



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.06.2010 Bulletin 2010/23

(51) Int Cl.:
F21S 8/10 ^(2006.01) **F21V 23/06** ^(2006.01)
H01R 13/66 ^(2006.01) **F21Y 101/02** ^(2006.01)
F21W 101/14 ^(2006.01)

(21) Application number: **09178327.4**

(22) Date of filing: **08.12.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

(72) Inventors:
• **Ito, Noriaki**
Shizuoka-shi, Shizuoka (JP)
• **Tsukamoto, Hironori**
Shizuoka-shi, Shizuoka (JP)

(30) Priority: **08.12.2008 JP 2008311733**

(74) Representative: **Intes, Didier Gérard André et al**
Cabinet Beau de Loménie
158, rue de l'Université
75340 Paris Cedex 07 (FR)

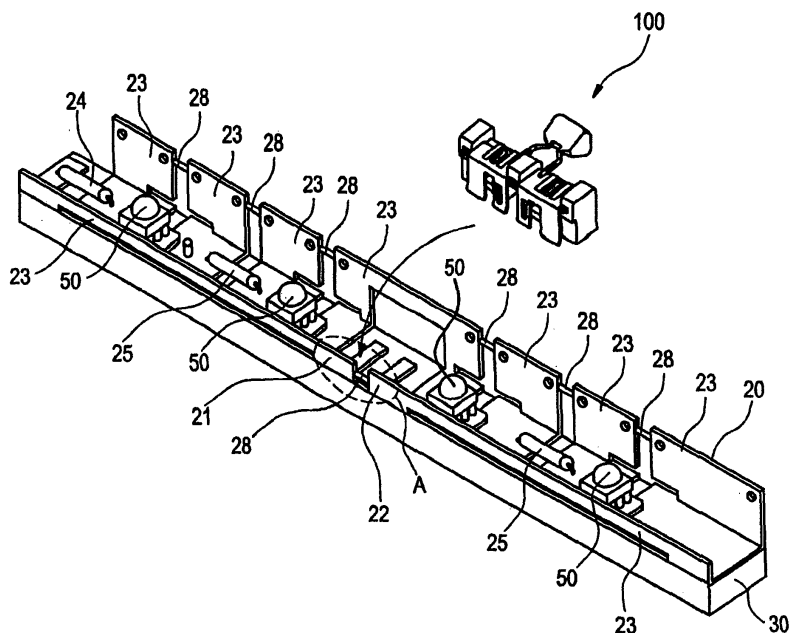
(71) Applicant: **Koito Manufacturing Co., Ltd.**
Tokyo 108-8711 (JP)

(54) **Electric power feed device and vehicle lamp**

(57) An electric power feed device (10) is adapted to feed electric power from a power supply to a vehicle lamp which uses at least one semiconductor light emitting device (50) as a light source. The electric power feed device (10) has a bus bar (20) and an interposing unit (100) which is attachable to the bus bar (20). The bus bar (20) has a positive side connecting portion (21) adapted to be electrically coupled to a positive terminal of the power supply, and a negative side connecting portion (22)

adapted to be electrically coupled to a negative terminal of the power supply to electrically couple the at least one semiconductor light emitting device (50) to the positive and negative terminals of the power supply. The interposing unit (100) is adapted to interpose and electrically couple, when attached to the bus bar (20), at least one electronic component (200) between the positive side connecting portion (21) and the negative side connecting portion (22) of the bus bar (20).

FIG. 4



Description

[0001] The present invention relates to an electric power feed device and a vehicle lamp. More specifically, the present invention relates to an electric power feed device of a vehicle lamp which feeds electric power from a power supply to a semiconductor light emitting device serving as a light source of the vehicle lamp.

[0002] In a power supply line, bus bars are generally being used in place of electric wires. A bus bar is a strip of an electrical conductor (e.g., a metal plate). In automotive applications, a bus bar is used, for example, for supplying electric power from a power supply to a semiconductor light emitting device (e.g., a light emitting diode) provided inside a vehicle lamp such as a stop lamp (see, e.g., JP 2001-063454 A).

[0003] However, a vehicle lamp that uses a light emitting diode has a drawback that it may undesirably flash due to a noise.

[0004] Thus, in order to prevent a flash from occurring due a noise, it has been proposed to incorporate a capacitor or the like in a lighting circuit for the light emitting diode. However, this countermeasure on the other hand hampers compatibility of a component because a circuit configuration of a lighting circuit of a vehicle lamp is changed in accordance with likelihood of noise generation which varies depending on a type of vehicle.

[0005] In order to solve the problems described above, an illustrative aspect of the present invention provides an electric power feed device adapted to feed electric power from a power supply to a vehicle lamp which uses at least one semiconductor light emitting device as a light source. The electric power feed device comprises a bus bar and an interposing unit which is attachable to the bus bar. The bus bar comprises a positive side connecting portion adapted to be electrically coupled to a positive terminal of the power supply and a negative side connecting portion adapted to be electrically coupled to a negative terminal of the power supply to electrically couple the at least one semiconductor light emitting device to the positive and negative terminals of the power supply. The interposing unit is adapted to interpose and electrically couple, when attached to the bus bar, at least one electronic component between the positive side connecting portion and the negative side connecting portion of the bus bar.

[0006] According to the electric power feed device described above, an electronic component such as a capacitor can be added without modifying the bus bar configuration or the arrangement of circuit elements mounted on the bus bar. Consequently, for example, a line noise suppressing capacitor can easily be added to the electric power feed device for use in a lamp of a vehicle in which a line noise is likely to be generated.

