to produce assorted outputs.

Alternatively, on inputs **1** and **2**, a low frequency power source could be applied to provide a combination effect of the steady illuminating light source and the special effect light source at the same time. In other words, if AC is applied to inputs **1**-**2**, the result will be the same as reversing polarity. The positive and negative wave forms will provide the reversing of polarity. In such case, the special effect is controlled by the frequency of the waveform.

Each bulb could be an LED and chip in the same housing, or in two separate housings next to each other to give the appearance when lit of one bulb, or combined in a refractive or translucent cover.

The bulb pairs can be wired in parallel or in series to other bulb pairs.

A simple controller or mechanical switching device is needed to be able to reverse the polarity of the bulb pairs so that one the polarity is in one direction, the set illuminates steady on, and when in the other direction, the set has a twinkle or other special effect function to it.

In first direction, all steady on bulbs are properly biased for current flow, while the twinkle bulbs are reversed biased.

In the other direction, all twinkle bulbs are properly biased for current flow. Depending on the application, if not all the bulbs were intended to twinkle, some of the twinkle bulbs could be substituted with steady on bulbs to create the effect desired.

This method uses the same amount of wire a regular set, adding a second set of LEDs and a low cost controller, saving on the extra wires, larger bundles, heavier sets, higher cost, reduces the resources needed to manufacture such a set and makes it easier to decorate with than existing products, or the high cost of addressable circuitry on each bulb, a separate data wire, and a processor to send signals to control each bulb.

For both embodiments the user selector of the operational mode (all steady on or all/partial twinkle/special effect) can be a variety of methods, including, but not limited to a selector switch, remote control, wireless control (WiFi, Bluetooth, ZigBee, etc.), app control, sound actuated, motion actuated, gesture actuated, etc.

The description of the invention and its applications as set forth herein is illustrative and is not intended to limit the scope of the invention. Variations and modifications of the embodiments disclosed herein are possible and practical alternatives to and equivalents of the various elements of the embodiments would be understood to those of ordinary skill in the art upon study of this patent document. These and other variations and modifications of the embodiments disclosed herein may be made without departing from the scope and spirit of the invention.

The invention claimed is:

1. A system for switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, comprising:

a. an electrically powered illumination element;

b. a first switching circuit in communication said illumination element for controlling the flow of current to the element, said first circuit containing a controller for controlling the power to said illumination element to produce a predetermined special illumination visual lighting effect in the illumination element, said first circuit initiating said lighting effect when powered up starting from an initial on illuminated state in the element and proceeding to other special lighting effects occurring after the on power up and periodically repeating said special lighting effect for a predetermined period of time, and

c. a second switching circuit, configured to periodically interrupt the flow of current to said first circuit, at an interruption frequency sufficient to cause the first circuit to reset to its on state without proceeding to said other special lighting effects, and thereby producing a plurality of on illumination pulses in the illumination element, so that a viewer perceives the illumination element as always on.

2. The system of claim **1** wherein said interruption frequency is at least sufficient to create the visual appearance in the illumination element of a steady on light.

3. The system of claim **2** wherein said interruption frequency is at least sufficient to provide a plurality of light pulses from the illumination element which appear of substantially uniform intensity.

4. The system of claim **2** wherein said interruption frequency is at least beyond the frequency of a human to observe flicker in the illumination element.

5. The system of claim **2** wherein said interruption frequency includes periodically energizing and reenergizing the second circuit to is at least sufficient to create the visual appearance in the illumination element of a steady on illumination.

6. The system of claim **2** wherein said special function is a twinkle light effect.

7. The system of claim **2** wherein said special function is a blinking light effect.

8. The system of claim **2** wherein said special function is a color changing effect.

9. The system of claim **2** wherein said special function is a color hue changing effect.

10. The system of claim **2** wherein steady on includes a momentary illumination at a substantially uniform light output.

11. A system for switchably converting a special effect lighting system to switch from a steady on light output to a special effect light output comprising:

a. a light string including:

1. a first illumination element which illuminates when energized when powered in a first polarity and not a second opposite polarity;
2. a second illumination element connected in parallel with said first element and configured to output light with a special lighting effect when powered is applied in the second polarity only;

b. a switching circuit connected to said elements, said circuit applying power to said string in said first polarity so only said first element will illuminate, and alternately apply power in said second polarity, thereby illuminating only said second illumination element with said special effect.

12. The system of claim **11** wherein said first element illuminates when power is applied in either polarity.

13. The system of claim **11** wherein said first and second elements illuminate alternately when Alternating Current (AC) power is applied thereto.

