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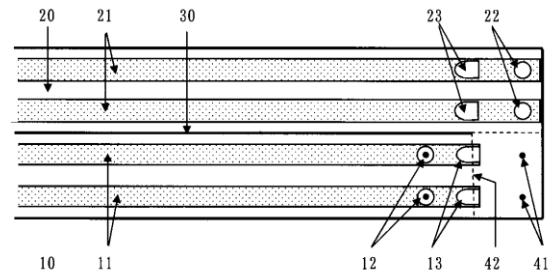
**(54) [Title of the Invention]** Flexible LED Substrate

(57) [Abstract] (Amended)

[Problem] To provide a long flexible LED substrate wherein no undesirable protruding portion is present on the substrate, that is not thicker at the folded part, wherein interconnections do not become open circuits, and wherein there is no loss of linearity.

[Means for Resolution] In a flexible LED substrate that has interconnections that are provided substantially in parallel and that has slits between the interconnections up to the vicinities of one end thereof, a folded-back substrate and an other substrate are formed along a slit. An overlapping part is formed through folding the folded-back substrate with respect to the other substrate, and interconnections can be connected through soldering the other substrate and the folded-back substrate at the overlapping part. At the overlapping part of the fold, soldering is through a through hole, and soldering at a part wherein there is a step that is within the overlapping part that is continuous with the step. LEDs are arranged with substantially equal spacing on both the folded-back substrate and the other substrate.

[Selected Drawing] FIG. 1



(2)

## [Patent Claims]

## [Claim 1]

A flexible LED substrate having interconnections that are provided substantially in parallel and having slits running between the interconnections up to the vicinity of one end, wherein:

a folded-back substrate and an other substrate are made along a slit;

an overlapping part is formed through folding the folded-back substrate with respect to the other substrate; and

interconnections are connected through soldering the folded-back substrate and the other substrate at the overlapping part.

## [Claim 2]

A flexible LED substrate set forth in claim 1, wherein:

at the overlapping part of the fold, soldering is through an interconnection exposing portion of the other substrate, an interconnection exposing portion of the folded-back substrate, and through holes that are provided at the same location.

## [Claim 3]

A flexible LED substrate set forth in claim 1, wherein:

at the overlapping part of the fold, an interconnection exposing portion is provided at both a part with a step and within an overlapping part that is continuous with the step, in the other substrate and in the folded-back substrate, and soldering is at an interconnection exposing portion of the step part and an interconnection exposing portion of the overlapping part.

## [Claim 4]

A flexible LED substrate set forth in claim 2 or 3, wherein:

in the other substrate and the folded-back substrate, the overlapping part of the fold is secured with an adhesive agent.

## [Claim 5]

A flexible LED substrate set forth in claim 1, 2, 3, or 4, wherein:

LEDs are arranged with substantially equal spacing on both the folded-back substrate and the other substrate.

## [Detailed Explanation of the Invention]

## [Field of Technology]

## [0001]

The present invention relates to a flexible LED substrate that is well-suited for making a long display.

## [Background Art]

## [0002]

As a conventional structure when making a display wherein LEDs are arranged along a long range, Japanese Unexamined Patent Application Publication 2007-112299 teaches that it is convenient to use a substrate that is formed in a shape wherein a single slit is formed cutting a flexible insulating substrate from one end to near to the other end, with the other ends of at least two strip-shaped parts connected by a connecting portion. A conductor pattern is formed on one face of a strip-shaped part of an insulating substrate, where LEDs (light emitting diodes) are connected so as to be lined up in one row on a straight line along each of the strip-shaped parts on the conductor pattern, so as to enable lengthening by extending each of the strip-shaped parts in a straight line through folding the connecting portions of the strip-shaped parts.