[0007] According to another illustrative aspect of the present invention, the interposing unit may comprise a positive terminal piece which is made of a conductive material and is adapted to be electrically connected to

the positive side connecting portion, a negative terminal piece which is made of a conductive material and is adapted to be electrically connected to the negative side connecting portion, and a holder which is made of an electrically insulative material to hold the positive terminal piece and the negative terminal piece such that the positive terminal piece and the negative terminal piece are electrically insulated from each other.

[0008] This configuration is advantageous in that a short circuit between the positive side connecting portion and the negative side connecting portion of the bus bar is reliably prevented from occurring when mounting the interposing unit.

[0009] According to another illustrative aspect of the present invention, each of the positive terminal piece and the negative terminal piece may comprise a crimp terminal adapted to be crimped to fasten the electronic component to the interposing unit.

[0010] This configuration is advantageous in that the electronic component can be attached to the interposing unit without soldering, so that the assembling work is facilitated. As an alternative method that does not involve soldering, the electronic component may be attached to the interposing unit by welding, pressure bonding, or press fitting into the terminals.

[0011] According to another illustrative aspect of the present invention, the electric power feed device may further comprise a base to which the bus bar is fixed. The positive side connecting portion and the negative side connecting portion of the bus bar may be partially protruded out from the base to form a connector, and the interposing unit may be configured to fit the connector.

[0012] This configuration is advantageous in that the interposing unit can easily be electrically connected between the positive side connecting portion and the negative side connecting portion of the bus bar.

[0013] According to another illustrative aspect of the present invention, each of the positive terminal piece and the negative terminal piece may comprise a holding portion. The interposing unit may be attached to the bus bar such that the positive side connecting portion is held between the holding portion of the positive terminal piece and the holder, and such that the negative side connecting portion is held between the holding portion of the negative terminal piece and the holder. This configuration is advantageous in that the interposing unit can easily be attached to the bus bar.

[0014] According to another illustrative aspect of the present invention, the holder may comprise a recess portion which provides a hollow space between the holding portions of the positive terminal piece and the negative terminal piece. This configuration is advantageous in that, even after attaching the interposing unit to the bus bar, a coupling part of the bus bar between the positive side connecting portion and the negative side connecting portion can be cut without damaging the interposing unit by inserting a cutting tool into the space provided by the recess portion.

[0015] According to another illustrative aspect of the present invention provides a vehicle lamp comprising the electric power feed device described above, and the at least one semiconductor light emitting device which emits light by the electric power fed from the power supply via the electric power feed device.

[0016] According to another illustrative aspect of the present invention, the vehicle lamp may further comprise the at least one electronic component which is interposed and electrically coupled between the positive side connecting portion and the negative side connecting portion of the bus bar via the interposing unit. The at least one electronic component may comprise a capacitor. This configuration is advantageous in that a line noise can be addressed depending on a type of vehicle on which the vehicle lamp is to be mounted, and without modifying the bus bar configuration of the electric power feed device or the arrangement of circuit elements mounted on the bus bar.

[0017] Other aspects and advantages of the invention will be apparent from the following description, the drawings and the claims.

[0018] Hereinafter, an exemplary embodiment of the present invention will be described in detail with reference to the drawings including:

- Fig. 1: an exploded perspective view of an interposing unit of an electric power feed device according to an exemplary embodiment of the present invention;
- Fig. 2: a top view of the electric power feed device;
- Fig. 3: a circuit diagram of the electric power feed device;
- Fig. 4: a perspective view of the electric power feed device;
- Fig. 5: a perspective view of the interposing unit after assembling;
- Fig. 6: an enlarged perspective view of the interposing unit that is mounted on a central portion a bus bar on one of longitudinal side edges of a base; and
- Fig. 7: an enlarged perspective view of a central portion of a bottom face of the base.

[0019] The following exemplary embodiment does not limit the scope of the present invention as defined by the appended claims. Further, the features of the following exemplary embodiment are not necessarily all essential for solving the foregoing problems.

[0020] As shown in Figs. 1 to 3, an electric power feed device 10 of the exemplary embodiment includes a bus bar 20, a base 30 on which the bus bar 20 is fixed, and an interposing unit 100 to which an electronic component 200 is firmly attached. The electric power feed device 10 is used, for example, as a part of a vehicle lamp (e.g., a high mount stop lamp) of an automobile to feed electric power from a power supply to a light source of the vehicle lamp.

[0021] The bus bar 20 is formed from a conductive plate material such as a copper plate, and is fixed to the base 30 by means of, for example, screws or engagement claws. The base 30 is made of an electrically insulative material such as a resin, and has a rectangular cuboid shape. The bus bar 20 is fabricated, for example, by sheet metal working. The base 30 is fabricated, for example, by injection molding.

[0022] The bus bar 20 has a plurality of conductive parts 23, adjacent ones of which are connected by a coupling part 28 respectively. Each of the conductive parts 23 has a horizontal portion which is fixed to an upper surface of the base 30, and a vertical portion which upwardly extends from either or both of the longitudinal side edges of the base 30. The coupling parts 28 are ultimately removed in the manufacturing process of the electric power feed device 10. However, for the sake of convenience in the following description, the electric power feed device 10 is illustrated together with the coupling parts 28 unremoved.

[0023] A diode 24, resistors 25, and light emitting diodes 50 are each fixed between the horizontal portion of associated one of the conductive part 23 and the horizontal portion of another conductive part 23 adjacent thereto. These electronic components are fixed to the associated conductive parts 23 by, for example, crimping a portion of the respective conductive parts 23. Alternatively, the electronic components may be fixed to the associated conductive parts 23 by pressure bonding, soldering or welding. The light emitting diode 50 is an example of the semiconductor light emitting device.

