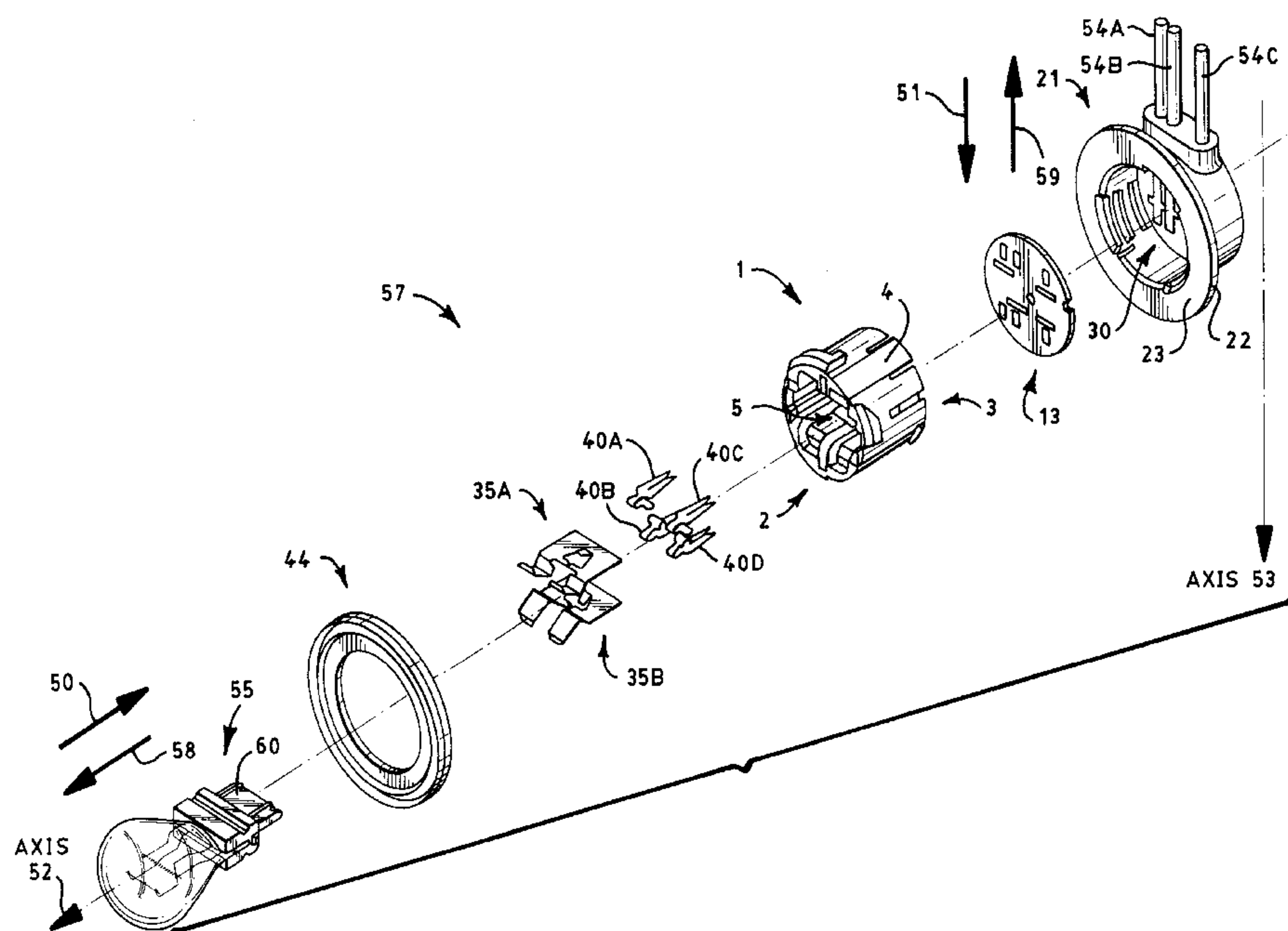




(72) KEY, EDWARD H., US
(72) BOYD, STEVEN M., US
(72) THOMAS, RONALD E., US
(72) WALKER, RICHARD P., US
(71) OSRAM SYLVANIA INC., US
(51) Int.Cl.⁷ H01R 33/00
(30) 1999/06/04 (60/137,554) US
(30) 2000/04/13 (09/548,508) US
(54) **DOUILLE**
(54) **SOCKET ASSEMBLY**



(57) An angled lamp socket includes a body and a housing. The body contains therein opposing lamp retaining clips and a plurality of IDC contacts. The housing contains a plurality of holes to receive wire leads. The housing also contains a housing disc. The bottom portion of the IDC contacts are connected electrically to the wire leads and the top portion of the IDC contacts are connected to the lamp. When a lamp is inserted into the socket body, the horizontal axis of the lamp will extend at an angle in relation to the wire leads. In a preferred embodiment, such an angle is 90° thereby providing a right angle lamp socket.