[Patent Document 1] Japanese Unexamined Patent Application Publication 2007-112299

(3)

[Disclosure of the Invention]

[Problem Solved by the Present Invention]

[0003]

However, in the conventional method of folding a substrate that uses a slit, a protruding portion is provided on the substrate and a junction portion is formed overlapping one end edge of the substrate, where the overlapping part that is the junction portion protrudes. The protruding portion has a drawback in that it tends to become snagged when handling the substrate. Moreover, the overlapping part is secured only at the protruding portion, so there is a possibility that the center part will come off. That is, there is a tendency to be thicker by the amount of the folded part, and for linearity to be lost. This is undesirable because it will cause positional nonuniformity in the LED light sources that are lined up with equal spacing. Moreover, because the interconnections are only interconnections that are provided in advance on the substrate in a serpentine pattern, and the serpentine interconnecting part is folded together with the substrate, there is the risk of electrical disconnection due to interconnections being present on the folded part as well.

[Means for Solving the Problem]

[0004]

In order to achieve the object set forth above, the present invention is a flexible LED substrate having interconnections that are provided substantially in parallel and having slits running between the interconnections up to the vicinity of one end, wherein: a folded-back substrate and an other substrate are made along a slit; an overlapping part is formed through folding the folded-back substrate with respect to the other substrate; and interconnections can be connected through soldering the folded-back substrate and the other substrate at the overlapping part.

Additionally, in the present invention, more preferably soldering is at the overlapping part of the fold, through an interconnection exposing portion of the other substrate, an interconnection exposing portion of the folded-back substrate, and through holes that are provided at the same location; and/or an interconnection exposing portion is provided at the overlapping part of the fold at both a part with a step and within an overlapping part that is continuous with the step, in the other substrate and in the folded-back substrate, and soldering is at an interconnection exposing portion of the step part and an interconnection exposing portion of the overlapping part; or in the other substrate and the folded-back substrate, the overlapping part of the fold is secured with an adhesive agent, wherein LEDs are arranged with substantially equal spacing on both the folded-back substrate and the other substrate.

[Effects of the Invention]

[0005]

In the present invention there is no need to provide a protruding portion on the side edge of the substrate in order to secure the folded portion, so the handling of the LED substrates is easy, as if they were a single strip, and because there is no interconnection at the part where the flexible LED substrate folds, the interconnection does not become disconnected, but rather even if an interconnection becomes disconnected, electrical conductivity is ensured through solder. Because at the overlapping portion securing is through soldering or an adhesive agent, it does not become thick, and there is no disruption to linearity, given that securing is at the overlapping portion.

Moreover, in the case wherein soldering is through the through hole, it is possible to secure near the center of the overlapping part of the folded portion, so that the overlapping part will not detach. When soldering at the part that is a step, the area of the connecting part will be large,

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enabling good connecting properties for the interconnections, and enabling high-strength. Because both of these can be employed, soldering is performed at multiple locations on the interconnections of the folded overlapping part, so that if the interconnection were to become disconnected at one location, there would still be electrical conductivity.

This makes it possible to preserve the equal spacing of the LEDs that are arranged, as the locations of the light sources, on both substrates, and if the substrate is formed in the shape of a tree or in a desired shape with respect to a shaped object, it becomes possible to produce lighting as desired.

[Best Mode for Carrying Out the Present Invention]

[0006]

The present invention is a flexible LED substrate that is made long, with a slit in a single substrate, and will be explained below.

[Embodiment]

[0007]

FIG. 1 is a plan view of a flexible LED substrate, prior to folding, in an embodiment according to the present invention; FIG. 2 is a plan view of a flexible LED substrate in an embodiment according to the present invention; and FIG. 6 is an explanatory diagram for the folded part. The folding sequence for the substrate is the same as in the prior art, so is not illustrated.

In these figures, 11 and 21 are interconnections that are provided substantially in parallel, showing an example where two interconnections are provided for each, but the significance of these is that they are electrical connections for LEDs (not shown), and in the case of LEDs of multiple colors, there may be three or more interconnections. For such interconnections 11 and 21, copper foil is provided on, for example, a polyimide insulating base, and coated with a top coating if necessary. Because with such a substrate the insulating base is flexible, the substrate itself is flexible. Additionally, there is a slit 30 that runs between these interconnections 11 and 21, up to the vicinity of one end. Moreover, a strip-shaped folded-back substrate 10 and other substrate 20 are formed for each of the interconnections 11 and 21 along the slit 30.