14. The system of claim **11** wherein the circuit is a reversing switch.

15. The system of claim **11** wherein said special effect is light twinkling.

16. The system of claim **11** wherein said special effect is color changing.

17. The system of claim **11** wherein said special effect is color hue changing.

18. A light string capable of switchable displaying special effect lighting and steady-on lighting outputs comprising:

a. a light string including:

1. a plurality of illumination elements which illuminate when energized by applying power in a first polarity and not illuminate when applying power a second opposite polarity;
2. a plurality of second illumination elements connected in parallel with said first elements and configured to output light with a special lighting effect when powered is applied in the second polarity only;
3. a switching circuit connected to said elements, said circuit being capable of applying power to said string in said first polarity so only said first element will illuminate, and, alternately apply power in said second polarity, thereby illuminating only said second illumination element with said special effect.

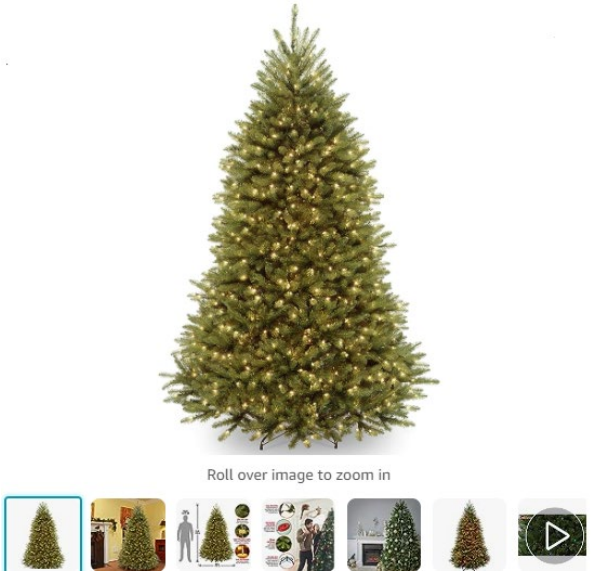
19. The light string of claim **18** wherein said switching circuit decodes a modulated signal.

20. The light string of claim **18** further including a second switching circuit to create steady-on illumination, said second a switching circuit in communication said illumination elements for controlling the flow of current to the first illumination elements, said second circuit containing a controller for controlling the power to said illumination elements and configured to periodically interrupt the flow of current to said illumination elements, at an interruption frequency sufficient to cause the second circuit to reset to a steady on-state, and thereby producing a plurality of steady-on illumination pulses in the illumination element.

* * * * *

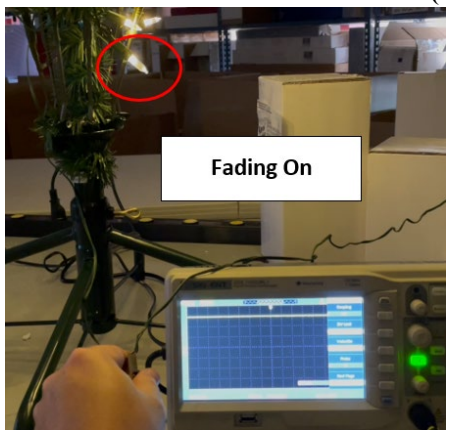
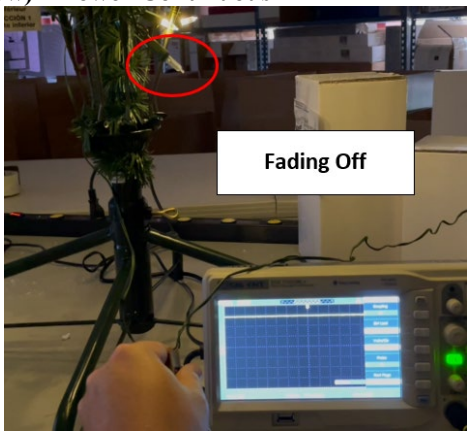
EXHIBIT C

