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(71)(72) Applicant and Inventor: SAVAGE, John, M., Jr. [US/US]; 538-B Via de la Valle, Solana Beach, CA 92075 (US).

(74) Agent: ROTH, W., Norman; Roth & Goldman, 523 West 6th Street, Suite 707, Los Angeles, CA 90014 (US).

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(54) Title: CIRCUIT COMPONENT STAND-OFF MOUNT

(57) Abstract

A stand-off device (10) to mount an electrical component, in stand-off relation to a horizontally extending circuit board (12), the component (11) having elongated lead structure (16-18), comprising a longitudinally vertically elongated body (30) having a supporting end portion (32) to support the component (11) remotely from the board (12), the body (30) having slot structure (33-36) extending from the end portion (32) to receive the lead structure (16-18); and deflectable retention structure (53-56) carried by the body in proximity to the slot structure (33-36) to be engaged and deflected by the lead structure (16-18), whereby the retention structure (53-56) frictionally retains the lead structure (16-18) in position in the slot structure (33-36) prior to attachment of the lead structure (16-18) to the circuit board (12).

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CIRCUIT COMPONENT STAND-OFF MOUNT

BACKGROUND OF THE INVENTION

This invention relates generally to stand-off devices for mounting electrical components, and more particularly to such devices which securely mount LEDs in stand-off relation to circuit boards.

There is great need for simple, effective, economical, and reliable apparatus to securely mount electrical components, such as LEDs on or to circuit boards. There is also need for devices of this nature which are capable of mounting LEDs or other components having different numbers of leads projecting toward the circuit board for electrical connection to circuitry on the board, and in the simple, effective manner as is now afforded by the present invention.

SUMMARY OF THE INVENTION

Basically the device of the invention comprises:

a) a longitudinally vertically elongated body having a supporting end portion to support the component remotely from the board, the body having slot means extending from the end portion to receive the lead means,

b) and deflectable retention means carried by the body in proximity to the slot means to be engaged and deflected by the lead means, whereby the retention means frictionally retains the lead means in position in the slot means prior to attachment of the lead means to the circuit board.

As will appear, the slot means typically comprises at least two slots extending lengthwise of the body; and examples are two, three and four such slots which extend in parallel relation. Further, the body advantageously may have a central elongated slot passage at the axis of the body which extends parallel to the slots. The slots are typically in the form of channels opening away from the body longitudinal axis.

Another object of the invention is to provide the retention means in the form of resiliently deflectable tab means. The tab means typically comprises tabs projecting toward the axis and into paths of reception of the lead means in the form of multiple leads when the leads are received into the slots for interference engagement with the leads tending to deflect the tabs. Also, the tabs may advantageously project in directions toward the axis and in longitudinal direction of lead reception in the slots; and the tabs may be integrally connected with body longitudinally elongated walls. Also, the tabs may have tips projecting

into the slots or channels, to be engaged by the leads.

Yet another object is the provision of a recess defined by the body supporting end portion, the recess receiving the electrical component, such as the lead frame of the LED, to seat the latter, the slot means intersecting the recess, the tab means longitudinally spaced from that recess. The seated component has leads, as referred to, which extend in the slots and into frictional engagement with the retention means, i.e., typically in the form of deflected tabs.

Yet another object is the mounting of the LED so that a central lead thereof passes through a central passage in the tubular body.

A further object is the provision of channels, as described, located in spaced, angular relation, i.e., at 0°, 90°, 180°, and 270° angularity about the stand-off body central axis.

A further object is to provide a method for spacing the base of an LED having leads from a circuit board, that include the steps:

a) providing a stand-off body having a main axis and being a generally tubular,

b) providing the body with first structure at one end thereof defining openings for passing LED leads to extend generally parallel to the axis, and to the board,

c) supporting the LED base at an end of the body in spaced relation to the board, and extending the leads through the openings,

d) and providing means associated with the structure frictionally engaging at least one of the leads proximate one of the openings, thereby to frictionally retain the LED in the mounted position, and to pre-position the leads for reception by the circuit board.

