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(71) Applicant: **Neon King Ltd.
Kowloon (CN)**

(72) Inventor: **Tsui, Pui-Hinh, Unit 1024, 10/Floor,
Tsimshatsui, Kowloon (CN)**

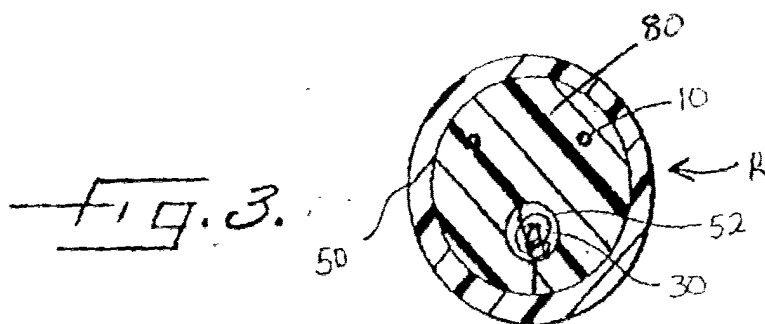
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(74) Representative: **Warren, Keith Stanley et al
BARON & WARREN 18 South End Kensington
London W8 5BU (GB)**

(54) **Rope light and methods of forming and using same**

(57) A rope light (R) has a plurality of exposed main body conductors (10) and an exposed light string conductor (20) connected to the main body conductors and extending substantially the entire length of the rope light substantially parallel to the main body conductors. The rope light also includes a plurality of lights (30) positioned along the light string conductor (20) and a substantially solid and translucent, flexible sheath (50)

which encases the exposed main body conductors (10), the exposed light string conductor (20) and the plurality of lights (30) along substantially the entire length of the rope light so that conducting outer surfaces of the exposed main body conductors, the exposed light string conductor and the lights are readily visible to a user through the sheath and so that light illumination through the sheath is enhanced.



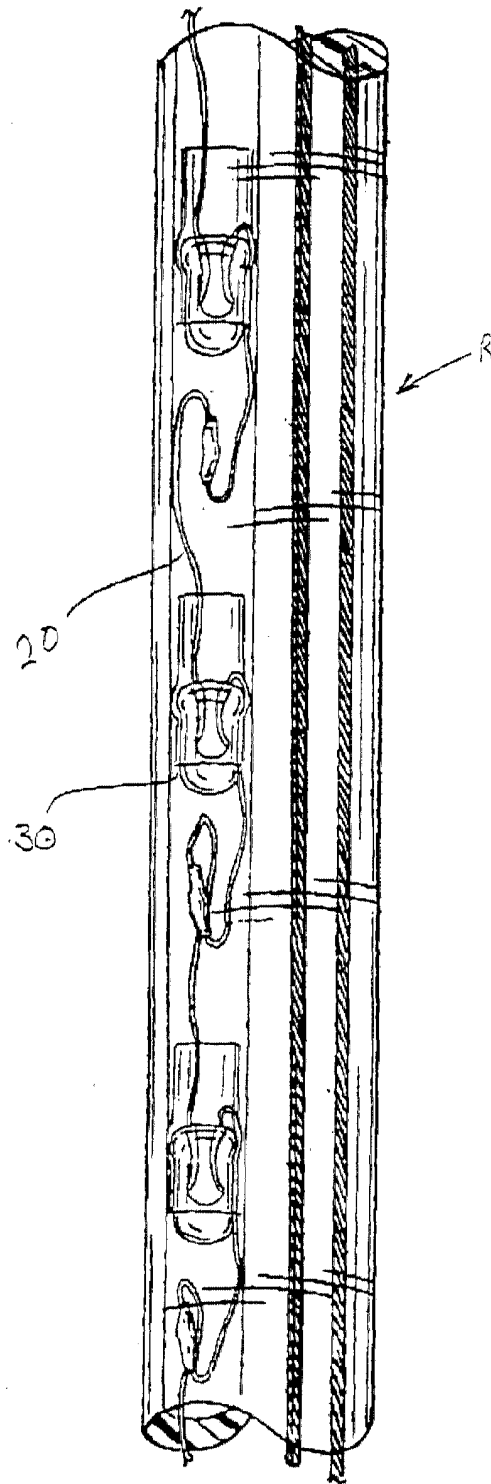


FIG. 10.

Description

[0001] The present invention relates to the field of lights and, more particularly, to ornamental lights and methods of forming same.

[0002] Consumers who purchase ornamental lights often encounter the problem of lights that do not illuminate brilliantly. Furthermore, current ornamental rope light systems do not provide a proper combination of flexibility and rigidity needed for customers to configure rope type lights in any arrangement with ease and little effort. Current ornamental rope light systems tend to tangle easily when positioned in a configuration suitable for storage. Current rope light applications are also costly to manufacture due to the complexity with which they are manufactured.

[0003] Manufacturers of ornamental rope type lights have been able to provide flexible lights, but only in very limited scope. Examples include traditional Christmas rope lights used to decorate and illuminate various objects. These types of lights tend to easily tangle when placed in a rolled configuration suitable for storage. Another disadvantage associated with this typical type of rope light is that the lighting tends to be dull because the only source of light is emitted at each individual light.

[0004] With the foregoing in mind, the present invention advantageously provides an elongate rope light which can easily be placed in a rolled configuration for storage without tangling. The present invention also advantageously provides brilliant, crystal like illumination of lights throughout the entire length of a rope light. The present invention still also advantageously provides a rope light that is easy for customers to handle. Additionally, the present invention also provides a rope light that is very inexpensive to manufacture. Furthermore, the present invention provides methods for forming and using a rope light that advantageously provide enhanced illumination and easy handling capabilities.