Nat'l Tree "7.5ft Dunhill Fir Tree" compared to US 9,554,437

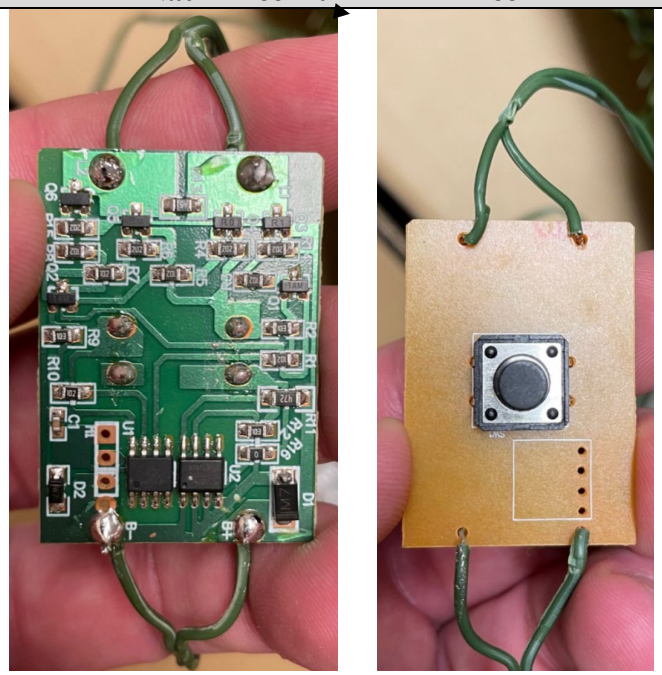
Claim	Nat'l Tree Dunhill Fir Tree
1. A system for switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, comprising:	The Nat'l Tree "7.5ft Dunhill Fir Tree" ("Dunhill Fir") product contains "900 Dual Color LED lights." See image below of the product. The Dual Color LED lights have two colors (Bi-Color)—Warm White and Multi Color.  [1] Some of the Dual Color LED lights are special illumination LEDs that can selectable fade in and out from steady on mode to off, in both colors. Nat'l Tree makes, offers for sale, sells, and imports the claimed system, including the special illumination LEDs, and induces others including Amazon, to offer for sale, sell and use the same.
a. an electrically powered illumination element;	Some of the Dual Color LED lights are special illumination LEDs that can selectable fade in and out from steady on mode to off, in both colors. Each special illumination LED has an integrated circuit (IC) in it. Other LEDs on the product are standard non switching LED bulbs, similar to the description in the patents. See '265 patent 4:17-20. The standard non switching LEDs (if provided) do not have an IC in them.

[1] As seen at https://www.amazon.com/National-Tree-Function-Footswitch-DUH-330LD-75S/dp/B005CXG1X0/ref=sr_1_2?crid=UROR9YGTWZKO&keywords=7.5ft%2Bpre-lit%2Bdunhill%2Bfull%2Bled%2Bartificial%E2%80%A6, and, accessed August 24, 2023.

Nat'l Tree "7.5ft Dunhill Fir Tree" compared to US 9,554,437

Claim	Nat'l Tree Dunhill Fir Tree
b. a first switching circuit in communication said illumination element for controlling the flow of current to the element, said first circuit containing a controller for controlling the power to said illumination element to produce a predetermined special illumination visual lighting effect in the illumination element, said first circuit initiating said lighting effect when powered up starting from an initial steady-on illuminated state in the element and then proceeding to other special lighting effects occurring after the steady-on power up and periodically repeating said special lighting effect for a predetermined period of time, and	Each special illumination LED has an integrated circuit (IC)—not shown—that constitutes a "first switching circuit." The IC is integrated into each LED unit, similar to the description in the patent. See '437 patent 4:3-11. The IC controls power to the special illumination LED producing a predetermined visual lighting effect that appears as follows: when the IC is initially powered up, the LED begins with a steady-on illumination (which may be for an extremely short period of time that appears to be part of the predetermined special visual lighting effect), followed by a period fading off to on, before restarting the cycle by returning to the steady-on illumination state, and then repeating the steady-on-to-fade on/off cycle for as long as power is maintained continuously. See images below of LED fading "on" and "off" while power is maintained continuously, as shown by the oscilloscope measurement. **Warm White Mode (below) – Power Continuous**   The special illumination LEDs operate in the same manner –fading on to off—when power is supplied continuously in the Multi-Color setting (not shown above). So long as power is maintained constant continuously to the LED IC, without interruption, the LED produces a continuous fading on and off visual effect.
c. a second switching circuit in communication with said first circuit, configured to periodically interrupt the flow of current to said first circuit, at an interruption frequency sufficient to cause the second circuit to reset to its steady on state without proceeding to said other special lighting effects, and thereby producing a plurality of steady-on illumination pulses in the illumination element.	The Dunhill Fir product contains a controller with a circuit board. The circuit board contains an IC that includes a function which constitutes a "second switching circuit." The IC on the circuit board is in communication with and controls the flow of current to the ICs in the special illuminating LEDs (first circuits). See below.