[0008]

With the slit 30 of the substrate, an overlapping part 40 is structured through folding the folded-back substrate 10 with respect to the other substrate 20. This folding is a process that is similar to that of the prior art, described above, where the substrate is overlapped together, with the lengthwise direction maintained in the strip shape, followed by making the interconnections 11 and 21 substantially straight, on the same surface, by folding back the folded-back substrate 10 near the tip end of the slit 30. In FIG. 1, the fold parts are shown by the dotted lines. The interconnections 11 and 21 are connected respectively, for both, through soldering the folded-back substrate 10 and the other substrate 20 at the overlapping part 40.

[0009]

In the overlapping part 40 of the fold of such a structure, an interconnection exposing portion 22 is provided in the other substrate 20 so as to be positioned substantially at the center of the overlapping part. An interconnection exposing portion 12 that is an open hole is provided also in the folded-back substrate 10 so as to be positioned in substantially the center of the overlapping part, and so as to be located so as to overlap the interconnection exposing portion 22 when folded back. Moreover, soldering (not shown) is carried out through the through holes 41 that are provided at positions corresponding to these interconnection exposing portions 12 and 22 when similarly overlapping. That is, when folded, the interconnection exposing portion 22, the through hole 41, and the open hole interconnection exposing portion 12 are provided in positions so as to

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each overlap with the interconnections 11 and 21. In this case, the hole of the open hole interconnection exposing portion 12 is for solder to pass therethrough so that the solder will reach the interconnection exposing portions 12 and 22. While the hole at this time is illustrated as being round, there is no limitation thereto, but rather it may be a notch that is cut out, in which case the interconnection exposing portion 12 itself may be in a substantially squared-U shape.  
[0010]

Moreover, on the interconnection 11, an interconnection exposing portion 13 is provided on a part of a step of the fold overlapping part 40 so as to extend into the overlapping part, connected to the step, and, at the other interconnection 21, an interconnection exposing portion 23 is provided so as to cover around where the step portion 42 is positioned. Soldering is at the interconnection exposing portions 13 and 23 at the step portion 42 of the overlapping part 40 and in the interior of the overlapping part 40 that is connected to the step portion 42 (referencing FIG. 6). In this structure, surface faces surface at the overlapping parts (the inner surfaces) 131 and 231 of the interconnection exposing portions 13 and 23, and so solder will permeate therein, improving the degree of contact. Because solder 34 is filled into the folded back part 132 of the folded-back substrate as well, the structure is three-dimensional, making possible to secure a large amount of solder, improving the securing force. A force for forming may also be applied to folding back the substrate.  
[0011]

In these, a large number of LEDs are arranged, with substantially uniform spacing, and secured bridging between these interconnections 11 and 21, on both the folded-back substrate 10 and the other substrate 20. This eliminates the need to provide a protruding portion, on the side edge of the substrate, for securing the folded portion, making the handling of the LED substrate easy, as if a single strip, and because there is no interconnection in the part wherein the flexible LED substrate is folded, the interconnection will not become disconnected, and electrical conductivity is secured by the solder, even if the interconnection becomes disconnected, as in the prior art. Because securing is through soldering at the step portion 42, or soldering at the overlapping portion, or through an adhesive agent, the overlapping portion is secured without increasing the thickness of the overlapping portion, reducing disruption to linearity.  
[0012]

FIG. 3 is a plan view of another embodiment showing the state prior to folding back, after LEDs have been mounted, where a plurality of LEDs 31 are mounted with substantially equal spacing on the flexible LED substrate. Lead wires of a power supply may be soldered to the power supply interconnection exposing portion 32 in order to connect the power supply for the LED lighting, or power supply cables may be connected to a connector 33. FIG. 4 is FIG. 3 after folding. The LEDs 31 are arranged with equal spacing, centered on the overlapping part 40.  
[0013]

FIG. 5 is the case of yet another embodiment wherein the interconnections of the flexible LED substrate use both faces, in the examples in FIG. 3 and FIG. 4, explained above. The use of interconnections of both faces makes it possible to reduce the width of the other substrate 20 and of the folded-back substrate 10. Conversely, the widths of the double-sided interconnections 61 on the other substrate 20 and of the double-sided interconnections 51 on the folded-back substrate 10 can be made wider.