[0005] More particularly, the present invention provides an elongate rope light having a plurality of exposed elongate main body conductors. The plurality of main body conductors each have first and second ends and are positioned to extend substantially parallel for substantially the entire length of the rope light. The rope light further includes at least one exposed elongate light string conductor connected to at least one of the main body conductors and positioned to extend substantially the entire length of the rope light. The light string conductor is positioned substantially parallel to the plurality of main body conductors. The light string conductor is defined by a plurality of light string conductors connected along respective end points. The rope light still further preferably includes a plurality of spaced-apart lights connected to and positioned along the exposed elongate light string conductor to extend outwardly therefrom. The rope light additionally includes a substantially solid and translucent, flexible sheath having a continuous annular shape. The sheath is positioned to encase

each of the plurality of exposed main body conductors, the at least one exposed light string conductor, and the plurality of lights along substantially the entire length of the rope light, so that conducting outer surfaces of the plurality of exposed main body conductors, conducting outer surfaces of the at least one exposed light string conductor and the plurality of lights are readily visible to a user through the sheath and so that light illumination through the sheath is enhanced.

[0006] The present invention also provides a method of forming an elongate rope light. The method includes the step of attaching a first end of at least one exposed elongate main body conductor to a first end of at least one exposed elongate light string conductor. The method also includes the step of positioning the at least one exposed elongate main body conductor and the at least one exposed light string conductor to extend substantially parallel the entire length of the rope light. The method still further includes the step of attaching at least one light to the at least one exposed elongate light string conductor. The method additionally includes the step of enclosing the at least one exposed elongate main body conductor, the at least one exposed elongate light string conductor and the at least one light in a substantially solid, translucent, flexible sheath so that conductive outer surfaces of the at least one exposed elongate main body conductor, conductive outer surfaces of the at least one exposed elongate light string conductor, and the at least one light are readily visible to a user through the sheath and so that light illumination through the sheath is enhanced.

[0007] Brilliant and crystal like illumination of rope light systems is very important to consumers and therefore, the present invention advantageously provides a rope light and methods of forming and using the same with enhanced illumination throughout the entire length of the rope light. The present invention also advantageously saves time and effort for consumers by providing a rope light system that will not tangle.

[0008] In order that the present invention may be more readily understood, reference will now be made to the accompanying drawings, in which:-

FIG. 1 is a fragmentary perspective view of a first embodiment of a rope light according to the present invention;

FIG. 2 is a fragmentary perspective view of the first embodiment illustrating first and second end portions;

FIG. 3 is a sectional view of the first embodiment taken along line 3-3 of FIG. 2;

FIG. 4 is an exploded perspective view showing connector portions and connectors of a rope light according to the present invention;

FIG. 5 is a fragmentary perspective view of a connector inserted into connector portions of a rope light according to the present invention;

FIG. 6 is a fragmentary perspective view of a sec-

ond embodiment of a rope light according to the present invention;

FIG. 7 is a fragmentary perspective view of the second embodiment illustrating first and second end portions;

FIG. 8 is a sectional view of the second embodiment taken along line 8-8 of FIG. 7;

FIG. 9 is an exploded top plan view of a rope light according to the present invention having connector portions;

FIG. 10 is a fragmentary perspective view of the first embodiment having soldered light string conductor connections; and

FIG. 11 is a fragmentary perspective view of a rope light according to the present invention having twisted light string conductor connections.

[0009] In the accompanying drawings, like numbers refer to like elements throughout, the prime notation, if used, indicates similar elements in alternative embodiments.

[0010] FIG. 1 illustrates a first embodiment of an elongate rope light **R**. The elongate rope light **R** preferably has a plurality of exposed elongate main body conductors **10** and, more preferably, two main body conductors, as shown in FIG. 3. Each exposed main body conductors **10** has first **40** and second **45** ends and is positioned to extend substantially parallel the entire length of the elongate rope light **R**. The elongate rope light **R** further includes at least one exposed elongate light string conductor **20** connected to at least one of the plurality of main body conductors **10**. The light string conductor **20** is connected to the main body conductor **10** at an end of the rope light **R**. The light string conductor **20** is positioned to extend substantially the entire length of the rope light **R** and also positioned parallel to the plurality of main body conductors **10**. The elongate rope light **R** still further includes a plurality of spaced-apart lights **30** connected to and positioned along the exposed elongate light string conductor **20** to extend outwardly therefrom. The plurality of lights **30** are preferably connected in series along the light string conductor **20**. Each of the plurality of lights **30** are preferably light emitting diode lamps and may also be provided in a plurality of colors.

[0011] The present invention also includes a substantially solid, flexible, translucent sheath **50**. The sheath **50** includes a hollow portion **52** positioned in the middle of the sheath **50** and extending substantially the length of the elongate rope light **R**. The solid material extends from an outer surface of the hollow portion **52** to an outer surface of the sheath **50**. The solid material is preferably a plastic or polymeric material such as polyvinyl chloride (PVC). The at least one light string conductor **20** and each of the plurality of lights **30** is positioned within the hollow portion **52** of the sheath **50**. This embodiment of the rope light **R** advantageously enhances illumination of each of the plurality of lights **30**. In the preferred embodiment, the sheath **50** of the elongate rope light **R** is

substantially clear throughout the entire thickness of the rope light **R**. This advantageously provides enhanced illumination to the elongate rope light **R**.