These and other objects and advantages of the invention, as well as the details of an illustrative embodiment, will be more fully understood from the following specification and drawings, in which:

DRAWING DESCRIPTION

Fig. 1 is a vertical elevation, partly in section, showing a stand-off device incorporating the invention, and with three leads projecting from an LED, and to a circuit board retained by the device;

Fig. 2 is an enlarged top plan view taken on lines 2-2 of Fig. 1;

Fig. 3 is a section taken on lines 3-3 of Fig. 2;

Fig. 4 is a bottom plan view taken on lines 4-4 of Fig. 3;

Fig. 5 is an enlarged fragmentary elevation showing the configuration of a tab as employed in Fig. 1;

Fig. 6 is an enlarged fragmentary section taken normal to the plane of Fig. 3 and showing a lead passing through a channel; and

Fig. 7 is a view like Fig. 1 but showing two leads extending through the stand-off device.

DETAILED DESCRIPTION

In Fig. 1, an upright, stand-off device 10 mounts an electrical component 11, in stand-off (spaced) relation, to a horizontally extending circuit board 12. The device or component may comprise an LED, as shown, having a base 14, light passing lens 15, and multiple (three) leads 16-18. The latter extend downwardly from the base 14 to the circuit board 12. Typically, the leads extend through board openings 16a--18a to connect, as via wave soldering at 16b--18b, to electrical circuitry. Accordingly, the leads retain the LED 11, and stand-off device 10, in mounted position, as shown, the lower end 10a of device 10 engaging the board top surface 12a.

As referred to, the device 10 comprises;

a) a longitudinally vertically elongated body having a supporting end portion to support the component remotely from the board, the body having slot means extending from the end portion to receive the lead means, such as leads 16-18;

b) and deflectable retention means carried by the body in proximity to the slot means, to be engaged and deflected by the lead means, whereby the retention means frictionally retain the lead means in position in the slot means prior to attachment of the lead means to the circuit board.

As shown, the device frame or body 30, typically consisting of insulation material, such as plastic, has an upper, flat surface 31, engaged by base 14, a recess 32, sunk in that surface (and into which a lead frame 70 may be received and seated at 71, as seen in Fig. 7). Slot means defined by the body takes the form, in the example, of four parallel channels 33-36 extending longitudinally and vertically, parallel to the body axis 42. The channels are located at angles 0°, 90°, 180°, and 270° about that axis, as seen in Figs. 2 and 4. The body also has a central bore 38 or passage, at axis 42, parallel to 33-36.

Such channels 33-36 and bore or passage 38 extend through the body, so as to receive leads from the LED; thus, up to four leads may extend through the body channels 33-36, and another central lead may extend through passage 38. See for example Fig. 1 showing leads 16 and 17 in opposite (0° and 180°) channels 33 and 35, and a central lead 18 in passage 38. Additional leads may extend channels 34 and 36.

Fig. 7 shows only the two lead configuration, i.e., lead 16 in channel 33 and lead 17 in channel 35.

The lead retention means, useful for pre-positioning the component and leads in and relative to the stand-off device, i.e., prior to lead connection to the circuit board, is shown in the form of four tabs 53-56 associated with channels 33-36, respectively. Note for example tapered tab 53 projecting in channel 33, and into position such that the tab reduced thickness end 53a projects into the path of lead 16 insertion endwise into channel 33, to interfere with the lead and to be deflected downwardly, as shown in Fig. 1. The tab two lateral edges 55b and 55c are molded integrally with channel walls, as at 35c and 35d, seen in Fig.6.

The tab 55 may be V-shaped in vertical radial section, as shown in Fig. 5, to enhance its flexibility at 55a, yet provide sturdy edge support for the tab. The flexible retention tabs projects toward axis 32, angularly and downwardly toward the circuit board, to be deflected downwardly by the leads, as the leads are inserted. Four such tabs are provided, one in each channel, near the bottom thereof, to accurately position the leads frictionally against the body walls 60, at the interior of the channels, as the leads are inserted. Therefore, the leads are pre-positioned axially and also normal to the body axis, i.e., slightly deflected radially against surfaces 60 at equal radial distances from axis 42, to be passed accurately and precisely through the lead openings in the circuit board, enabling more rapid and accurate assembly of the LEDs to the board, via LED leads which are to hold the LEDs and stand-off devices to the board as referred to.

The stand-off device can be made in sizes between .100 inch and 1.0 inch, for example.

CLAIMS

1. In a stand-off device to mount an electrical component, in stand-off relation to a horizontally extending circuit board, the component having elongated lead means, the combination comprising

a) a longitudinally vertically elongated body having a supporting end portion to support said component remotely from the board, said body having slot means extending from said end portion to receive said lead means,

b) and deflectable retention means carried by the body in proximity to said slot means to be engaged and deflected by the lead means, whereby the retention means frictionally retains the lead means in position in said slot means prior to attachment of the lead means to the circuit board.