Nat'l Tree "7.5ft Dunhill Fir Tree" compared to US 9,554,437

Claim	Nat'l Tree Dunhill Fir Tree
	 **Second Circuit with Mode Selector** The Dunhill Fir product contains a mode selector connected to a circuit board that allows users to change between "Steady On" or "Fading" modes for the special illumination LEDs, as well as between Warm White and Multi-Color modes. When a user selects the "Steady On" mode, the IC on the circuit board interrupts current to the IC in the special illumination LED (first switching circuit). The interruption in power causes the IC on the special illumination LED to reset the steady-on-to-fading on/off cycle and return to a "Steady On" state. When a user selects a "Steady On" mode, the IC on the circuit board (second circuit) produces a series (a plurality) of interrupting pulses to the IC (first circuit) on the special illuminating LEDs sufficient to keep the LEDs in a "Steady On" state, and not proceeding to the "Fading" state in the steady-on-to-fading cycle. See image below showing frequency interruption pulses from the LED on the circuit board creating a "Steady On" visual effect. When a user selects "Fading" mode the IC (second circuit) allows uninterrupted (non-pulsing) to flow to allow the IC (first circuit) in the special illumination LED to operate normally and causing the lights to produce a "fading" effect. See item b above.

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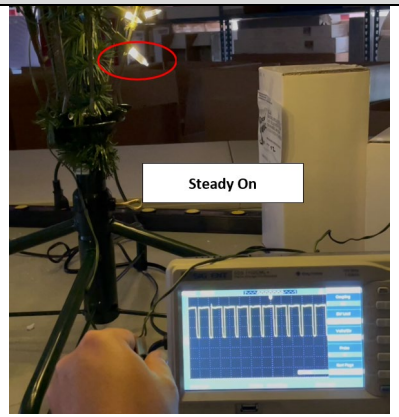
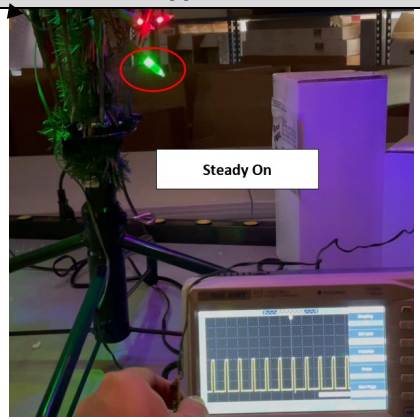
Claim	Nat'l Tree Dunhill Fir Tree
	  **Steady On when Power Interrupted (pulsed)** Warm White (left) and Multi-Color (right)
2. The system of claim 1 wherein said interruption frequency is at least sufficient to create the visual appearance in the illumination element of a steady-on light.	When a user selects "Steady On" mode, the IC on the circuit board produces a series (a plurality) of illuminating pulses sufficient to keep the LEDs in a "Steady On" state, and creating the visual appearance of an uninterrupted "Steady On" light.
3. The system of claim 2 wherein said interruption frequency is at least sufficient to provide a plurality of light pulses from the illumination element which appear to have substantially uniform intensity.	The light emitting from the special illuminating LEDs appear to have substantially uniform intensity in the "Steady On" state.
4. The system of claim 2 wherein said interruption frequency is at least more than the frequency of a human eye to observe flicker in the illumination element.	The light emitting from the special illuminating LEDs appear to have substantially uniform intensity in the "Steady On" state to a human observer.
5. The system of claim 2 wherein said interruption frequency includes periodically energizing and reenergizing the second circuit to at least sufficiently to create the visual appearance in the illumination element of a steady-on illumination.	The light emitting from the special illuminating LEDs appear to have the appearance of "Steady On" illumination.