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## [Industrial Applicability]

[0014]

This makes it possible to maintain the equal spacing of the LEDs as the positions of the light sources arranged on both substrates, enabling lighting as intended through arranging the substrate formed into a desired shape or a tree or a shaped object.

## [Brief Descriptions of the Drawings]

[0015]

FIG. 1 is a plan view of a flexible LED substrate prior to folding in an embodiment according to the present invention.

FIG. 2 is a plan view of a flexible LED substrate in an embodiment according to the present invention.

FIG. 3 is a plan view, prior to folding, after mounting the LEDs in another embodiment according to the present invention.

FIG. 4 is a plan view after folding in another embodiment according to the present invention.

FIG. 5 is a plan view after folding when there are interconnections on both faces in yet another embodiment according to the present invention.

FIG. 6 is an explanatory diagram for the step portion of the overlapping part in an embodiment according to the present invention.

## [Explanation of Reference Symbols]

[0016]

10: Folded-back Substrate

11: Interconnections (of the Folded-back Substrate)

12: (Open Hole) Interconnection Exposing Portion

13: Interconnection Exposing Portion (of the Folded-back Substrate)

20: Other Substrate

21: Interconnection (of the Other Substrate)

22: Interconnection Exposing Portion (of the Other Substrate)

23: Interconnection Exposing Portion (of the Other Substrate)

30: Slit

31: LED

32: Power Supply Interconnection Exposing Portion

33: Connector

34: Solder

40: Overlapping Part

41: Through Hole

42: Step Portion (of the Fold)

51, 61: Interconnections

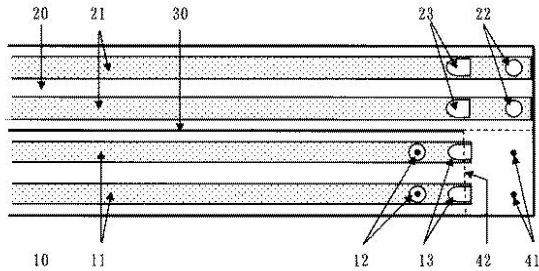
131: Interconnection Exposing Portion (of the Step Part)

132: Folded-back Part

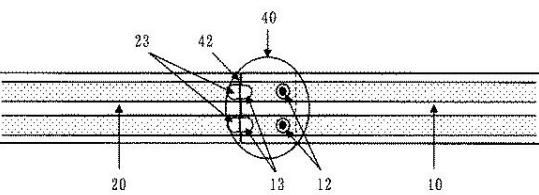
231: Interconnection Exposing Portion (of the Step Part of the Other Substrate)

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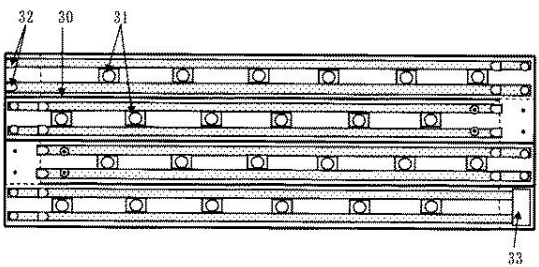
[FIG. 1]



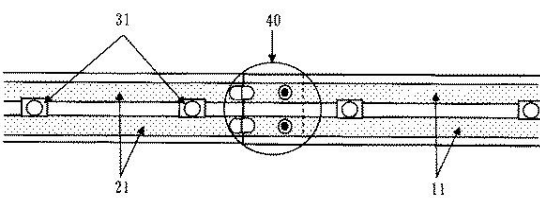
[FIG. 2]



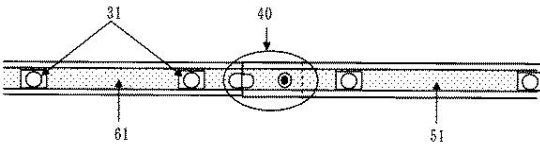
[FIG. 3]



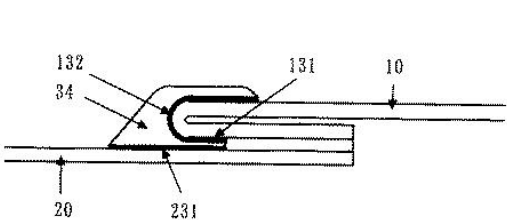
[FIG. 4]



[FIG. 5]



[FIG. 6]





## TRANSLATOR CERTIFICATION

Date: February 6, 2023

To whom it may concern:

I, Dr. Warren Smith, a translator fluent in the Japanese and English languages, on behalf of Morningside Translations, do solemnly and sincerely declare that the following is, to the best of my knowledge and belief, a true and correct translation of the documents listed below in a form that reflects the intention and meaning of the original text.