[0024] Two of the conductive parts 23 have the respective vertical portions on the same longitudinal side edge of the base 30 (the front side edge of the base 30 in Fig. 4). One of the two conductive parts 23 has a positive side connecting portion 21 and the other of the two conductive parts 23 has a negative side connecting portion 22. The positive side connecting portion 21 and the negative side connecting portion 22 are located at a central portion in the longitudinal direction of the base 30, and are connected via the associated coupling part 28. The positive side connecting portion 21 is adapted to be electrically coupled to a positive terminal of a power supply (not shown), and the negative side connecting portion 22 is adapted to be electrically coupled to a negative terminal of the power supply. The positive side connecting portion 21 and the negative side connecting portion 22 are connected to the power supply via conductive members such as feeder wires respectively. The power supply is, for example, a direct current power source such as an automotive battery.

[0025] The interposing unit 100 holds the electronic component 200, and is mounted, during the manufacture of the electric power feed device 10, onto the vertical portions of the positive side connecting portion 21 and the negative side connecting portion 22, i.e., onto a central portion A of the bus bar 20 in the longitudinal direction of the base 30 (see Figs. 2 and 4). Accordingly, as shown

in the circuit configuration of Fig. 3, the electronic component 200 is interposed and electrically coupled between the positive side connecting portion 21 and the negative side connecting portion 22 of the lighting circuit including the conductive parts 23, the diode 24, the resistors 25 and the light emitting diodes 50.

[0026] In this exemplary embodiment, the electronic component 200 is a capacitor, and filters out an external line noise which would otherwise adversely affect the lighting circuit on the electric power feed device 10. According to the electric power feed device 10 of the exemplary embodiment, this electronic component 200 (i.e., the capacitor) can be electrically connected in parallel to the lighting circuit by using of the interposing unit 100. Consequently, countermeasures against line noise can be improved without modifying the design of the bus bar 20, etc.

[0027] As shown in Figs. 1 and 5, the interposing unit 100 has a positive terminal piece 110, a negative terminal piece 120, and a holder 130 which holds the positive terminal piece 110 and the negative terminal piece 120. The positive terminal piece 110 and the negative terminal piece 120 are made of a conductive material. For example, each of the positive terminal piece 110 and the negative terminal piece 120 may be formed from a stainless steel plate. The holder 130 is formed made of an electrically insulative material such as a plastic. Each of positive terminal piece 110 and the negative terminal piece 120 has a crimp terminal 112, 122. The crimp terminal 112, 122 may be formed to horizontally extend. Legs of the electronic component 200 are inserted into the respective crimp terminals 112, 122, which are then crimped to fasten the electronic component 200 to the positive terminal piece 110 and the negative terminal piece 120. The positive terminal piece 110 and the negative terminal piece 120 are fabricated by, for example, sheet metal working.

[0028] The holder 130 has two pairs of engagement grooves 131, 132 which are formed such that the corresponding portions of the holder 130 are cut out. The engagement grooves 131, 132 are formed at a central portion and respective end portions of the holder in a longitudinal direction of the holder 130. The holder 130 has a recess portion 135 which is hollowed upward from a central portion of a lower surface of the holder 130. The pairs of engagement grooves 131, 132 are symmetrically configured with respect to a horizontal direction orthogonal to the longitudinal direction of the holder 130. One pair of the engagement grooves 131 engages with horizontal side portions of the positive terminal piece 110, and the other pair of the engagement grooves 132 engages with horizontal side portions of the negative terminal piece 120.

[0029] Further, locking projections 133, 134 are provided on the upper surface of the holder 130. The locking projection 133 engages with a horizontally extending locking hole 111 of the positive terminal piece 110, and the locking projection 134 engages with a horizontally extending locking hole 121 of the negative terminal piece

120.

[0030] When the interposing unit 100 is assembled, the positive terminal piece 110, the negative terminal piece 120, and the holder 130 are mutually fixed to each other by the locking holes 111, 121 of the positive terminal piece 110 and the negative terminal piece 120, and the engagement grooves 131, 132 and the locking projections 133, 134 of the holder 130.

[0031] Further, the electronic component 200 is fixed and electrically connected to the positive terminal piece 110 and the negative terminal piece 120 in the manner described above. In this assembled state, vertically extending holding portions 113 of the positive terminal piece 110 and vertically extending holding portions 123 of the negative terminal piece 120 are disposed on respective sides of the recess portion 135 of the holder 130. In other words, the recess portion 135 is arranged between the holding portions 113 of the positive terminal piece 110 and the holding portions 123 the negative terminal piece 120 to provide a hollow space between the holding portions 113 of the positive terminal piece 110 and the holding portions 123 the negative terminal piece 120.

[0032] In this assembled state, moreover, the positive terminal piece 110 and the negative terminal piece 120 are held on to the holder 130 state that the positive terminal piece 110 and the negative terminal piece 120 are electrically insulated from each other by the holder 130. Consequently, when mounting the interposing unit 100 on the bus bar 20, a short circuit between the positive side connecting portion 21 and the negative side connecting portion 22 of the bus bar 20 can reliably by prevented from occurring erroneously.

[0033] As shown in Fig. 6, when attaching the assembled interposing unit 100 to the bus bar 20, the vertical portion of the positive side connecting portion 21 of the bus bar 20 is inserted and held between the holding portions 113 of the positive terminal piece 110 and a front surface of the holder 130, and the vertical portion of the negative side connecting portion 22 of the bus bar 20 is inserted and held between and the holding portions 123 of the negative terminal piece 120 and the front surface of the holder 130, whereby the interposing unit 100 is firmly attached and fixed to the bus bar 20.