ABSTRACT

An angled lamp socket includes a body and a housing. The body contains therein opposing lamp retaining clips and a plurality of IDC contacts. The housing contains a plurality of
5 holes to receive wire leads. The housing also contains a housing disc. The bottom portion of the IDC contacts are connected electrically to the wire leads and the top portion of the IDC contacts are connected to the lamp. When a lamp is inserted into the socket body, the horizontal axis of the lamp will extend at an angle in relation to the wire leads. In a preferred embodiment, such an angle is 90° thereby providing a right angle lamp socket.

Socket Assembly

This application claims priority from Provisional Application S.N. 60/137554 filed June 4,
5 1999.

TECHNICAL FIELD

The present invention relates to a lamp socket, more particularly to an insulation displacement connector (IDC) wedge base angled lamp socket for a wedge based lamp used
10 in a lighting module of a motor vehicle. This angled lamp socket of the present invention is particularly useful in front and rear automobile directional and safety lighting.

BACKGROUND ART

The need for a lamp socket wherein the horizontal axis of the lamp inserted therein extends
15 in one direction and the terminals of the lamp socket extend in another direction and at an angle thereto is well known. Such a lamp socket is herein referred to as an angled lamp socket. One such angled lamp socket is referred to in the lamp industry as a right angle lamp socket. In such a lamp socket, the horizontal axis of the lamp and the terminals of the lamp socket are orientated at 90° relative to each other.

20

It is presently known to provide an angled lamp socket that is satisfactory for use in motor vehicle applications. Examples of such angled lamp sockets are illustrated in U.S. Pat. Nos. 5,197,187 and 5,411,407 (these patents are commonly owned with the instant application and are incorporated herein by reference). Another example is illustrated by Application S.N.:
25 09/260,253 filed March 2, 1999, (this application is presently assigned to the assignee of the present invention and is hereby incorporated by reference). However, such lamp sockets with wire leads require that the wires be stripped and terminals be crimped to them. These wires with crimped terminals are then either separately or together, as part of a connector, plugged into the terminals which contact the lamp. This requires additional terminals and an
30 additional set of mating interfaces, resulting in both increased cost and decreased reliability.

DISCLOSURE OF THE INVENTION

It is an object of the present invention to obviate the disadvantages of the prior art.

It is an object of the present invention to provide an improved angled lamp socket.

It is an object of the present invention to provide an angled lamp socket that is less costly to fabricate than those heretofore provided.

5

It is an object of the invention to make a more reliable angled lamp socket by effectively connecting the socket wire leads directly to the same terminals that actually make contact with the lamp.

10 It is an object of the present invention to provide a more reliable angled lamp socket by using IDC contacts to engage the lead wires thereby eliminating the need for welding in the socket housing.

15 It is a further object of the present invention to provide an angled lamp socket having improved life expectancy.

It is another object of the present invention to provide an improved method for assembling the angled lamp socket of the present invention.

20 This invention achieves these and other objectives by providing an angled lamp socket that comprises a body having a housing attached thereto. At least one lamp retaining member is provided within the body and is structured to retain a lamp that has a longitudinal lamp axis, such that the lamp axis will extend in a first direction when the lamp is inserted into the body.

A plurality of "U" shaped IDC contacts is provided such that at least a portion of each is in
25 the socket body with a portion extending beyond the bottom of the body. A socket housing disc, containing a plurality of slits to receive the portion of the IDC terminals protruding below the socket body, will be placed into the housing. The disc will contain a plurality of small finger-like projections on the rear of the disc that will place a normal force on wire leads placed into the housing. The disc will also contain a center post to help secure the disc
30 in the housing and a plurality of holes through which molded projections from the bottom of the body will go to place strain relief on the wires. The housing contains a plurality of holes through which wires will be inserted. The floor of the housing will contain a plurality of grooves in which the wires will sit as they are inserted into the housing. These wires will be inserted in a second direction which will be at an angle to the first direction. Each wire will

be fed through a hole into the housing where it will be held in place by the finger-like projections of the housing disc to prevent easy removal of the wires. The IDC terminals, securely located in the body and guided by the slits in the housing disc, terminate the wires at the same time that molded projections from the rear of the socket body put strain relief on the wires. A method for assembling an angled lamp socket is also provided.