- JP2010153549A

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

A handwritten signature in black ink, appearing to read "Warren Smith", is written over a horizontal line.

Signature

Warren Smith

Print

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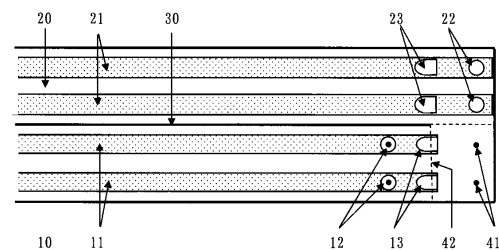
(54) 【発明の名称】 フレキシブルLED基板

(57) 【要約】 (修正有)

【課題】 基板に不所望な突出部を設けたり折り曲げ部分だけが厚くなったり配線が断線したり直線性が損なわれたりすることがない長尺なフレキシブルLED基板を提供する。

【解決手段】 ほぼ平行して設けられた配線を有し、その配線の間に沿って一端の近傍まで切れ目を有するフレキシブルLED基板において、切れ目に沿って折返し基板と他方基板とする。他方基板に対して折返し基板を折り曲げることによって重なり部分を構成し、その重なり部分にて他方基板と折返し基板を半田付けすることにより配線を接続し得るものである。折り曲げの重なり部分において、透孔を介して半田付けしたり、段差の部分とその段差に続く重なり部分内部で半田付けする。折返し基板と他方基板の両方にLEDをほぼ等間隔で配置したものである。

【選択図】 図1



## 【特許請求の範囲】

## 【請求項 1】

ほぼ平行して設けられた配線を有し、その配線の間に沿って一端の近傍まで切れ目を有するフレキシブル L E D 基板において、切れ目に沿って折返し基板と他方基板とし、その他方基板に対して折返し基板を折り曲げることによって重なり部分を構成し、その重なり部分にて前記折返し基板と前記他方基板を半田付けすることにより配線を接続したことを特徴とするフレキシブル L E D 基板。

## 【請求項 2】

折り曲げの前記重なり部分において、前記他方基板の配線露出部と前記折返し基板の配線露出部及び同じ位置に設けた透孔で半田付けしたことを特徴とする前記請求項 1 に記載のフレキシブル L E D 基板。

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## 【請求項 3】

折り曲げの前記重なり部分において、前記他方基板と前記折返し基板とにおいて配線露出部を段差の部分およびその段差に続く重なり部分内部にも設け、前記段差の部分の配線露出部および重なり部分の配線露出部で半田付けしたことを特徴とする前記請求項 1 に記載のフレキシブル L E D 基板。

## 【請求項 4】

前記他方基板と前記折返し基板とにおいて、折り曲げの前記重なり部分を接着剤で固定したことを特徴とする前記請求項 2 または 3 に記載のフレキシブル L E D 基板。

## 【請求項 5】

前記折返し基板と前記他方基板の両方に L E D をほぼ等間隔で配置したことを特徴とする請求項 1、2、3 または 4 に記載のフレキシブル L E D 基板。

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## 【発明の詳細な説明】

## 【技術分野】

## 【0001】

本発明は長尺な表示を行うに好適なフレキシブル L E D 基板に関する。

## 【背景技術】

## 【0002】

長尺な範囲に互って L E D を配置し表示を行うにあたっては、従来の構成は、例えば特開 2007-112299 号公報には、フレキシブルな絶縁基板に少なくとも 1 本の一端から他端の近くまで切り込まれたスリットを形成して、少なくとも 2 つの帯状部分が他端の連結部でつながる形状に形成する基板を用いると便利であることが開示されている。そしてこの絶縁基板の帯状部分の片面に導体パターンを形成し、この導体パターン上にかつ夫々の帯状部分に沿って直線上に一行に並ぶように L E D（発光ダイオード）を接合し、帯状部分の連結部において折り曲げることで各帯状部分を直線状に延ばして長尺化を得るようにしている。