[0034] The interposing unit 100 is fixed to the bus bar 20 such that the coupling part 28 between the positive side connecting portion 21 and the negative side connecting portion 22 is positioned between the holding portions 113 of the positive terminal portion 110 and the holding portions 123 of the negative terminal piece 120. Thus, a hollow space is provided behind the coupling part 28 by the recess portion 135 of the holder 130. Consequently, even after the interposing unit 100 is mounted on the bus bar 20, a cutting tool can be inserted into the hollow space from the front of the bus bar 20 so that the coupling part 28 can be cut without damaging the interposing unit 100.

[0035] Fig. 7 is an enlarged view of a central portion of a bottom face of the base 30. As shown in Fig. 7, the

positive side connecting portion 21 and the negative side connecting portion 22 of the bus bar 20 may penetrate through the base 30 and protrude out from the bottom face of the base 30 to form a positive terminal 26 and a negative terminal 27 of a connector 29.

[0036] According to the configuration shown in Fig. 7, instead of being attached to the vertical portions of the bus bar 20, the interposing unit 100 may be configured to fit the connector 29 such that the positive terminal 26 and the negative terminal 27 of the connector 29 are inserted into the interposing unit 10. In this case, the electronic component 200 can easily be interposed between the positive side terminal 26 and the negative side terminal 27.

[0037] While the present invention has been described with reference to a certain exemplary embodiment thereof, it will be understood by those skilled in the art that various changes and other modifications may be made therein without departing from the spirit and scope of the present invention as defined by the appended claims.

Claims

1. An electric power feed device (10) adapted to feed electric power from a power supply to a vehicle lamp which uses at least one semiconductor light emitting device (50) as a light source, the electric power feed device (10) comprising:

a bus bar (20) which electrically couples the at least one semiconductor light emitting device (50) to positive and negative terminals of the power supply; and
an interposing unit (100) which is attachable to the bus bar (20),

wherein the bus bar (20) comprises:

a positive side connecting portion (21) adapted to be electrically coupled to the positive terminal of the power supply; and
a negative side connecting portion (22) adapted to be electrically coupled to the negative terminal of the power supply,

wherein the interposing unit (100) is adapted to interpose and electrically couple, when attached to the bus bar (20), at least one electronic component (200) between the positive side connecting portion (21) and the negative side connecting portion (22) of the bus bar (20).

2. The electric power feed device (10) according to claim 1, wherein the interposing unit (100) comprises:

a positive terminal piece (110) which is made of

a conductive material and is adapted to be electrically connected to the positive side connecting portion (21);

a negative terminal piece (120) which is made of a conductive material and is adapted to be electrically connected to the negative side connecting portion (22); and

a holder (130) which is made of an electrically insulative material,

wherein the holder (130) holds the positive terminal piece (110) and the negative terminal piece (120) such that the positive terminal piece (110) and the negative terminal piece (120) are electrically insulated from each other.

3. The electric power feed device (10) according to claim 2, wherein each of the positive terminal piece (110) and the negative terminal piece (120) comprises a crimp terminal (112, 122) adapted to be crimped to fasten the electronic component (200) to the interposing unit (100).

4. The electric power feed device (10) according to any one of claims 1 to 3, further comprising a base (30) to which the bus bar (20) is fixed, wherein the positive side connecting portion (21) and the negative side connecting portion (22) of the bus bar (20) are partially protruded out from the base (30) to form a connector (29), and the interposing unit (100) is configured to fit the connector (29).

5. The electric power feed device (10) according to any one of claims 2 to 3, wherein each of the positive terminal piece (110) and the negative terminal piece (120) comprises a holding portion (113, 123), wherein the interposing unit (100) is attached to the bus bar (20) such that the positive side connecting portion (21) is held between the holding portion (113) of the positive terminal piece (110) and the holder (130), and such that the negative side connecting portion (22) is held between the holding portion (123) of the negative terminal piece (120) and the holder (130).

6. The electric power feed device (10) according to claim 5, wherein the holder (130) comprises a recess portion (135) which provides a hollow space between the holding portions (113, 123) of the positive terminal piece (110) and the negative terminal piece (120).

7. A vehicle lamp comprising:

the electric power feed device (10) according to any one of the preceding claims; and
the at least one semiconductor light emitting device (50) which emits light by the electric power

fed from the power supply via the electric power feed device (10).

8. The vehicle lamp according to claim 7, comprising the at least one electronic component (200) which is interposed and electrically coupled between the positive side connecting portion (21) and the negative side connecting portion (22) of the bus bar (20) via the interposing unit (100), wherein the at least one electronic component (200) comprises a capacitor.