BRIEF DESCRIPTION OF THE DRAWINGS

This invention may be clearly understood by reference to the attached drawings in that like reference numerals designate like parts and in that:

FIG. 1 is an exploded view of an angled lamp socket in accordance with one embodiment of the present invention with a lamp shown but not attached;

FIG. 2A is a perspective view of the body of the lamp socket in bottom plan;

FIG. 2B is a perspective view of the body of the lamp socket in top plan;

FIG. 3 is a top perspective view of the housing disc;

FIG. 4 is a top perspective view of the housing;

FIG. 5 is a cross section of the completed lamp socket showing the housing disc center post engagement of the housing;

FIG. 6 is another cross section of the completed invention showing the strain relief placed on the wire leads by the molded plastic protrusion on the rear of the body;

FIG. 7 is a front view of the completed lamp socket and non-attached lamp;

FIG. 8 is a perspective view of a lamp retainer clip; and

FIG. 9 is a perspective view of an IDC contact;

BEST MODE FOR CARRYING OUT THE INVENTION

For a better understanding of the present invention, together with other and further objects, advantages and capabilities thereof, reference is made to the following disclosure and appended claims taken in conjunction with the above-described drawings.

5

The embodiment of this invention that is illustrated in the drawings is particularly suited for achieving the objects of this invention. FIG. 1 illustrates a lamp socket 57 embodying the present invention. Lamp socket 57 provides a three piece insulator that is in the form of first, second and third slidably engaging components including a body 1, a housing disc 13, and
10 a housing 21. As will be apparent herein, the three-piece insulator simplifies design and assembly of the lamp socket. The body component includes a body cavity 5 that extends in a direction 50 of axis 52.

The housing disc 13 (Fig. 3) contains a plurality of slits 16A, B, C and D. These slits receive
15 the bottom portion 42 of the IDC contacts 40A, B, C and D (shown in Fig. 9) guiding them to a position just above the wire leads 54A, B and C at an approximate distance of 5.3 mm.

The housing 21 includes a cavity 30 that opens in direction 58 of axis 52 and a plurality of holes 29A, B and C, the holes extending in the direction 59 of axis 53. The axis 52 extends
20 at an angle to the axis 53. In the preferred embodiment illustrated in FIG. 7, the angle is 90°, and the angled lamp socket is a right angle lamp socket. The body and the housing disc are connected to the housing as described hereinafter.

The lamp socket 57 includes two lamp-retaining members in the form of a first resilient
25 retention member 35A and an opposite second resilient retention member 35B. In a preferred embodiment, the resilient retention members are metal, although other materials may be used. Retention members 35A and 35B are structured and arranged for insertion into the body cavity 5 to retain a wedge-like base 60 of a lamp 55, such as a conventional S8 wedge base lamp, so that the lamp longitudinal axis 52 extends in the first direction 50 when the lamp
30 is inserted in the body cavity.

The lamp socket 57 includes a plurality of IDC contacts 40A, B, C and D, in the body cavity 5. In a preferred embodiment each IDC contact is "U" shaped, although other shapes may be used. Each IDC contact 40 includes a top end 41 and a bottom end 42. The top end 41

faces the front end 2 of the body 1 and is adapted to engage a respective lead 56 of lamp 55.

The bottom end 42 extends out of the body 1 at the rear end 3 of said body and is adapted to terminate a wire lead.

- 5 The lamp socket includes wire leads 54A, B and C, which are inserted into the holes 29 A, B and C in the housing 21. Each wire lead is inserted into a hole in the housing and is guided by a groove 24 in the floor of the housing to its final position.

10 In a preferred embodiment, the housing disc 13 is snapped into the housing cavity 30 in the first direction. The body 1, containing the lamp retention members 35A and 35B and the IDC contacts 40A, B, C and D, is snapped into the housing cavity 30 at a position where the bottom portion 42 of the IDC contacts 40 is approximately 5.3 mm from the termination point of the wire leads 54. Wire leads 54A, B and C, are inserted into the holes in the housing in the second direction. The wire leads deflect up finger-like projections (not shown)
15 on the rear of the housing disc 13, these finger-like projections exerting a normal force on the wire leads 54A, B and C, to prevent easy removal of said wire leads. A force is exerted on the front of the body 1 in the first direction. As the body snaps down into the housing cavity 30, the bottom portion of the IDC contacts 42A, B, C and D, pass through the slits 16A, B, C and D, in the housing disc 13 and terminate the wire leads 54A, B and C, providing an
20 electrical connection. As illustrated in FIG. 4, the bottom portion of the IDC contacts engage detents 25 in the floor 32 of the housing 21 upon termination of the wire leads 54. Simultaneously, molded protrusions 7A, B and C, on the rear of the body 1 pass through holes 17A, B and C, in the housing disc 13 and engage the wire leads 54A, B and C, providing strain relief on said wire leads.