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【特許文献 1】特開 2007-112299 号公報

## 【発明の開示】

## 【発明が解決しようとする課題】

40

## 【0003】

ところがこの従来のスリットで基板を折り曲げる方法では、基板に突出部を設けて基板の一方の端縁で重なる接合部を形成しているのでその接合部である重なり部分が突出している。この突出部は基板を取り扱う上で引っかけやすく不都合である。またその突出部のみで重なり部分を固定させており、中央部分が浮いてしまう可能性がある。つまり折り曲げ部分だけが厚くなったり、直線性が損なわれたりしやすい。これは等間隔で並べた L E D の光源の位置ムラとなるので好ましくない。また、配線は予め基板に蛇行して設けた配線のみでありその蛇行配線部分を基板と共に折り曲げるので、曲げの部分にも配線がある為切断する虞れがある。

## 【課題を解決するための手段】

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## 【0004】

上述の目標を達成するため、本発明は、ほぼ平行して設けられた配線を有し、その配線の間に沿って一端の近傍まで切れ目を有するフレキシブルLED基板において、切れ目に沿って折返し基板と他方基板とし、その他方基板に対して折返し基板を折り曲げることによって重なり部分を構成し、その重なり部分にて他方基板と折返し基板を半田付けすることにより配線を接続し得るものである。

そして本発明は更に好ましくは、折り曲げの重なり部分において、他方基板の配線露出部と前記折返し基板の配線露出部及び同じ位置に設けた透孔で半田付けし、または／および、折り曲げの重なり部分において、他方基板と折返し基板とにおいて配線露出部を段差の部分およびその段差に続く重なり部分内部にも設け、段差の部分の配線露出部で半田付けしたもので、あるいは段差部分を半田付けし更に重なり部分を接着剤で固定するものであり、これらにおいて折返し基板と他方基板の両方にLEDをほぼ等間隔で配置したものである。

## 【発明の効果】

## 【0005】

本発明によれば、基板の側縁に折り曲げ部の固定のための突出部を設ける必要がないのでLED基板の取り扱いが1本の紐のように容易であり、フレキシブルLED基板の折り曲げる部分には配線がない場合には配線が切れることがなく、配線があっても半田で電氣的導通が確保される。また重なり部で半田付けまたは接着剤で固定するので重なり部が厚く膨らむことがなく、重なり部が固定されるので直線性が崩れにくい。

さらに透孔を介して半田付けする場合には、折り曲げ部の重なり部分の中央付近で固定することが出来、重なり部分に浮きがでにくい。また段差の部分で半田付けする場合、接続部分の面積が大きくなり、配線の接合性および強度を高くすることができる。そしてこれらの両方を採用することも出来るので、折り曲げた重なり部分の配線上の複数個所で半田付けを行うことになるため1箇所切れても配線が電氣的に切断されない。

これらにより、両方の基板に配置されたLEDは、光源の位置として等間隔を維持でき、また基板を樹木や造形物に対して所望の形状に変形させ配置すれば、その意図通りに照明することができる。

## 【発明を実施するための最良の形態】

## 【0006】

本発明は1枚の基板に切れ目（スリット）を設けて長尺化したフレキシブルLED基板であってその詳細を以下に説明する。

## 【実施例】

## 【0007】

図1は本発明実施例の折り曲げ前のフレキシブルLED基板の平面図で、図2は本発明実施例のフレキシブルLED基板の平面図、図6はその折曲げ部分の説明図である。基板の折り曲げ順は上述した先行技術と同様なので図示していない。