[0012] In another embodiment of the present invention, the elongate rope light **R'** preferably includes a substantially solid and translucent sheath **50'**. The sheath **50'** has a continuous annular shape and is positioned to encase each of the plurality of exposed main body conductors **10'**, the at least one exposed light string conductor **20'**, and the plurality of lights **30'** along substantially the entire length of the elongate rope light **R'** so that conducting outer surfaces of the plurality of exposed main body conductors **10'** and the at least one light string conductor **20'** and the plurality of lights **30'** are readily visible to a user through the sheath **50'**. The substantially solid sheath **50'** has solid material extending from an outer surface of the sheath **50'** to abuttingly contact each of the plurality of main body conductors **10'**, the at least one light string conductor **20'** and each of the plurality of lights **30'** positioned along the at least one light string conductor **20'**. In this embodiment of the elongate rope light **R'** the outer sheath **50'** can advantageously include formed ridges, ribs, or rough regions which provide the outer sheath **50'** with texture for ease of handling and gripping and enhancing visual appearance for many desired applications. The rope light **R'** is integrally formed from a single extruded piece of plastic.

[0013] Each of the plurality of main body conductors **10** and the at least one light string conductor **20** are made of a reflective metallic material. The combination of the illuminated lights **30**, the reflective main body conductors **10**, reflective light string conductor **20** and substantially clear sheath **50** advantageously enhance the illumination of the elongate rope light **R**. This embodiment advantageously provides crystal-like illumination and provides a rope light **R** that has the appearance of illuminated glass.

[0014] Each of the plurality of main body conductors **10** further includes a plurality of strands positioned in a twisted configuration. This twisted configuration also advantageously enhances illumination of each of the elongate rope lights **R**.

[0015] The present invention can also advantageously include a plurality of light string conductors **20**. One of the plurality of light string conductors **20** can advantageously be connected to another of the plurality of light string conductors **20** along respective end portions. The connected plurality of light string conductors **20** define the at least one exposed elongate light string conductor **20**. The end portions of the plurality of light string conductors **20** are advantageously welded, e.g., soldered, together, as best illustrated in FIG. 10. Welding the end portions of the plurality of light string conductors **20** advantageously provides a strong connection between the plurality of light string conductors **20**.

[0016] In another embodiment of the present invention, end portions of one of the plurality of light string conductors **20"** are positioned to overlap and abuttingly

contact, e.g., twisting, end portions of another of the plurality of light string conductors **20''**, as best illustrated in FIG. 11. This connection of the plurality of light string conductors **20''** advantageously provides an increased surface area along which the end portions of the plurality of light string conductors **20''** connect, provides a strong connection between each of the plurality of light string conductors **20''** and also advantageously increases the brilliance of the illumination of the rope light **R''**. Overlapping and abuttingly contacting the plurality of light string conductors **20''** still further advantageously enhances manufacturing efficiency by decreasing manufacturing costs and time required to manufacture the rope light **R''**. The connection also advantageously enhances the flexibility of the rope light **R''**.

[0017] The elongate rope light **R** also includes an end cap **60** positioned to overlie a first end of the sheath **50** and also positioned adjacent the first ends **40** of the plurality of main body conductors **10**. The elongate rope light **R** further includes a plurality of connector portions **62** formed in a second end of the sheath **50**. Each of the plurality of connector portions **62** includes an opening formed in the sheath **50** and has one of the plurality of main body conductors **10** positioned therein for receiving a connector **70**. The connector **70** includes a plurality of insert portions **72** that matingly contact each of the plurality of openings formed in the sheath **50** so that each of the plurality of main body conductors **10** surrounds each of the plurality of insert portions **72** when inserted into each of the plurality of openings. This connector **70** advantageously allows consumers to customize the length of the elongate rope light **R** by adding additional rope lights to a first or second end of an elongate rope light **R** and allows the manufacturer to readily cut and strip different lengths of rope light **R**.

[0018] The present invention also advantageously provides a method of forming an elongate rope light **R**. The method includes the step of attaching a first end **40** of at least one exposed elongate main body conductor **10** to a first end of at least one exposed elongate light string conductor **20**. The method further advantageously includes the step of positioning the at least one exposed elongate main body conductor **10** and the at least one exposed light string conductor **20** to extend substantially parallel the entire length of the rope light **R**. The method also includes the step of attaching the at least one exposed elongate light string conductor **20**. The method of forming the elongate rope light **R** further includes the step of forming a hollow portion **52** positioned in the middle of the sheath **50**. Solid material extends from outer surface of the hollow portion **52** to the outer surface of the sheath **50**. The method also includes the step of positioning the at least one light string conductor **20** and the at least one light **30** within the hollow portion **52**. This method advantageously reduces shadowing and thereby enhances illumination.

[0019] In another embodiment of the present invention, the method of forming an elongate rope light **R** in-

cludes the step of enclosing the at least one exposed elongate main body conductor **10'**, the at least one exposed elongate light string conductor **20'** and the at least one light **30'** in a substantially solid, translucent, flexible sheath **50'** so that conductive outer surfaces of the at least one exposed elongate main body conductor **10'**, conductive outer surfaces of the at least one exposed elongate light string conductor **20'** and the at least one light **30'** are readily visible to a user through the sheath **50'**. This method advantageously enhances illumination of the at least one light **30'** through the substantially solid, translucent, flexible sheath **50'**. The method of forming the elongate rope light **R'** further includes the step of extending solid material from the outer surface of the sheath **50'** to abuttingly contact the at least one main body conductor **10'**, the at least one exposed light string conductor **20'** and the at least one light **30'**.

[0020] The method of forming an elongate rope light **R** also includes the step of twisting a plurality of elongate reflective, metallic strands to form the at least one elongate main body conductor **10**. The plurality of reflective, metallic strands positioned in a twisted configuration to enhance illumination of the rope light **R**.