2. The combination of claim 1 wherein said slot means comprises at least two slots extending in parallel relation and lengthwise of said body.

3. The combination of claim 2 wherein said slot means comprises one of the following:

i) two parallel slots
ii) three parallel slots
iii) four parallel slots.

4. The combination of claim 2 wherein the body has a central elongated axis extending parallel to said slots.

5. The combination of claim 2 wherein said slots are in the form of channels opening sidewardly away from said axis.

6. The combination of claim 4 wherein said retention means comprises resiliently deflectable tab means.

7. The combination of claim 6 wherein said tab means comprises tabs projecting toward said axis and into paths of reception of said lead means in the form of

multiple leads when the leads are received into said slots, for interference engagement with said leads tending to deflect the tabs.

8. The combination of claim 7 wherein at least some of said slots are in the form of channels opening toward said tabs.

9. The combination of claim 7 wherein said tabs project in directions toward said axis in the longitudinal direction of lead reception in the slots.

10. The combination of claim 7 wherein the body has longitudinally elongated walls with which said tabs are integrally connected.

11. The combination of claim 8 wherein said tabs have tips projecting into said channels to be engaged by said leads.

12. The combination of claim 1 wherein said supporting end portion defines a recess into which said component is received and seated, said slot means intersecting said recess, said tab means longitudinally spaced from said recess.

13. The combination of claim 1 including said component supported by said end portion, and including said component lead means extending in said slot means and in deflected and frictional engagement with said retention means.

14. The combination of claim 13 wherein said lead means comprise multiple elongated leads having side surfaces in engagement with said retention means which are in the form of lead deflected tabs.

15. The combination of claim 14 wherein the tabs are carried by walls defined by the body whereby the tabs project toward said channels.

16. The combination of claim 13 wherein said component comprises an LED.

17. The combination of claim 8 wherein another of said slots extends axially through said body.

18. The combination of claim 14 including said circuit board to which said body is connected via said leads.

19. In stand-off apparatus for spacing an LED having leads from a circuit board, the combination comprising:

a) a stand-off body having a main axis and being a generally tubular,

b) said body having first structure at one end thereof defining openings for passing LED leads to extend generally parallel to said axis, and to said board,

c) said body having second structure at the other end of the body for passing said LED leads, the LED body adapted to be supported by the body at tone of said ends, and in spaced relation to the board,

d) and positioning means associated with at least one of said structures for frictionally engaging said leads proximate said openings, thereby to frictionally retain the LED in said mounted position.

20. The combination of claim 19 wherein said last-named means comprises tab means slidably engageable with at least one of the LED leads.

21. The combination of claim 20 wherein said tab means include multiple tabs for engaging multiple of said leads.

22. The combination of claim 20 wherein said tab means is directed toward the path of reception of at least one LED lead through openings in said structures.

23. The combination of claim 21 wherein said tab means includes multiple tabs, each directed toward the path of one LED lead passing through the respective structures.

24. The combination of claim 19 including said LED mounted on said apparatus at one end thereof, and having multiple leads extending through openings in said

structures, at least one lead engaged by said positioning means.

25. The combination of claim 24 wherein the LED has an end face engaging one of said structures.

26. The combination of claim 25 wherein the LED also has a medial lead passing through said tubular body.

27. The combination of claim 26 wherein the leads engaged by said positioning means project externally of said body.

28. The combination of claim 19 wherein said openings are located at opposite sides of said axis.

29. The combination of claim 28 wherein there is an additional lead received in an opening or openings located on a circle passing through said openings at opposite sides of said axis, and located at approximately equal distances from said openings at opposite sides of said axis.

30. The combination of claim 29 wherein said openings are located in angular relationship, at angles 0°, 90°, 180°, and 270° about said axis.

31. The combination of claim 30 wherein said positioning means is also located at angular positions about said axis, and at angular spacing corresponding to said opening spacings.