25

FIG. 2 shows the body 1 with rear portion 3 having a plurality of molded projections extending in direction 50 of axis 52. Apertures 10A, B, C and D, on the rear 3 of the body 1 allow the bottom 42 of each IDC contact member 40A, B, C and D, to extend below the body. A notch 12 on one side of the body 1 contacts a vertical rib 28 on the interior wall
30 surface 61 of the housing cavity 30 helping guide the body into its proper position in the housing cavity. Detents 8 and 9 on the outside surface 4 of the body 1 engage ribs 26 and 27 on the interior surface of the housing cavity 21 securing the body in said housing. Slots 11A, B, C and D, in the front of the body cavity 5 receive the lamp retention members 35A and 35B securing them in the body cavity.

FIG. 3 shows the housing disc 13 with slits 16A,B,C and D to receive the bottom portion 42 of the IDC contact members 40. Holes 29A, B and C, (see Fig. 4) receive the molded projections 7A, B and C, extending from the rear 3 of the body 1 and the top view of the finger-like projections (not shown) that extend from the rear 15 of the housing disc 13, the finger-like projections providing a normal force on the wire leads 54A, B and C, inserted into the housing thereby preventing easy removal of said wire leads. A notch 20 on the side of the housing disc contacts a vertical rib 28 on the inside surface of the housing cavity 30 helping to guide the disc into position. The center post 18 (see Fig. 5) on the rear of the housing disc engages a detent 34 (see Fig. 5) in the floor of the housing 21. The disc snaps into position engaging rib 27 on the inside surface of said housing.

FIG 4 shows the housing 21 with a cavity 30 extending in direction 58 of axis 52 and a plurality of holes 29A,B, and C extending in direction 59 of axis 53 through which wire leads 54A, B and C, are inserted. The wire leads 54A, B, and C, are guided into place by grooves 24 in the floor of the housing 21. Vertical rib 28 aligns with the notch 20 on the housing disc 13 as it is snapped into the housing cavity 30. Rib 27 (not shown) holds the housing disc in place. In the initial position, rib 26 engages detent 8 on the body's outside surface 4 so that the IDC contact members 40A, B, C and D, are positioned just in the slits 16A, B, C and D, of the housing disc 13 at a position approximately 5.3 mm from the wire leads 54A,B and C. The surface 23 of the flange 22 receives the annular seal 44 and the inside surface of the flange 49 engages the outside surface 4 of the body 1.

FIG. 5 shows a cross section of the completed lamp socket 57. The body 1, containing lamp retention members 35A and 35B, is snapped into the housing 21. The housing disc 13 has center post 18 which engages a detent 34 in the floor 32 of the housing 21. The annular seal 44 engages the front surface 23 of the flange 22. IDC contacts 40A, and C, engage the lamp terminals (not shown) creating an electrical connection.

FIG. 6 shows a cross section of the completed lamp socket 57. A wire lead 54 is placed into a hole 29 of the housing 21 at the second direction. The wire lead is guided by a groove 24 in the floor 32 of the housing deflecting up a finger-like projection 19 on the rear of the housing disc 13 preventing the wire lead from being easily removed.

A force is exerted on the body 1 in the first direction. The bottom portion 42 of an IDC contact 40A passes through one of the slits 16 in the housing disc 13 and terminates the wire lead 54 while a molded projection 7 from the rear of the body 1 passes through a hole 17 in the housing disc 13 and engages the wire lead 54 providing strain relief. As a result of the force applied to the front of the body 1, ribs 26 and 27 located on the inside surface 61 of the housing 21, engage notches 8 and 9, located on the outside surface 4 of the body 1, securing the body inside the housing.