15

20

25

30

35

40

45

50

55

FIG. 1

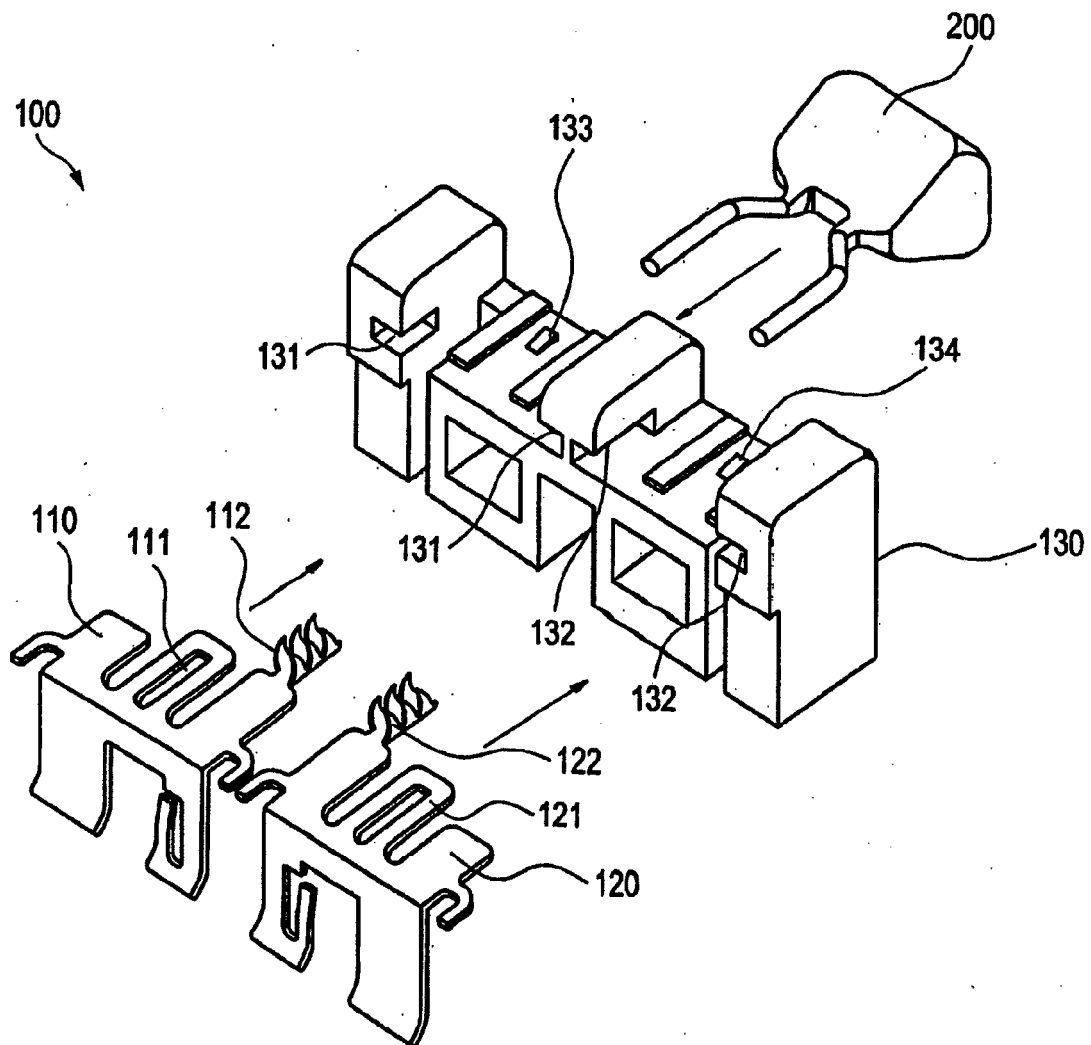


FIG. 2