[0021] The method of forming the rope light **R** further comprises connecting end portions of one of a plurality of light string conductors **20** to end portions of another of a plurality of light string conductors **20** to thereby define the at least one exposed elongate light string conductor **20**. The step of connecting the plurality of light string conductors **20** can also advantageously include the step of welding, e.g., soldering, the plurality of light string conductors **20** as best illustrated in FIG. 10. This method of connecting the light string conductors **20** advantageously provides a strong connection between each of the plurality of light string conductors **20** to thereby provide a stronger rope light **R**.

[0022] In another embodiment of the present invention, the step of connecting end portions of the plurality of light string conductors **20''** can also advantageously include the step of overlapping and abuttingly contacting, e.g., twisting, end portions of one of the plurality of light string conductors **20''** to end portions of another of the plurality of light string conductors **20''** to thereby define the at least one elongate light string conductor **20''** as best illustrated in FIG. 11. This method of connecting the plurality of light string conductors **20''** advantageously provides an increased surface area along which the respective end portions of the plurality of light string conductors **20''** contact and provides a strong connection between each of the plurality of light string conductors **20''**. This method also advantageously provides a rope light **R''** with enhanced brilliance, greater flexibility and low manufacturing cost.

[0023] The method of forming the rope light **R** also advantageously includes the step of positioning an end cap **60** to overlie a first end of the sheath **50** adjacent a first end of the at least one main body conductor **10**. The method still further includes a step of forming a plu-

rality of connector portions **62** that include openings in
 a second end of the sheath **50** adjacent the second end
 of the at least one main body conductor **10**. This method
 advantageously simplifies the insertion of a connector
70 having insert portions **72** to the second end of the at
 least one elongate main body conductor **10**. The insert
 portions **72** of the connector **70** are inserted into the con-
 nector portions **62** formed in the sheath **50** and the main
 body conductors **10** advantageously surround the insert
 portions **72** to make good electrical contact between the
 insert portions **72** and each of the plurality of main body
 conductors **10**.

[0024] Some of the advantages of the rope light **R** in-
 clude inexpensive manufacturing and increased hand-
 ling ease. The sheath **50** positioned to enclose the
 main body conductor **10**, the light string conductor **20**
 and the lights **30** is flexible, but still has rigid character-
 istics to increase ease of handling the rope light **R**. A
 consumer will now be able to position a rope light **R** in
 a desired location without the assistance of another in-
 dividual.

[0025] Another advantage of the present invention is
 that the conductors can remain exposed within the outer
 sheath **50**. The outer sheath **50** acts as an insulator for
 the conductors. Therefore, the conductors on the rope
 light **R** do not require additional insulators in order to
 operate in a safe and efficient manner. The conductors
 can therefore remain exposed thereby reflecting the il-
 lumination from each of the plurality of lights **30**. The
 reflective properties of the exposed conductors en-
 hance the crystal-like illumination of the rope light **R**.

[0026] As stated above, the manufacturing cost of the
 present invention is advantageously decreased. In the
 preferred embodiment of the rope light **R**, the combina-
 tion of the main body conductor **10**, light string conductor
20 and lights **30** is positioned within a split interior plastic
 tube **80**. The split interior plastic tube **80** containing the
 main body conductor **10**, the light string conductor **20**
 and the lights **30** is then passed through an extrusion
 device to enclose the inner plastic tube **80** within an out-
 er sheath **50**.

[0027] The manufacturing cost of another embodi-
 ment of the rope light **R'** is also decreased. The main
 body conductor **10'**, the light string conductor **20'** and
 each of the plurality of lights **30'** are simply encased in
 a solid, translucent sheath **50'**. The main body conduc-
 tor **10'**, light string conductor **20'** and lights **30'** are con-
 nected to one another. The combination is then placed
 through an extrusion device to thereby encase the main
 body conductor **10'**, light string conductor **20'** and lights
30' in the translucent sheath **50'**.

Claims

1. A rope light (R) comprising

at least one exposed main body conductor (10)

extending for substantially the entire length of
the rope light;

at least one exposed light string conductor (20)
connected to at least one main body conductor
(10) and extending substantially the entire
length of the rope light;

at least one light (30) connected to the exposed
elongate light string conductor(s); and

a substantially solid and translucent, flexible
sheath (50) encasing the exposed main body
conductor(s), the exposed light string conduc-
tor(s) and the light(s) along substantially the en-
tire length of the rope light so that conducting
outer surfaces of the exposed main body con-
ductor(s), conducting outer surfaces of the ex-
posed light string conductor(s) and the light(s)
are readily visible to a user through the sheath.

2. The rope light as claimed in claim 1, wherein the
main body conductor(s) (10) and the light string
conductor(s) (20) each comprises reflective metal-
lic material for enhancing illumination of the one
light(s).

3. The rope light as claimed in claim 1 or 2, wherein
the or each main body conductor (1) comprises a
plurality of elongate strands positioned in a twisted
configuration.

4. The rope light as claimed in claim 1, 2 or 3, including
an end cap (60) positioned to overlie a first end of
the sheath (50) and positioned adjacent a first end
of the or each main body conductor (10), and at
least one connector portion (62) formed in a second
end of the sheath, the at least one connector portion
including at least one opening formed in the sheath
and having the at least one main body conductor
positioned therein for receiving a connector, the
connector comprising at least one insert portion
(72) which matingly contacts the at least one open-
ing formed in the sheath so that the at least one
main body conductor surrounds the at least one
connector portion when inserted into the at least
one opening.

5. The rope light as claimed in any preceding claim,
wherein the sheath (50) comprises solid material
extending from an outer surface of the sheath to
abuttingly contact the main body conductors(s)
(10), the light string conductor(s) (20) and the light
(s) (30) positioned along the light string conduc-
tor(s).