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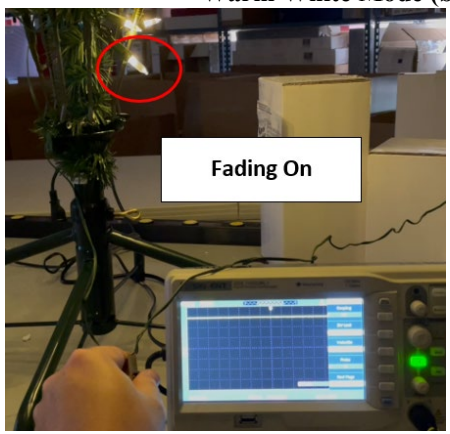
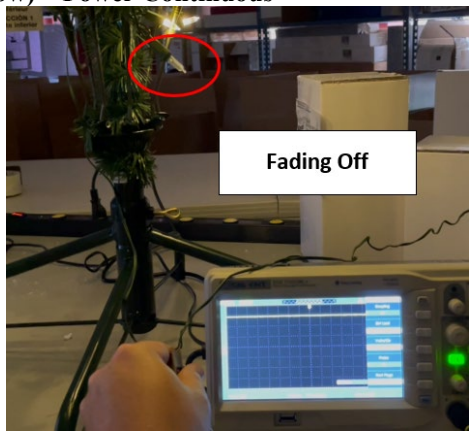
Claim	Nat'l Tree Dunhill Fir Tree
10. The system of claim 2 wherein steady-on includes a momentary illumination at a substantially uniform light output.	The "steady on" state appears as steady on illumination, even though the power to the LED is pulsed (at a frequency fast enough for human observation to see it as steady on).
11. A method of switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, comprising the steps of:	The Nat'l Tree "7.5ft Dunhill Fir Tree" ("Dunhill Fir") product contains "900 Dual Color LED lights." See image below of the product. The Dual Color LED lights have two colors (Bi-Color)—Warm White and Multi Color.  [2] Some of the Dual Color LED lights are special illumination LEDs that can selectable fade in and out from steady on mode to off, in both colors. Nat'l Tree induces others including Amazon, to offer for sale, sell and use the claimed system with the special illumination LEDs.
a. electrically powering illumination element;	Some of the Dual Color LED lights are special illumination LEDs that can selectable fade in and out from steady on mode to off, in both colors. Each special illumination LED has an integrated circuit (IC) in it. Other LEDs

[2] As seen at https://www.amazon.com/National-Tree-Function-Footswitch-DUH-330LD-75S/dp/B005CXG1X0/ref=sr_1_2?crid=UROR9YGTWZKO&keywords=7.5ft%2Bpre-lit%2Bdunhill%2Bfull%2Bled%2Bartificial%E2%80%A6, and, accessed August 24, 2023.

Nat'l Tree "7.5ft Dunhill Fir Tree" compared to US 9,554,437

Claim	Nat'l Tree Dunhill Fir Tree
	on the product are standard non switching LED bulbs, similar to the description in the patents. See '265 patent 4:17-20. The standard non switching LEDs (if provided) do not have an IC in them.
b. in communication with said illumination element, controlling the flow of current to the element to produce a predetermined special illumination visual lighting effect in the illumination element, controlling said element so that when it is powered up starting with an initial steady on illuminated state in the element and then proceed to said special lighting effects occurring after the steady-on power up and periodically repeating said special lighting effect for a predetermined period of time, and	Each special illumination LED has an integrated circuit (IC)—not shown—that constitutes a "first switching circuit." The IC is integrated into each LED unit, similar to the description in the patent. See '437 patent 4:3-11. The IC controls power to the special illumination LED producing a predetermined visual lighting effect that appears as follows: when the IC is initially powered up, the LED begins with a steady-on illumination (which may be for an extremely short period of time that appears to be part of the predetermined special visual lighting effect), followed by a period fading off to on, before restarting the cycle by returning to the steady-on illumination state, and then repeating the steady-on-to-fade on/off cycle for as long as power is maintained continuously. See images below of LED fading "on" and "off" while power is maintained continuously, as shown by the oscilloscope measurement. **Warm White Mode (below) – Power Continuous**   The special illumination LEDs operate in the same manner –fading on to off—when power is supplied continuously in the Multi-Color setting (not shown above). So long as power is maintained constant continuously to the LED IC, without interruption, the LED produces a continuous fading on and off visual effect.
c. periodically interrupt the flow of current to said illumination element, at an interruption frequency sufficient to cause the steady-on state without proceeding to said special lighting effects, and thereby producing a plurality of steady-on illumination pulses in the illumination element.	The Dunhill Fir product contains a controller with a circuit board. The circuit board contains an IC that includes a function which constitutes a "second switching circuit." The IC on the circuit board is in communication with and controls the flow of current to the ICs in the special illuminating LEDs (first circuits). See below.