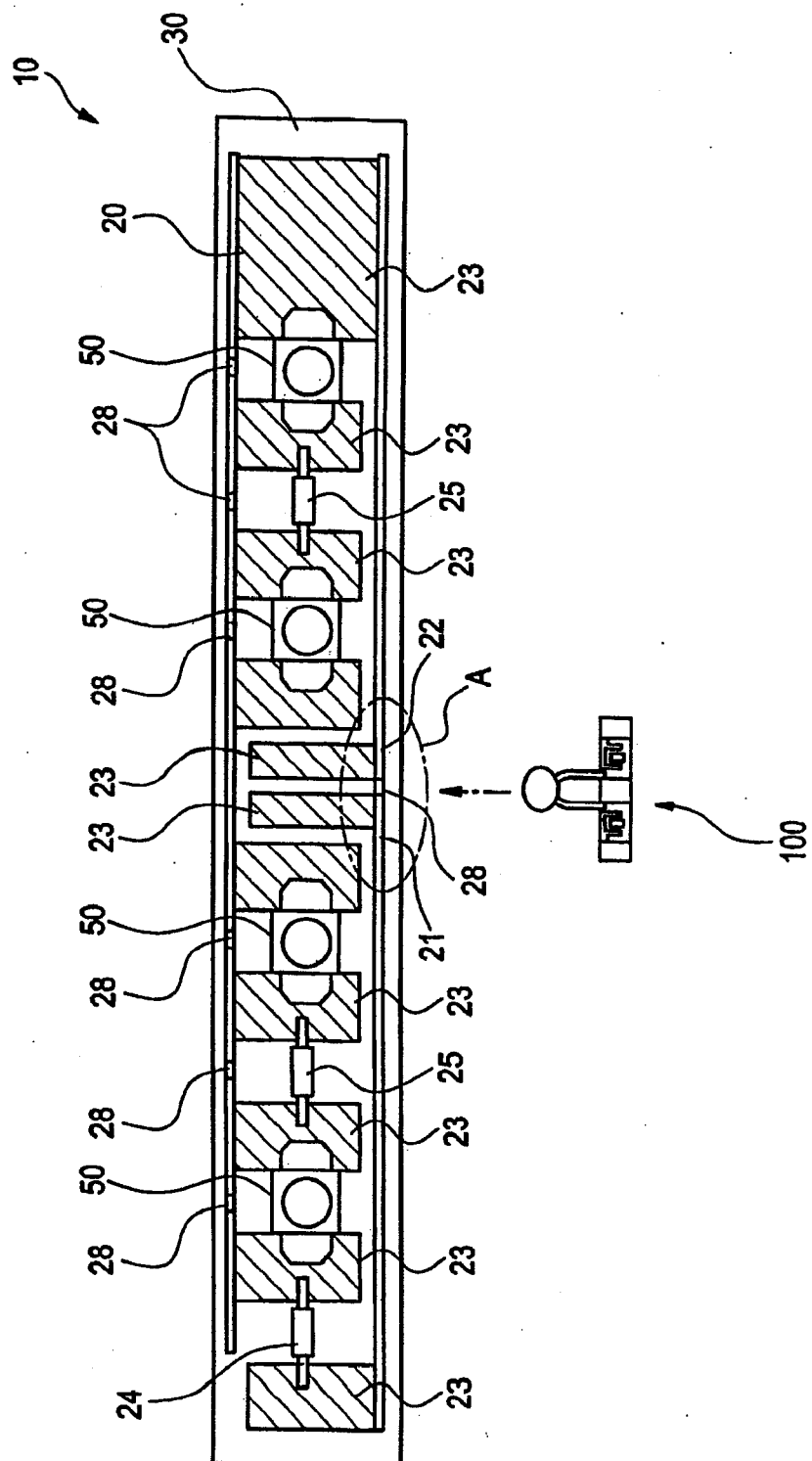


FIG. 3

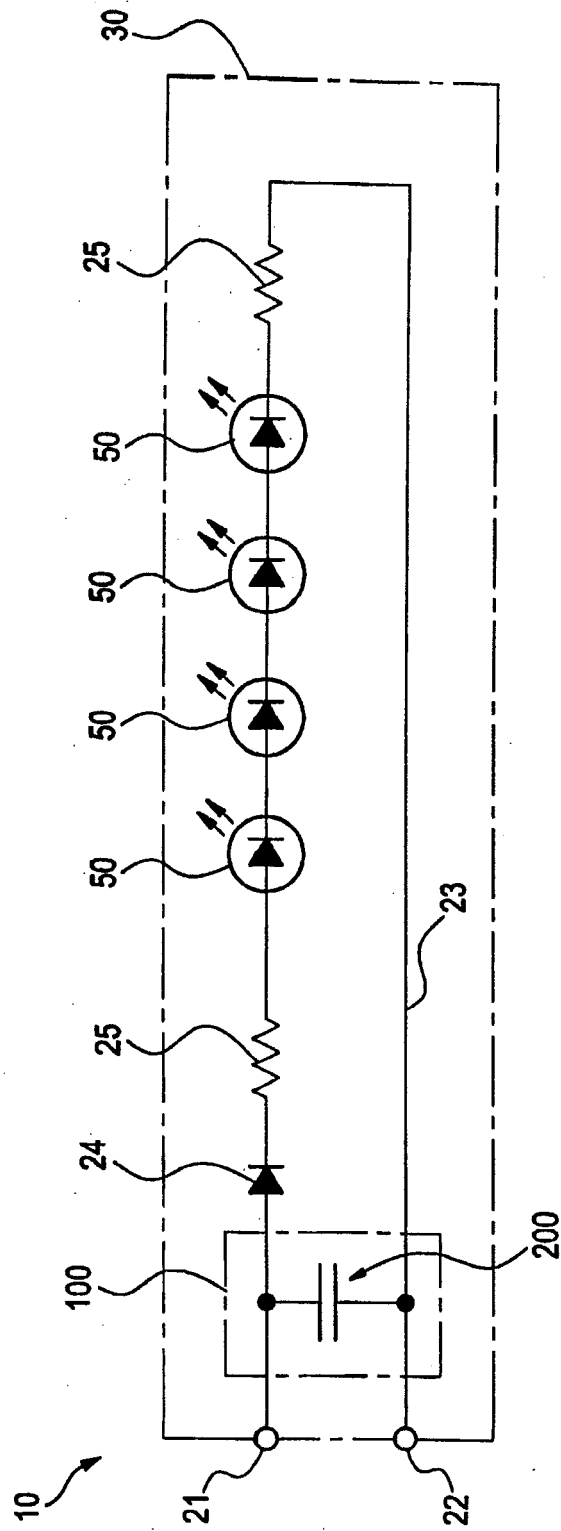


FIG. 4

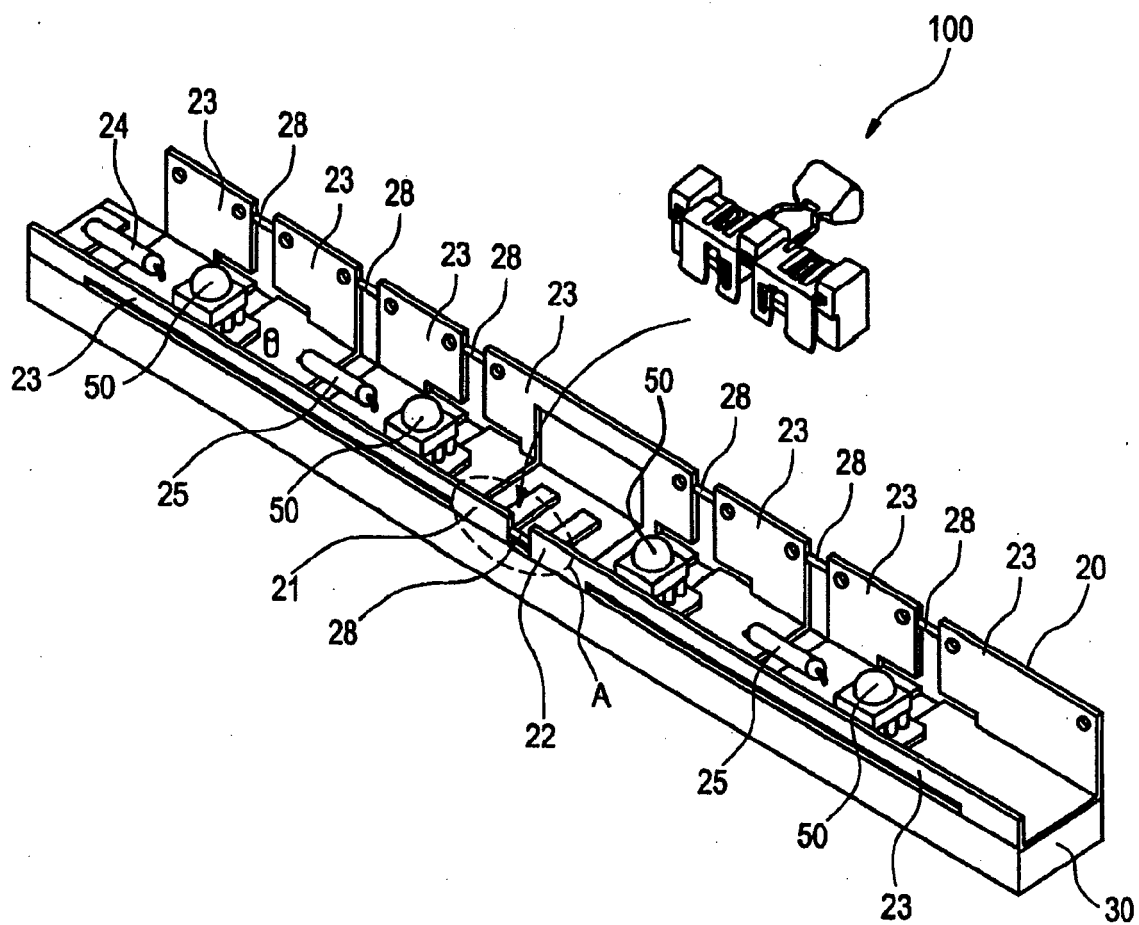