6. The rope light as claimed in claim 5, including a hol-
low portion (52) positioned within the sheath and ex-
tending substantially the length of the rope light, the
solid material extending from an outer surface of the
hollow portion to an outer surface of the sheath (50),

and the light string conductor(s) (20) and the light (s) being positioned within said hollow portion.

7. The rope light as claimed in any preceding claim wherein the outer surface of the sheath (50) is textured and ribbed for enhancing illumination of the one light(s). 5
8. The rope light as claimed in any preceding claim, wherein the or each exposed light string conductor (20) comprises a plurality of light string conductor sections, each being connected to another one of the light string conductor sections along respective end portions thereof so that the plurality of light string conductor sections in combination define the light string conductor (20). 10 15
9. The rope light as claimed in claim 8, wherein the respective end portions of the plurality of light string conductor sections are welded together or overlap and abuttingly contact. 20
10. A method of forming a rope light (R), comprising the steps of 25
 - attaching a first end of at least one exposed main body conductor (10) to a first end of at least one exposed light string conductor (20); positioning the exposed main body conductor (s) (10) and the exposed light string conductor (s) (20) to extend substantially parallel the entire length of the rope light; attaching at least one light (30) to the exposed light string conductor(s); and enclosing the exposed main body conductor(s), the exposed light string conductor(s) and the light(s) in a substantially solid, translucent, flexible sheath (50) so that conductive outer surfaces of the exposed main body conductor(s), the exposed light string conductor(s), and the light(s) are readily visible to a user through the sheath. 30 35 40
11. The method as claimed in claim 10, including the step of twisting a plurality of elongate reflective, metallic strands to form the main body conductor(s) (10). 45
12. The method as claimed in claim 10 or 11, including positioning an end cap (60) to overlie a first end of the sheath (50) adjacent a first end of the or each main body conductor (10) and forming a plurality of connector portions (62) including openings in a second end of the sheath adjacent a second end of the or each main body conductor for receiving a connector (70) having insert portions (72). 50 55
13. The method as claimed in claim 12, including the

step of matingly attaching the connector having a plurality of insert portions (72) to the plurality of connector portions (62) positioned in the second end of the sheath (50) so that the main body conductors (10) positioned within the connector portions surrounds the insert portions of the connector when inserting the connector into the connector portions.

14. The method as claimed in any preceding claim 10 to 13, including the step of extending solid material from the outer surface of the sheath (50) to abuttingly contact the main body conductor(s) (10), the exposed light string(s) (20) and the light(s) (30).
15. The method as claimed in claim 14, including the step of forming a hollow portion (52) in the sheath with solid material extending from an outer surface of the hollow portion (52) to an outer surface of the sheath.
16. The method as claimed in claim 15, including the step of positioning the light string conductor(s) and the light(s) within the hollow portion for enhancing illumination of the light(s).
17. The method as claimed in any preceding claim 10 to 16, including connecting a plurality of light string conductor sections end to end so that the plurality of light string conductor sections in combination define the exposed light string conductor(s) (20).
18. The method as claimed in claim 17, wherein the step of connecting a plurality of the light string conductor sections comprises welding or overlapping and abuttingly contacting a first of the plurality of light string conductor sections with another of the plurality of light string conductor sections thereby to define the exposed light string conductor(s) (20).
19. A method of using a rope light (R), comprising the steps of
 - connecting a plurality of exposed conductors (20) having a plurality of lights (30) attached thereto to a power source, the combination of the plurality of exposed conductors having the plurality of lights attached thereto being encased in a substantially solid and translucent sheath (50); and enhancing illumination of the plurality of lights by reflecting light illumination from each of the plurality of exposed conductors.
20. The method as claimed in claim 19, including the step of connecting a first elongate rope light (R) to a second elongate rope light (R) by inserting portions (72) of a connector (70) into connector portions positioned on the first and second rope lights.

21. The method as claimed in claim 19 or 20, including the step of viewing the plurality of exposed conductors (20) through the translucent sheath (50).