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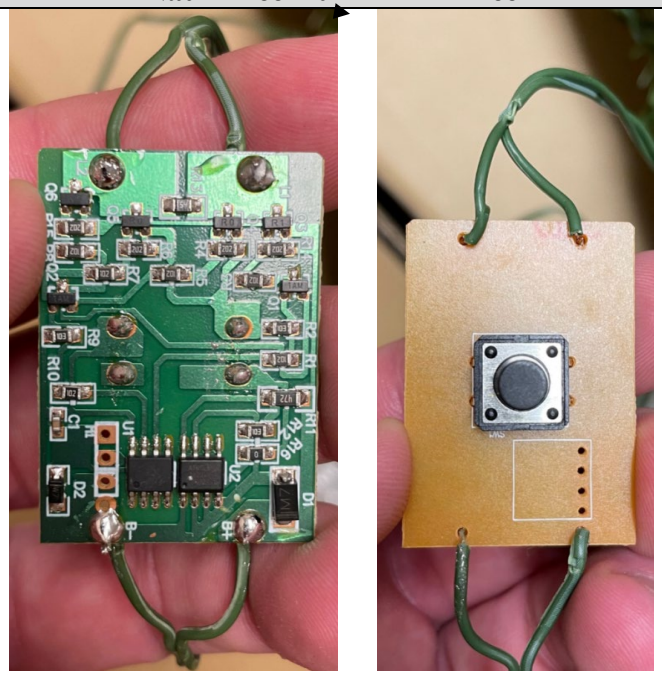
Claim	Nat'l Tree Dunhill Fir Tree
	 **Second Circuit with Mode Selector** The Dunhill Fir product contains a mode selector connected to a circuit board that allows users to change between "Steady On" or "Fading" modes for the special illumination LEDs, as well as between Warm White and Multi-Color modes. When a user selects the "Steady On" mode, the IC on the circuit board interrupts current to the IC in the special illumination LED (first switching circuit). The interruption in power causes the IC on the special illumination LED to reset the steady-on-to-fading on/off cycle and return to a "Steady On" state. When a user selects a "Steady On" mode, the IC on the circuit board (second circuit) produces a series (a plurality) of interrupting pulses to the IC (first circuit) on the special illuminating LEDs sufficient to keep the LEDs in a "Steady On" state, and not proceeding to the "Fading" state in the steady-on-to-fading cycle. See image below showing frequency interruption pulses from the LED on the circuit board creating a "Steady On" visual effect. When a user selects "Fading" mode the IC (second circuit) allows uninterrupted (non-pulsing) to flow to allow the IC (first circuit) in the special illumination LED to operate normally and causing the lights to produce a "fading" effect. See item b above.

Nat'l Tree "7.5ft Dunhill Fir Tree" compared to US 9,554,437

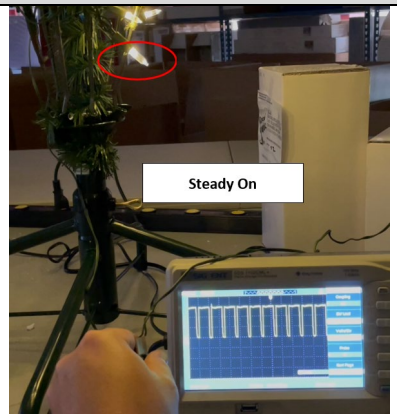
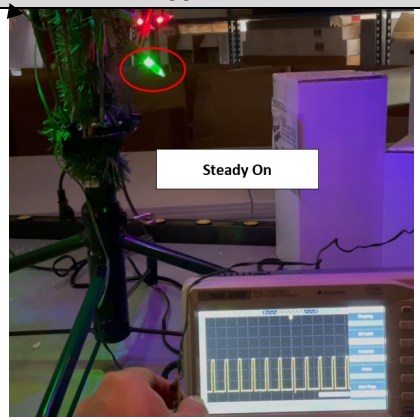
Claim	Nat'l Tree Dunhill Fir Tree
	  **Steady On when Power Interrupted (pulsed)** Warm White (left) and Multi-Color (right)

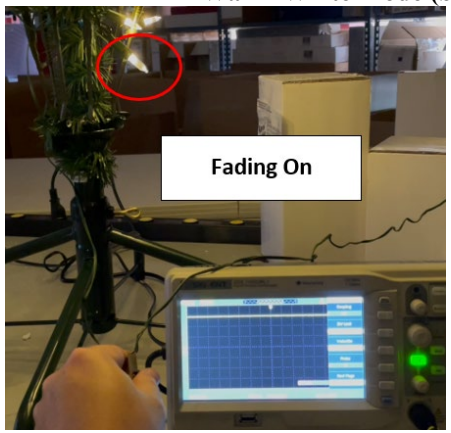
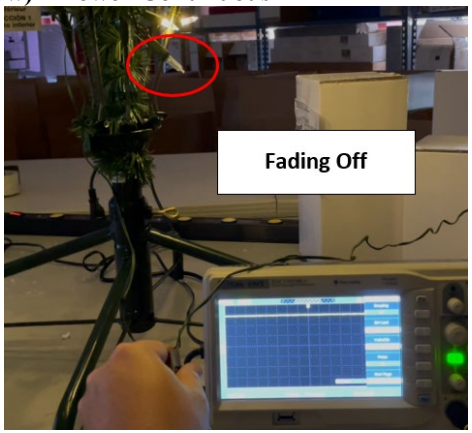
EXHIBIT D