FIG. 5

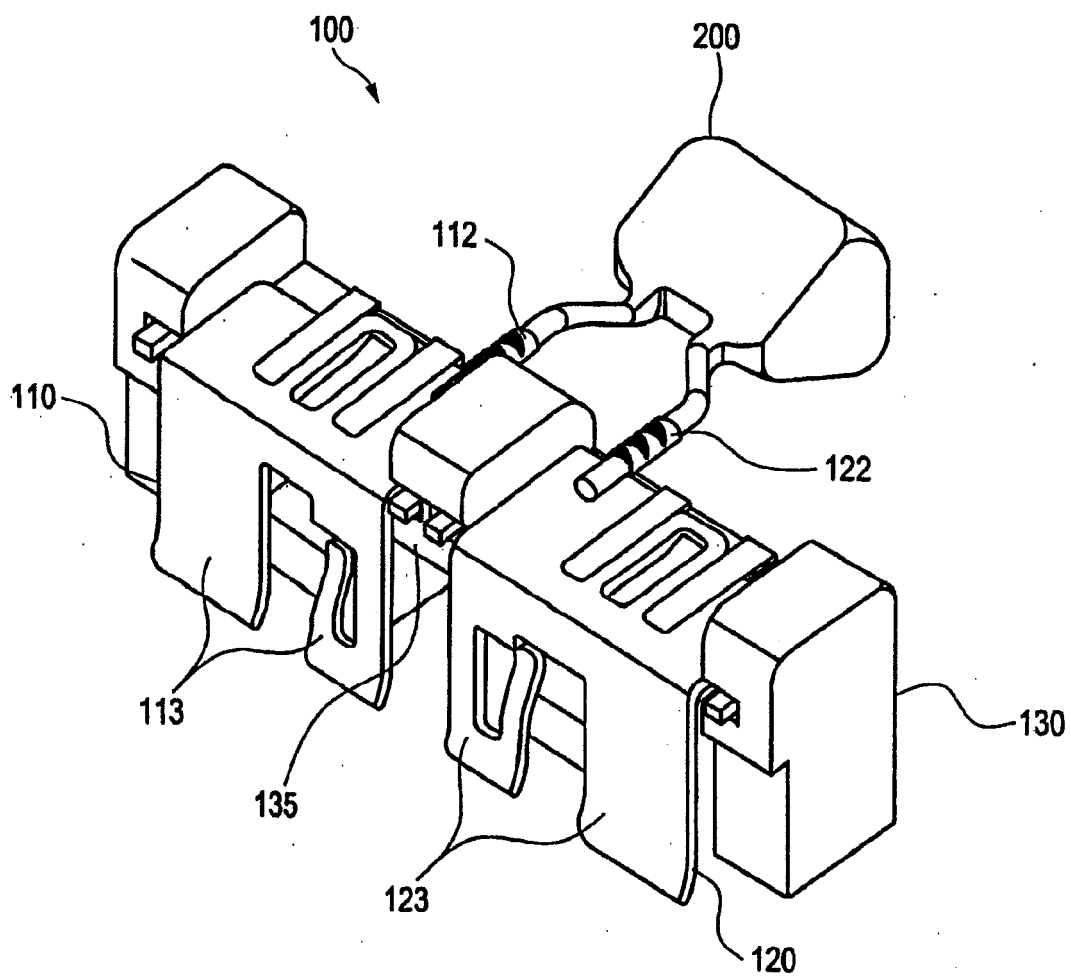


FIG. 6

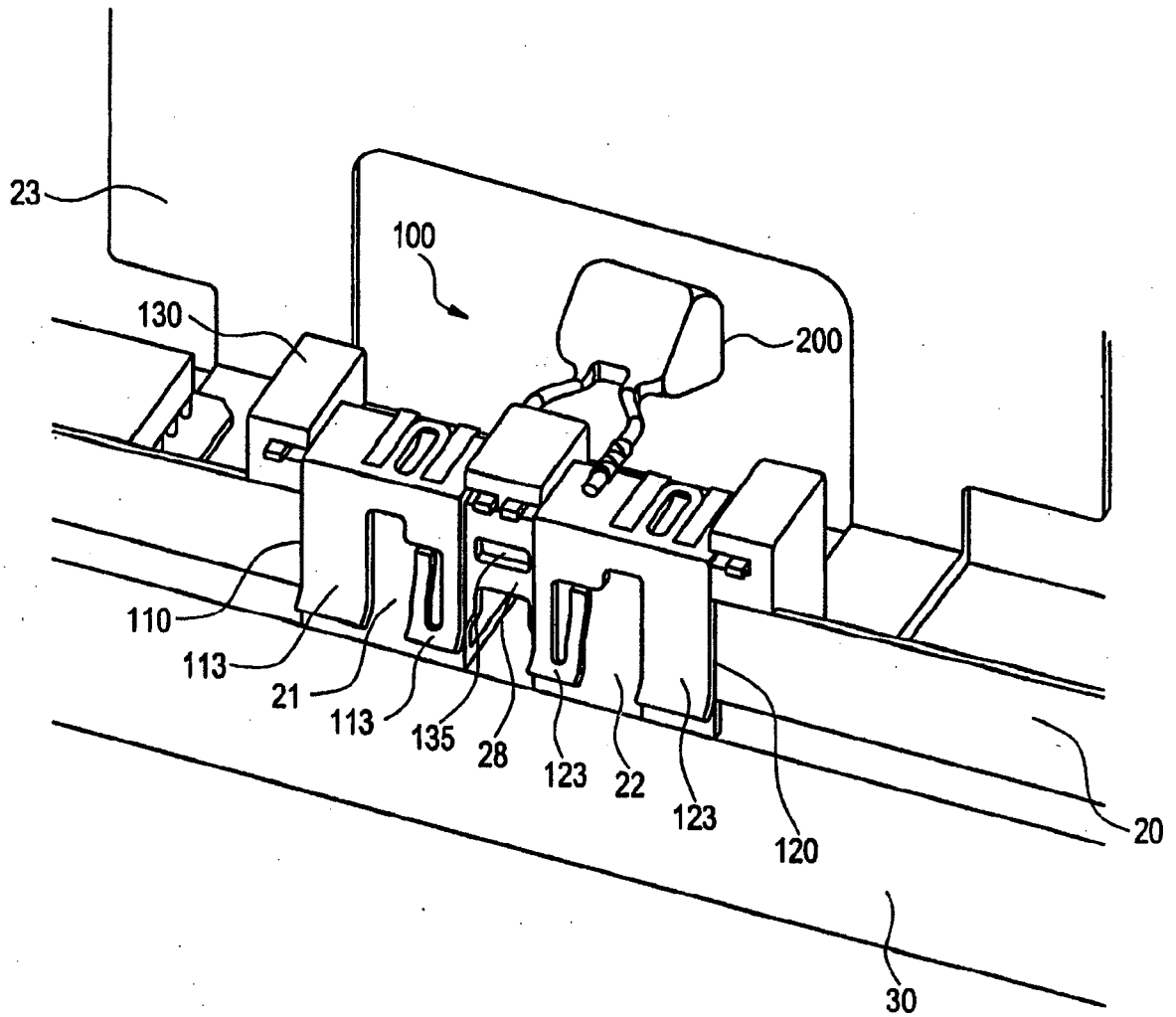