32. The method of spacing the base of an LED having leads from a circuit board, that include the steps:

a) providing a stand-off body having a main axis and being a generally tubular,

b) providing said body with first structure at one end thereof defining openings for passing LED leads to extend generally parallel to said axis, and to said board,

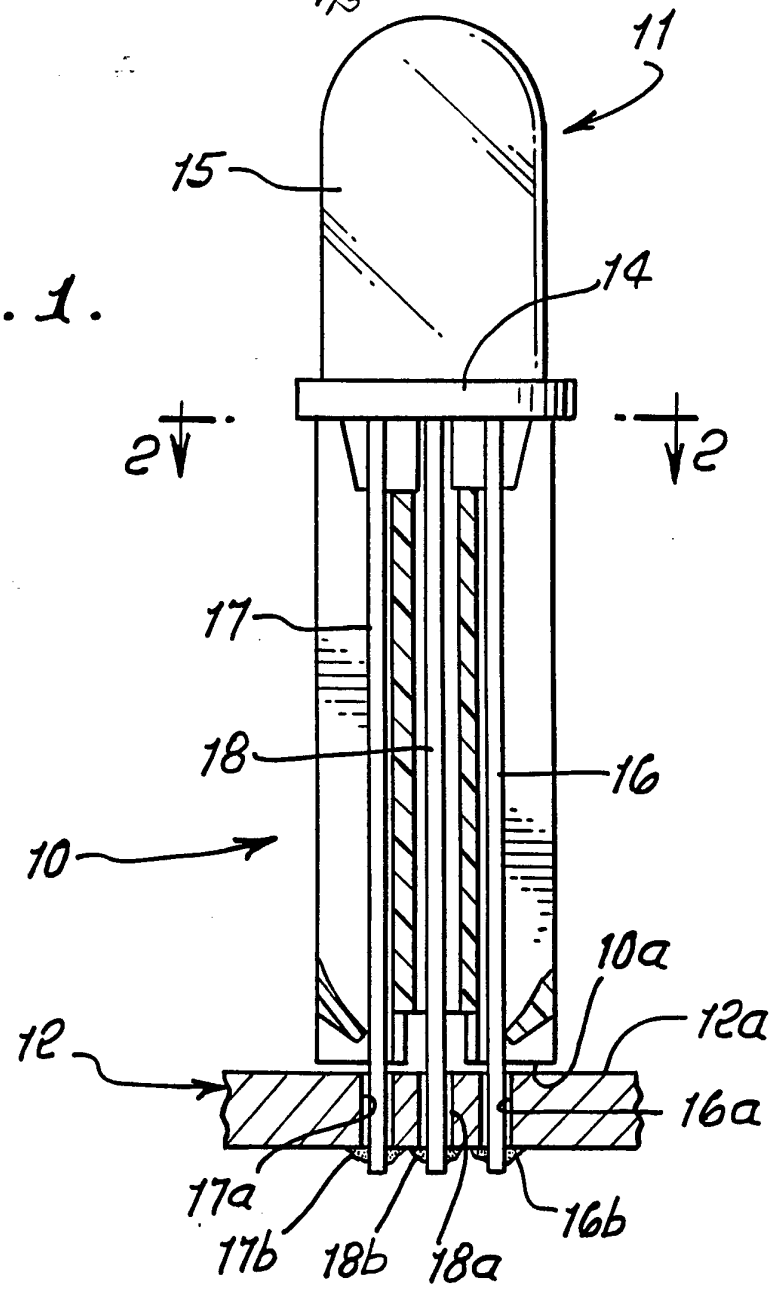
c) supporting said LED base at an end of said body in spaced relation to

the board, and extending said leads through said openings,

d) and providing means associated with said structure frictionally engaging at least one of said leads proximate one of said openings, thereby to frictionally retain the LED in said mounted position, and to pre-position said leads relative to said axis for reception by the circuit board.

33. The method of claim 32 wherein the board has pre-positioned through openings for the LED leads, and including passing said pre-positioned leads through said pre-positioned openings and attaching the leads to the board with an end of said body supported by the board.

FIG. 1.


11
15
14
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16
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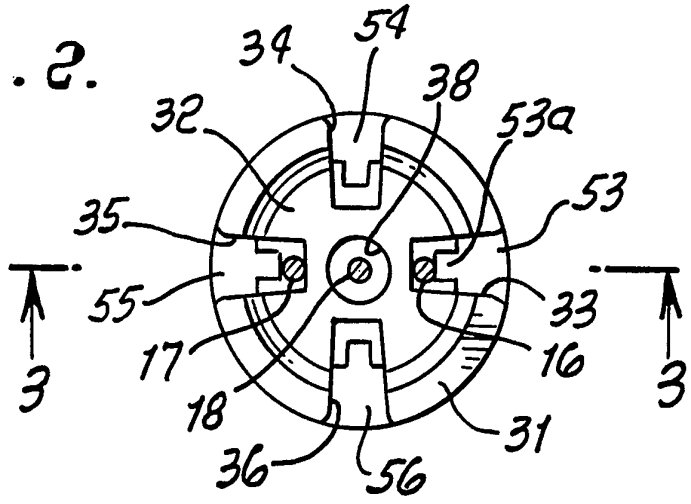
10a
12a
12
16a
17a
17b
18b
18a
16b