Nat'l Tree "7.5ft Dunhill Fir Tree" compared to US 10,080,265

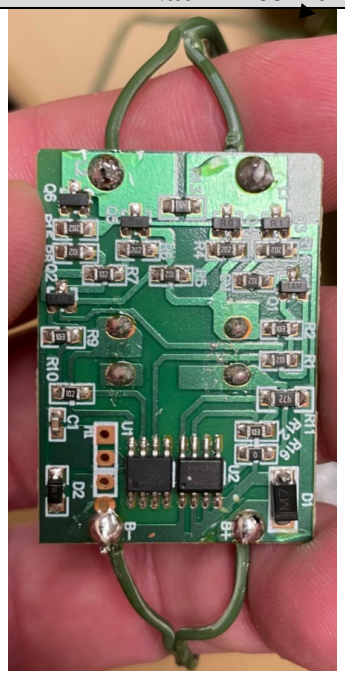
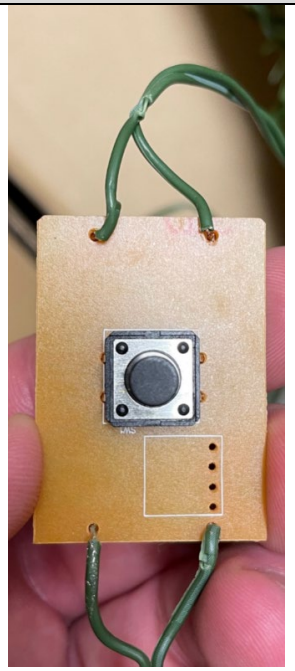
Claim	Nat'l Tree Dunhill Fir Tree
1. A system for switchably changing the function of a special function bulb controller to switch an illumination element between having visual appearance of steady-on and a visual appearance of a predetermined special visual function, comprising:	The Nat'l Tree "7.5ft Dunhill Fir Tree" ("Dunhill Fir") product contains "900 Dual Color LED lights." See image below of the product. The Dual Color LED lights have two colors (Bi-Color)—Warm White and Multi Color.  Roll over image to zoom in  [1] Some of the Dual Color LED lights are special illumination LEDs that can selectable fade in and out from steady on mode to off, in both colors. Nat'l Tree makes, offers for sale, sells, and imports the claimed system, including the special illumination LEDs, and induces others including Amazon, to offer for sale, sell and use the same.
a. an electrically powered illumination element;	Some of the Dual Color LED lights are special illumination LEDs that can selectable fade in and out from steady on mode to off, in both colors. Each special illumination LED has an integrated circuit (IC) in it. Other LEDs on the product are standard non switching LED bulbs, similar to the description in the patents. See '265 patent 4:17-20. The standard non switching LEDs (if provided) do not have an IC in them.

[1] As seen at https://www.amazon.com/National-Tree-Function-Footswitch-DUH-330LD-75S/dp/B005CXG1X0/ref=sr_1_2?crid=UROR9YGTWZKO&keywords=7.5ft%2Bpre-lit%2Bdunhill%2Bfull%2Bled%2Bartificial%E2%80%A6, and, accessed August 24, 2023.

Nat'l Tree "7.5ft Dunhill Fir Tree" compared to US 10,080,265

Claim	Nat'l Tree Dunhill Fir Tree
b. a first switching circuit in communication said illumination element for controlling the flow of current to the element, said first circuit containing a controller for controlling the power to said illumination element to produce a predetermined special illumination visual lighting effect in the illumination element, said first circuit initiating said lighting effect when powered up starting from an initial on illuminated state in the element and proceeding to other special lighting effects occurring after the on power up and periodically repeating said special lighting effect for a predetermined period of time, and	Each special illumination LED has an integrated circuit (IC)—not shown—that constitutes a "first switching circuit." The IC is integrated into each LED unit, similar to the description in the patent. See '437 patent 4:3-11. The IC controls power to the special illumination LED producing a predetermined visual lighting effect that appears as follows: when the IC is initially powered up, the LED begins with a steady-on illumination (which may be for an extremely short period of time that appears to be part of the predetermined special visual lighting effect), followed by a period fading off to on, before restarting the cycle by returning to the steady-on illumination state, and then repeating the steady-on-to-fade on/off cycle for as long as power is maintained continuously. See images below of LED fading "on" and "off" while power is maintained continuously, as shown by the oscilloscope measurement. **Warm White Mode (below) – Power Continuous**   The special illumination LEDs operate in the same manner –fading on to off—when power is supplied continuously in the Multi-Color setting (not shown above). So long as power is maintained constant continuously to the LED IC, without interruption, the LED produces a continuous fading on and off visual effect.
c. a second switching circuit, configured to periodically interrupt the flow of current to said first circuit, at an interruption frequency sufficient to cause the first circuit to reset to its on state without proceeding to said other special lighting effects, and thereby producing a plurality of on illumination pulses in the illumination element, so that a viewer perceives the illumination element as always on.	The Dunhill Fir product contains a controller with a circuit board. The circuit board contains an IC that includes a function which constitutes a "second switching circuit." The IC on the circuit board is in communication with and controls the flow of current to the ICs in the special illuminating LEDs (first circuits). See below.