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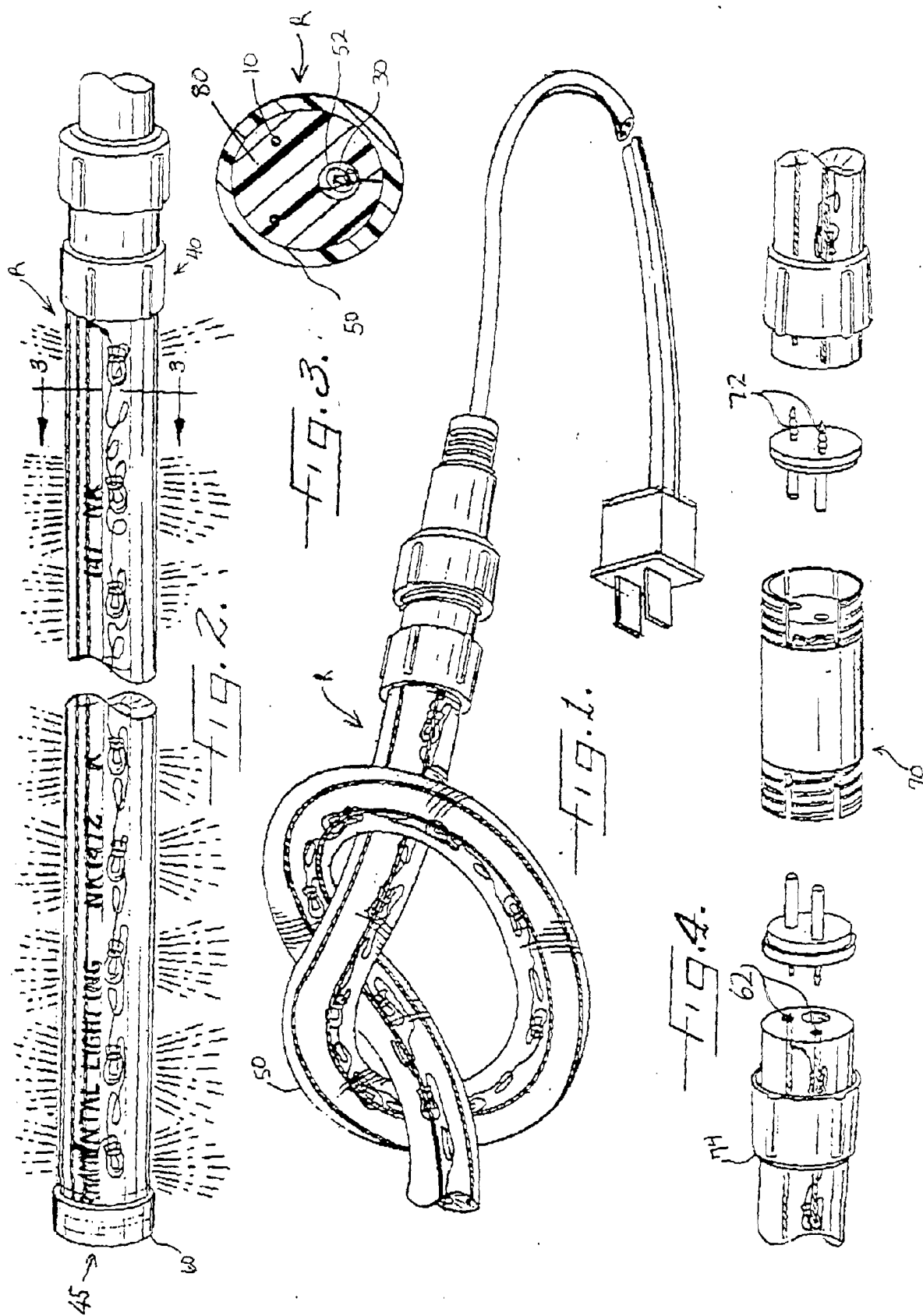
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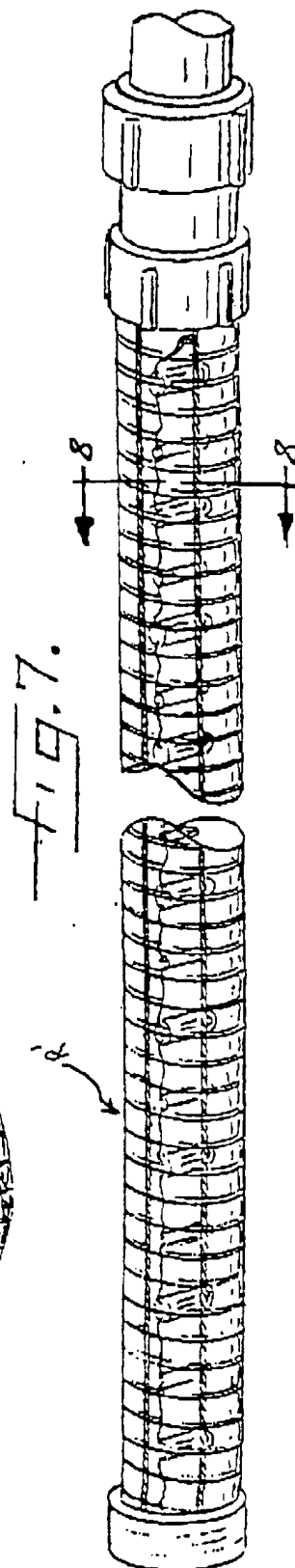