これらの図において11、21はほぼ平行して設けられた配線であり、それぞれ2本ずつを例示しているが、これはLED（図示せず）の電気配線を意味しており、複数色のLEDの場合は3本またはそれ以上でもよい。このような配線11、21は、例えばポリイミド絶縁基台に銅箔で設けられ、必要に応じてオーバーコートで覆われている。このような基板は絶縁基台が柔軟であるから、基板自体が可撓性を有している。そしてその配線11、21の間に沿って一端の近傍まで切れ目30を有する。そしてその切れ目30に沿って配線11、21ごとに帯状の折返し基板10と他方基板20が形成されている。

## 【0008】

基板のその切れ目30他方基板20に対して折返し基板10を折り曲げることによって重なり部分40を構成している。この折り曲げは上述した先行技術と同様の手順であり、帯状に長手方向をそのままに基板を重ねあわせ、その後折返し基板10を切れ目30の先端付近で折り返すことによって配線11、21が同じ面にてほぼ直線状になるよう

にする。図 1 にはその折曲げ部分を破線で示してある。その重なり部分 4 0 にて折返し基板 1 0 と他方基板 2 0 を半田付けすることにより配線 1 1、2 1 を 2 本ともそれぞれに接続している。

#### 【0009】

このような構成において折り曲げの重なり部分 4 0 においては、他方基板 2 0 には重なり部分のほぼ中央に位置するように配線露出部 2 2 が設けられている。また折返し基板 1 0 にもその重なり部分のほぼ中央に位置するように、かつ折り返したときに配線露出部 2 2 と重なる箇所に、穴あきの配線露出部 1 2 が設けられている。そしてこれら配線露出部 1 2、2 2 と同じく重ねたときに対応する位置に設けられた透孔 4 1 を介して半田付け（図示せず）がなされている。つまり、折り曲げたとき、配線露出部 2 2、透孔 4 1、穴あき配線露出部 1 2 はそれぞれ配線 1 1、2 1 上において重なるような位置に設けられていることになる。この場合において穴あき配線露出部 1 2 の穴とは半田が浸透して、配線露出部 1 2 および 2 2 に半田が届くためのものである。この時の穴とは丸型を図示しているが、これに限られるものではなく、切り欠きでも良く、その場合は配線露出部 1 2 自体がほぼコ字状をなしていても良い。

#### 【0010】

また配線 1 1 には、折り曲げ重なり部分 4 0 の段差の部分に配線露出部 1 3 がその段差に続く重なり部分内部にも延在するように設けられており、他方配線 2 1 にも段差部 4 2 が位置する前後をカバーできるような配線露出部 2 3 が設けてある。そして重なり部分 4 0 の段差部 4 2 およびその段差部 4 2 に続く重なり部分 4 0 内部において配線露出部 1 3、2 3 で半田付け（図 6 参照）がなされている。このような構成において配線露出部 1 3、2 3 の重なり部分（内面）1 3 1、2 3 1 においては面と面の対向となるので、そこに半田が浸透し、密着度が良くなる。さらに折返し基板の折り返し部分 1 3 2 にも半田 3 4 が盛られるので立体的になり、半田量が多く確保でき、固着力がよい。そして基板の折り返しに対して整形する力をも与えることができる。

#### 【0011】

これらにおいて、折返し基板 1 0 と他方基板 2 0 の両方に配線 1 1、2 1 に跨るように多数の L E D をほぼ等間隔で配置固着してある。これによって、基板の側縁に折り曲げ部の固定のための突出部を設ける必要がないので L E D 基板の取り扱いが 1 本の紐のように容易であり、フレキシブル L E D 基板の折り曲げる部分には配線がない場合には配線が切れることがなく、図示していないが先行技術のように配線があって切れたとしても半田で電氣的導通が確保される。また段差部 4 2 で半田付け、または重なり部で半田付けもしくは接着剤で固定するので重なり部が厚く膨らむことがなく、重なり部が固定されるので直線性が崩れにくい。

#### 【0012】

図 3 は L E D 実装後の折り曲げ前の状態を示す他の実施例の平面図であり、フレキシブル L E D 基板に複数の L E D 3 1 を等間隔で実装している。L E D 点灯の為の電源を接続するための電源用配線露出部 3 2 に電源のリード線を半田付けしてもコネクタ 3 3 に電源ケーブルを接続してもよい。図 4 は図 3 の折り曲げ後のものである。重なり部分 4 0 を中心にして等間隔に L E D 3 1 を配置している。