Nat'l Tree "7.5ft Dunhill Fir Tree" compared to US 10,080,265

Claim	Nat'l Tree Dunhill Fir Tree
	  **Second Circuit with Mode Selector** The Dunhill Fir product contains a mode selector connected to a circuit board that allows users to change between "Steady On" or "Fading" modes for the special illumination LEDs, as well as between Warm White and Multi-Color modes. When a user selects the "Steady On" mode, the IC on the circuit board interrupts current to the IC in the special illumination LED (first switching circuit). The interruption in power causes the IC on the special illumination LED to reset the steady-on-to-fading on/off cycle and return to a "Steady On" state. When a user selects a "Steady On" mode, the IC on the circuit board (second circuit) produces a series (a plurality) of interrupting pulses to the IC (first circuit) on the special illuminating LEDs sufficient to keep the LEDs in a "Steady On" state, and not proceeding to the "Fading" state in the steady-on-to-fading cycle. See image below showing frequency interruption pulses from the LED on the circuit board creating a "Steady On" visual effect. When a user selects "Fading" mode the IC (second circuit) allows uninterrupted (non-pulsing) to flow to allow the IC (first circuit) in the special illumination LED to operate normally and causing the lights to produce a "fading" effect. See item b above.

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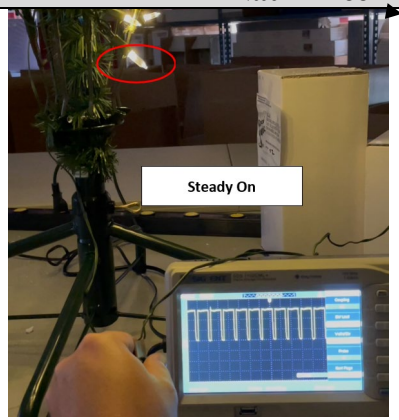
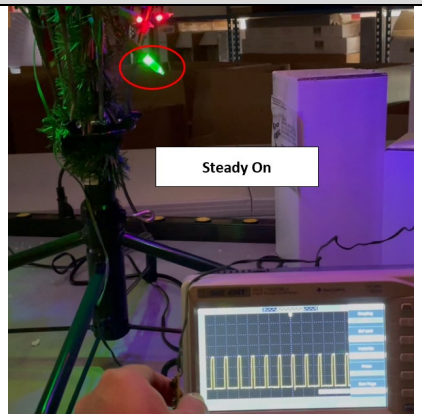
Claim	Nat'l Tree Dunhill Fir Tree
	  **Steady On when Power Interrupted (pulsed)** Warm White (left) and Multi-Color (right)
2. The system of claim 1 wherein said interruption frequency is at least sufficient to create the visual appearance in the illumination element of a steady on light.	When a user selects "Steady On" mode, the IC on the circuit board produces a series (a plurality) of illuminating pulses sufficient to keep the LEDs in a "Steady On" state, and creating the visual appearance of an uninterrupted "Steady On" light.
3. The system of claim 2 wherein said interruption frequency is at least sufficient to provide a plurality of light pulses from the illumination element which appear of substantially uniform intensity.	The light emitting from the special illuminating LEDs appear to have substantially uniform intensity in the "Steady On" state.
4. The system of claim 2 wherein said interruption frequency is at least beyond the frequency of a human to observe flicker in the illumination element.	The light emitting from the special illuminating LEDs appear to have substantially uniform intensity in the "Steady On" state to a human observer.
5. The system of claim 2 wherein said interruption frequency includes periodically energizing and reenergizing the second circuit to is at least sufficient to create the visual appearance in the illumination element of a steady on illumination.	The light emitting from the special illuminating LEDs appear to have the appearance of "Steady On" illumination.
10. The system of claim 2 wherein steady on includes a momentary illumination at a substantially uniform light output.	The "steady on" state appears as steady on illumination, even though the power to the LED is pulsed (at a frequency fast enough for human observation to see it as steady on).