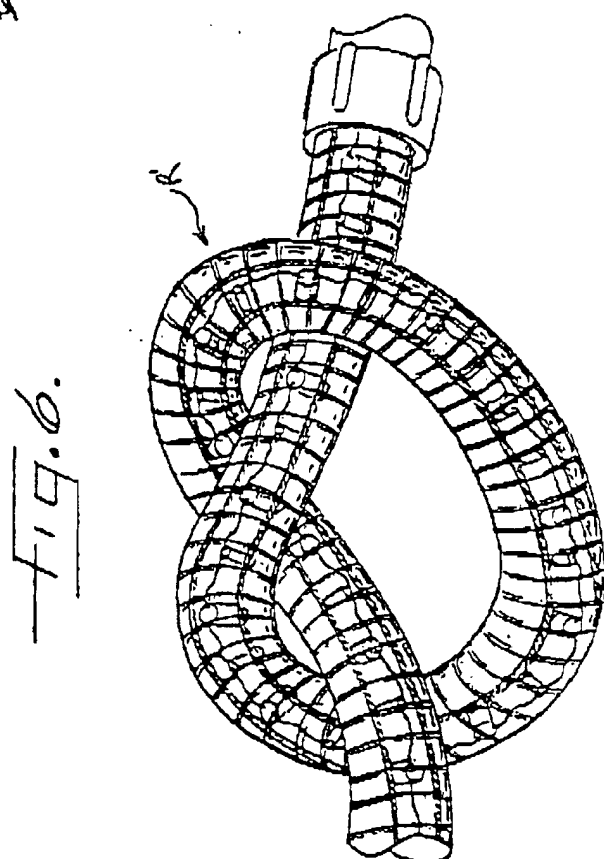
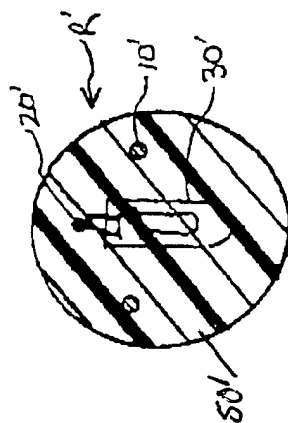
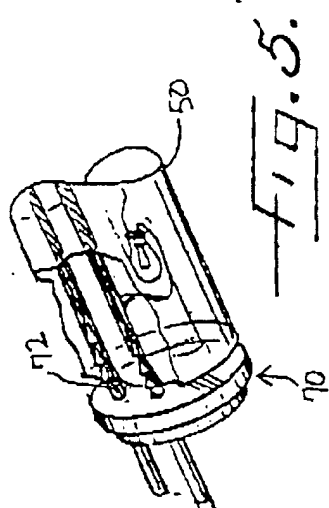
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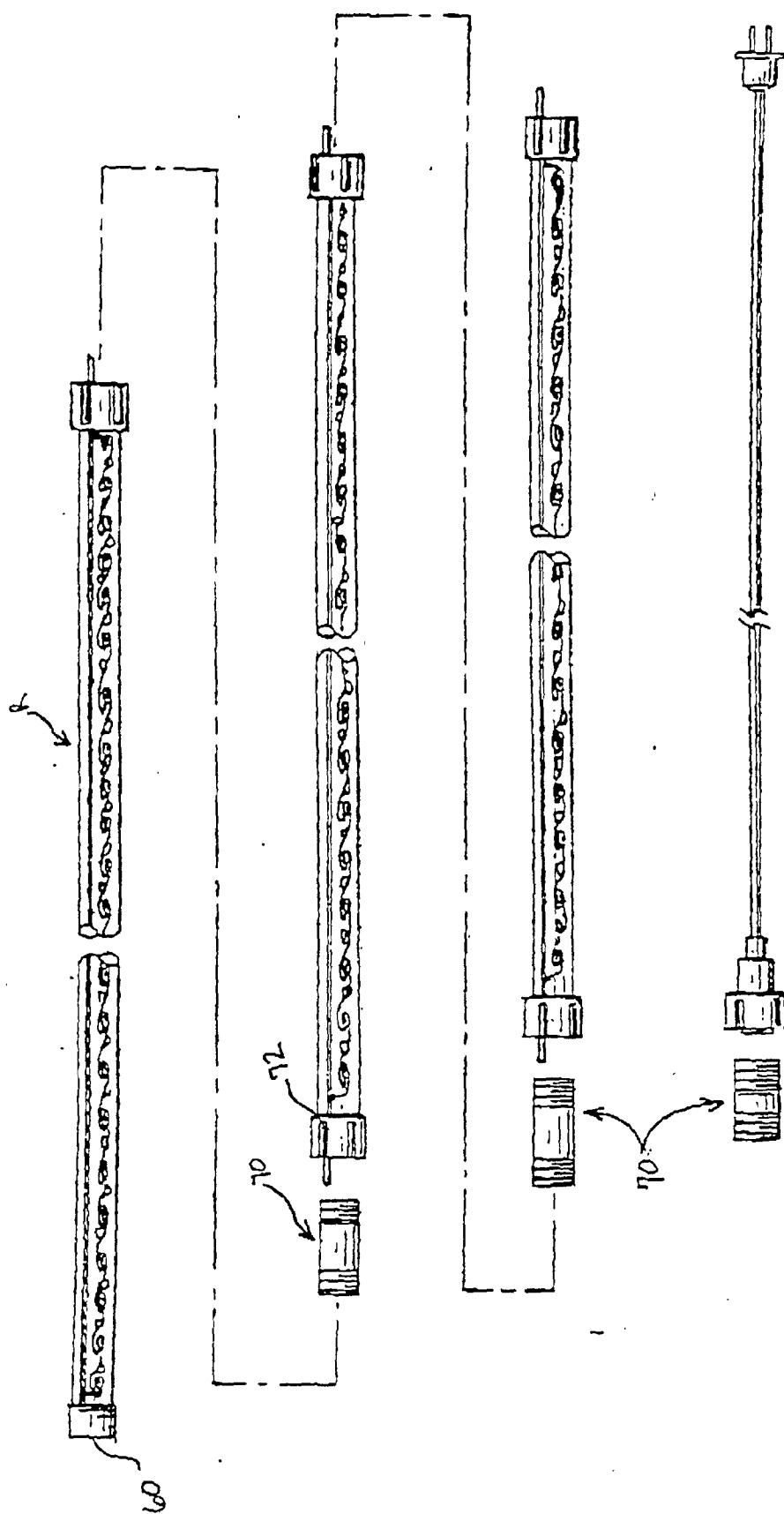