FIG. 2.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38
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53a
53
35
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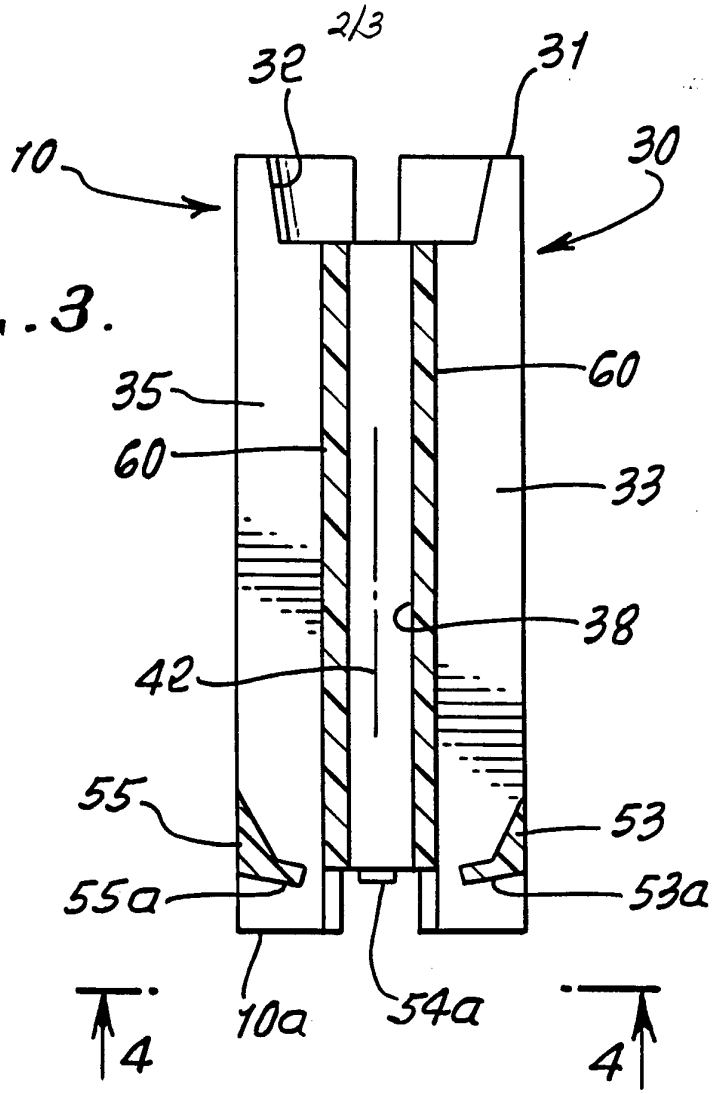
33
17
16
18
31
36
56
3
3

FIG. 3.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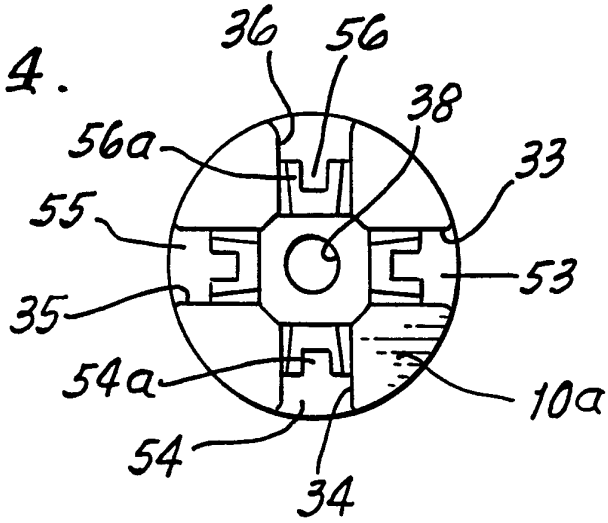
53
55a
53a
10a
54a
4
4

FIG. 4.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38
56a
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55
53
35
54a
10a
54
34

FIG. 5.

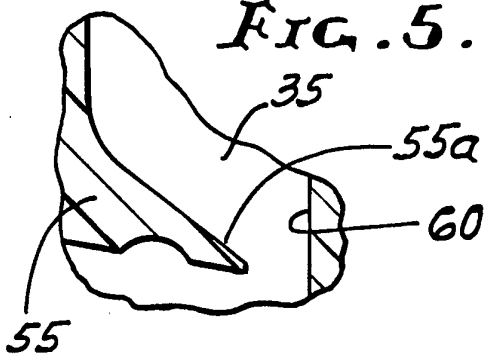


FIG. 7.