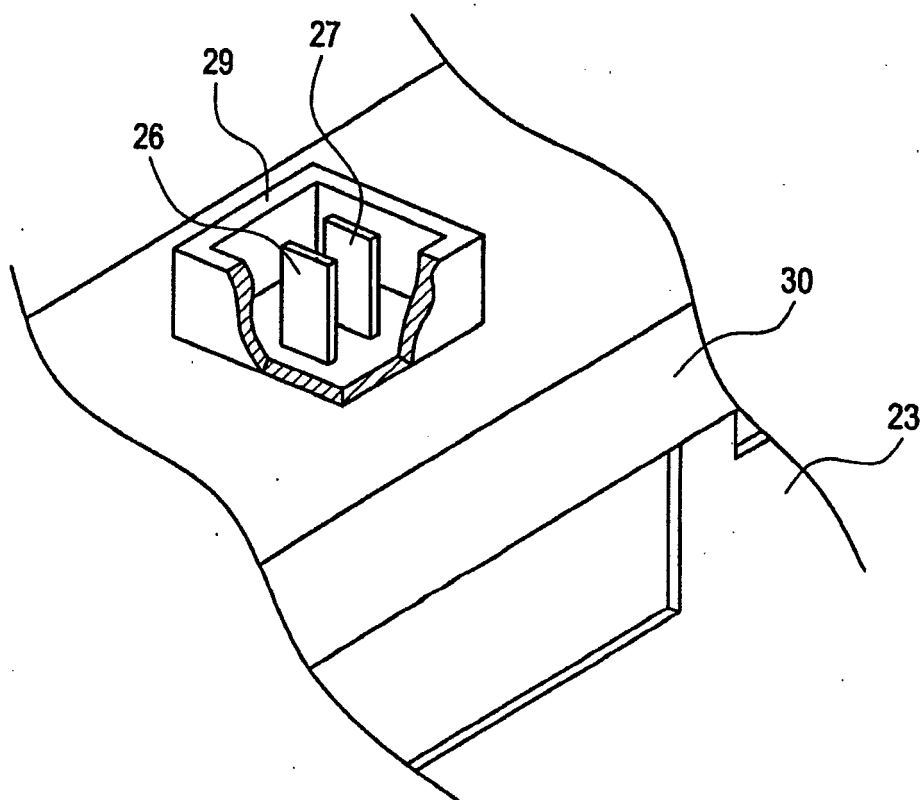


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2001063454 A [0002]