Fig. 9.

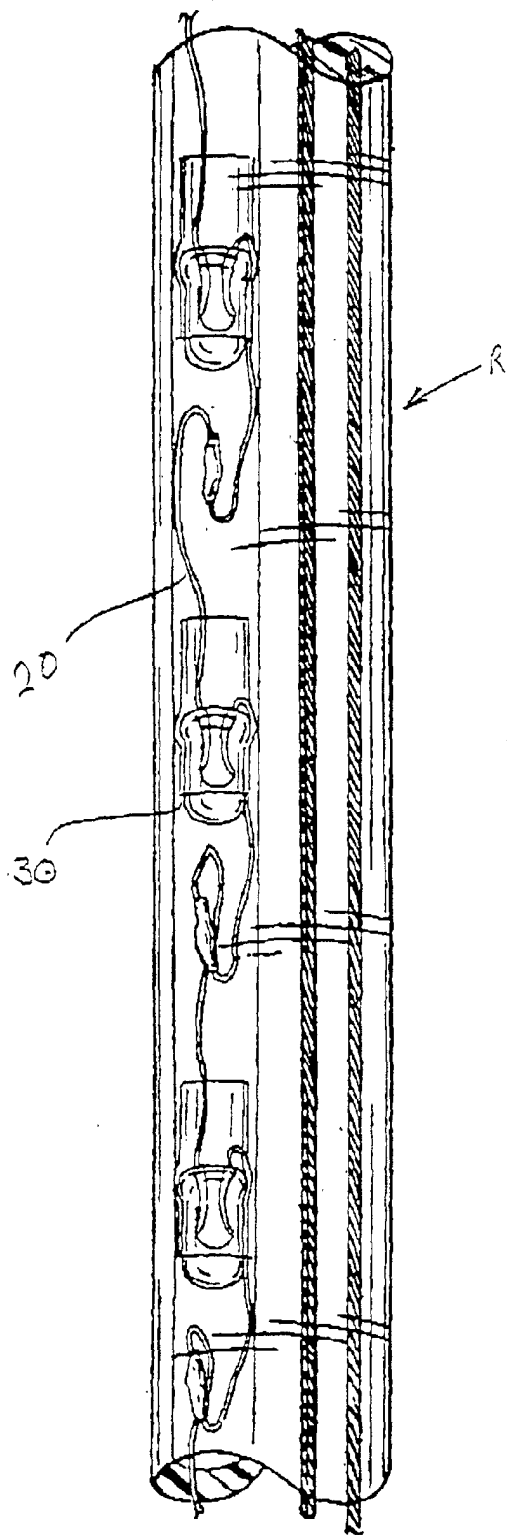


FIG. 10.

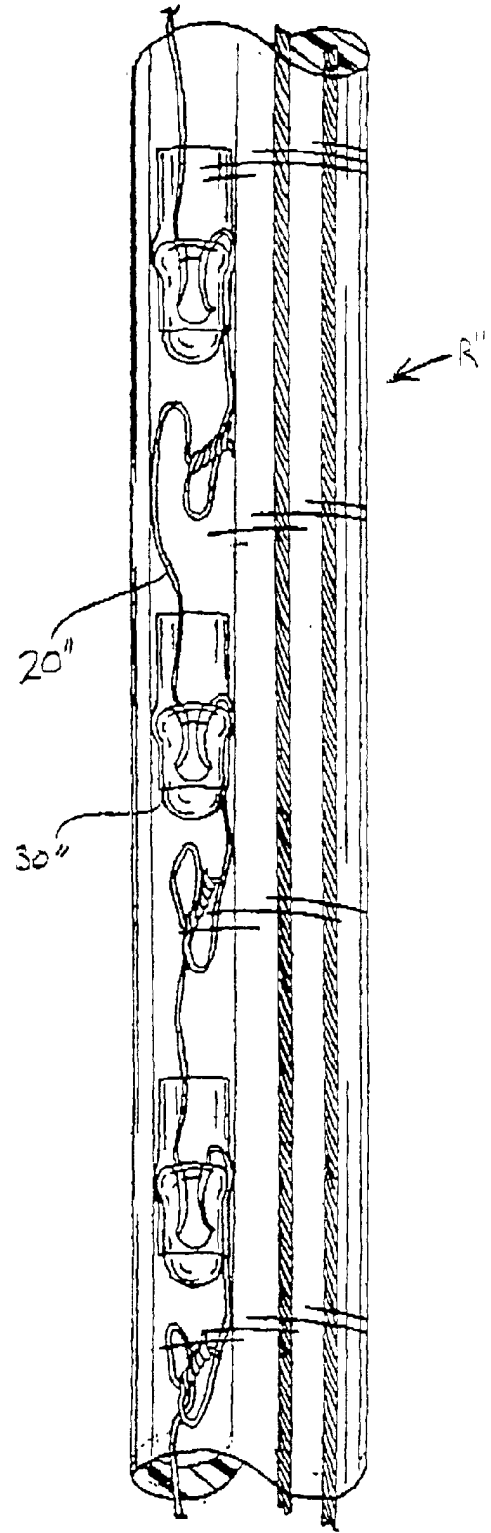


FIG. 11.



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 30 7077

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 934 792 A (CAMAROTA RICHARD J) 10 August 1999 (1999-08-10) * column 2, line 1 - column 4, line 16 * * figures 1-5 *	1,3-6, 10, 12-17, 19-21	F21S4/00
A	---	2,8,9, 11,18	
X	US 4 607 317 A (LIN TA-YEH) 19 August 1986 (1986-08-19) * column 1, line 62 - column 5, line 55 * * figures 1-3 *	1,3,4,7, 8,10, 12-17, 19-21	
Y	---	9	
A	---	2,18	
Y	US 4 665 470 A (GEORGE JR BENJAMIN B) 12 May 1987 (1987-05-12) * column 1, line 6 - line 21 * * column 3, line 36 - line 43 * * figure 4 *	9	
A	---	1,10,19	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F21P F21V F21K
X	US 4 812 956 A (CHEN SCOTT) 14 March 1989 (1989-03-14) * column 2, line 4 - line 68 * * figures 1,3,4 *	1,8,10, 14-17, 19,21	
A	---		
A	US 5 964 518 A (SHEN YA-KUANG) 12 October 1999 (1999-10-12) * the whole document *	1-3,5,6, 8-10, 19-21	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 January 2001	Examiner Cosnard, D
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