#### 【0013】

図 5 は、先に説明した図 3 および図 4 の例におけるフレキシブル L E D 基板の配線が両面のものを使用した更に他の実施例の場合である。両面の配線を使用することにより前記他方基板 2 0 と前記折返し基板 1 0 の幅を細くすることができる。または、前記他方基板 2 0 の両面配線 6 1 と前記折返し基板 1 0 の両面配線 5 1 の幅を太くすることができる。

#### 【産業上の利用可能性】

#### 【0014】

これらにより、両方の基板に配置された L E D は、光源の位置として等間隔を維持でき、また基板を樹木や造形物に対して所望の形状に変形させ配置すれば、その意図

通りに照明することができる。

【図面の簡単な説明】

【0015】

【図1】本発明実施例の折り曲げ前のフレキシブルLED基板の平面図である。

【図2】本発明実施例のフレキシブルLED基板の平面図である。

【図3】本発明の他の実施例のLEDを実装後の折り曲げ前の平面図である。

【図4】本発明の他の実施例の折り曲げ後の平面図である。

【図5】本発明の更に他の実施例に係る両面配線にした時の折り曲げ後の平面図である。

【図6】本発明実施例の重なり部分の段差部の説明図である。

【符号の説明】

10

【0016】

10 折返し基板

11 (折返し基板の) 配線

12 (穴あき) 配線露出部

13 (折返し基板の) 配線露出部

20 他方基板

21 (他方基板の) 配線

22 (他方基板の) 配線露出部

23 (他方基板の) 配線露出部

30 切れ目

20

31 LED

32 電源用配線露出部

33 コネクタ

34 半田

40 重なり部分

41 透孔

42 (折り曲げの) 段差部

51, 61 配線

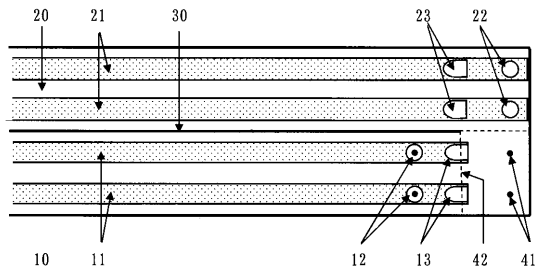
131 (段差部分の) 配線露出部

132 折返し部分

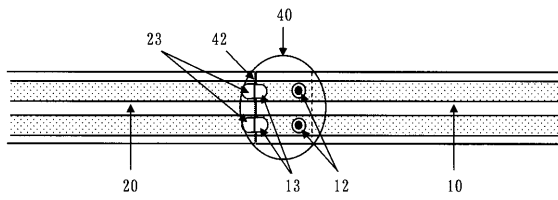
30

231 (他方基板の段差部分の) 配線露出部

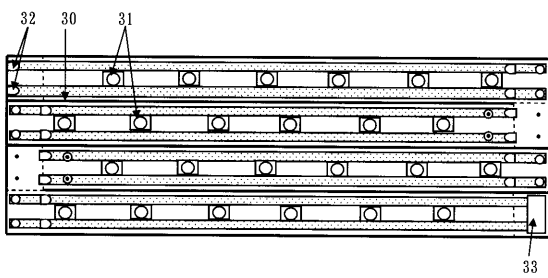
【図 1】



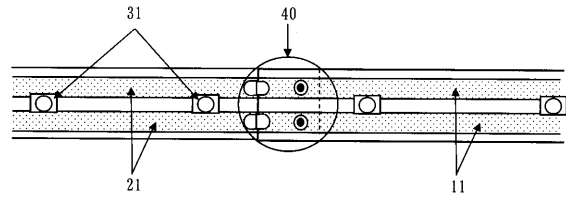
【図 2】



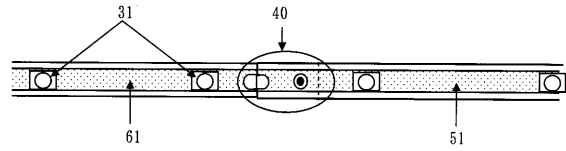
【図 3】



【図 4】



【図 5】



【図 6】