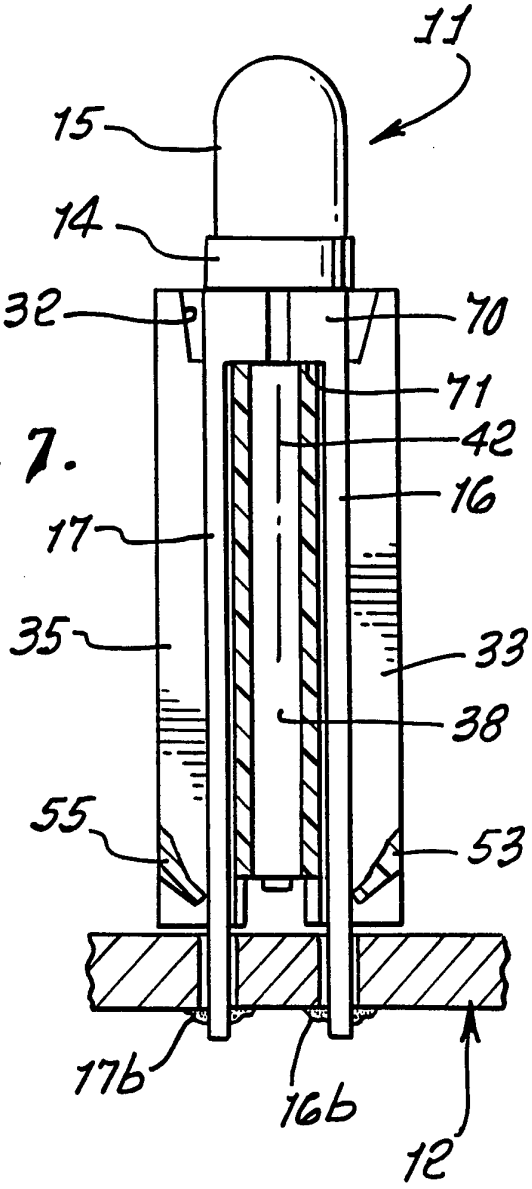
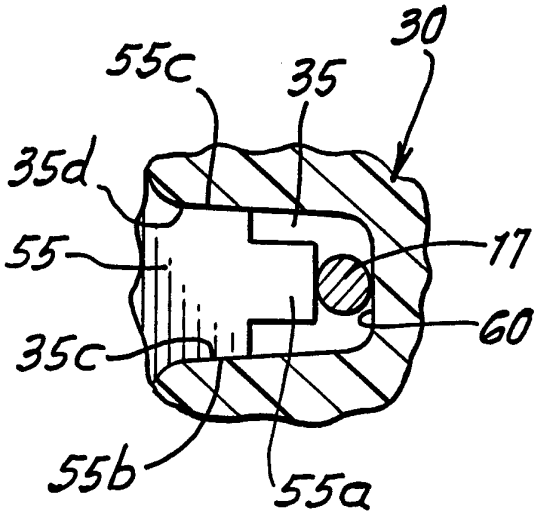


FIG. 6.



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/01841

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :H01B 17/00,
US CL :174/138G, 52.1, 52.2; 361/807, 809, 825; 439/56
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 174/138G, 52.1, 52.2; 361/807, 809, 825; 439/56

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB, A, 2,081,516 (Lang) 17 February 1982, see Figs. 5, 7 and 9	1-33
Y	US, A, 4,986,772 (Fukutani) 22 January 1991, see parts 17 and 17a in Figs. 4 and 6-13	1, 6-15, 19, 21-23 and 32
Y	US, A, 4,219,172 (Murayama) 26 August 1980, see Figs. 2, 4 and 5	1-4, 19, 28, 32 and 33
Y	US, A, 4,821,152 (Lorenzen) 11 April 1989, see Figs. 1-7	1-4, 19, 28, 32 and 33
Y	US, A, 3,184,536 (Vincent) 18 May 1965, see Figs. 2, 5, 7, 10 and 13	1-33
Y	US, A, Des 200,157 (Vincent) 26 January 1965, see Figs. 1-3	1-33

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 2,999,895 (Smith) 12 September 1961, see Figs. 1 and 3-7	1-33