FIG. 7 shows a completed angled lamp socket 57 with a lamp 55 not attached. In a preferred embodiment the lamp 55 is inserted into the lamp socket body 1 in a first direction and is held in place by lamp retention members 35A and 35B. Angled portions 37 of the lamp retention members 35 engage the lamp base 60 thereby securing the lamp in the body cavity 5. Wire leads 54A, B and C, extend from the housing in the second direction thereby creating an angled lamp socket. The lamp terminals 56 contact the top portion 41 of the IDC contacts creating an electrical connection between the lamp and the IDC contacts. The bottom portion 42 of the IDC contacts terminate the wire leads 54A, B and C, as shown in Fig. 6, providing an electrical connection between the IDC contacts and the wire lead. This allows the lamp terminals 56 to be electrically connected to the same IDC contacts 40A, B, C and D, that terminate the wire leads 54A, B and C, eliminating welding in the housing and the need for additional sets of contact members.

FIG. 8 shows a lamp retainer clip 35 with a bottom portion 38 and a small finger projection 39 which holds the retainer clip in the body cavity 5 when said small finger projection 39 contacts a detent in the body cavity. Top portions 36 contain an angled bend 37 which, when placed in the body cavity 5 secure the lamp 55.

FIG. 9 shows a U-shaped IDC contact 40. The top portion 41 engages the leads 56 of the lamp 55 thereby creating an electrical connection. The IDC contact also contains shoulders 43 which engage portions of the body cavity 5 to keep the IDC contact in place. The bottom portion 42 of the IDC contact 40 is shaped so as to allow it to terminate a wire lead 54 by cutting through the insulation and engaging the copper wire thereby creating an electrical connection.

Thus there is provided an angled lamp socket that is economical to fabricate. The need for

welding, with its concomitant contamination, is eliminated. Further, the number of contacts is minimized by utilizing the socket wire-lead contact as a direct connection to the lamp.

5 While there have been shown and described what are at present considered the preferred embodiments of the invention, it will be apparent to those skilled in the art that various changes and modifications can be made herein without departing from the scope of the invention as defined by the appended claims.

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS.**

5

1. An angled lamp socket, comprising:

a body having a front end and a rear end;

10

a housing disc having a front end and a rear end, said front end being attached to the rear end of the body;

a housing attached to said housing disc at said rear end;

15

at least one lamp retaining member within said body and structured and arranged to retain a lamp having a longitudinal lamp axis inserted into said body at the front end such that said longitudinal lamp axis of said lamp will extend in a first direction when the lamp is inserted in the body;

20

a plurality of IDC contacts at least a portion of each that is in the body, each IDC contact capable of terminating a wire lead; and

a plurality of holes in the housing at a second direction, said second direction being at an angle to the first direction.

25

2. An angled lamp socket, comprising;

a body having a body cavity extending in a first direction of a first axis from a front end to rear end;

30

a housing disc having a plurality of slits capable of receiving the bottom portion of at least one IDC contact;

a housing having a housing cavity extending in the first direction and a plurality of holes extending through said housing in a second direction such that the second direction is at an angle to said first direction;

5 at least one lamp retaining member at least a portion of which is in said body cavity, said lamp retaining member being structured and arranged to retain a lamp having a longitudinal lamp axis to be inserted in said body cavity at said front end such that said longitudinal lamp axis of said lamp will extend in said first direction when said lamp is inserted in said body cavity; and

10

a plurality of IDC contacts such that a portion of each IDC contact is in the body cavity and a portion of each IDC contact extends below said body cavity and is capable of terminating a wire lead;

15 3. The angled lamp socket of claim 2 wherein each IDC contact comprises a bottom portion capable of terminating a wire and creating an electrical connection.

4. The angled lamp socket of claim 2 wherein the body cavity comprises at least one detent, and each IDC contact comprises a projection that engages a detent and each projection
20 being structured and arranged to maintain alignment of said IDC contact during its termination of a wire lead.

5. The IDC contact of claim 4 wherein said IDC contact comprises a top portion capable of engaging a lead from a lamp and creating an electrical connection.

25

6. The angled lamp socket of claim 2 wherein the housing further comprises grooves on the floor of the housing capable of guiding wire leads.

7. The angled lamp socket of claim 2 wherein the housing cavity extending in the first
30 direction comprises a flange, and further including an annular seal through that the body extends, said annular seal being structured and arranged to have a first surface that sealingly engages said flange, and a second surface that sealingly engages an outer surface of said body, in a use mode of said angled lamp socket.

8. The angled lamp socket of claim 2 wherein the housing further comprises at least one rib which engages the housing disc when said disc is inserted into said housing cavity.

9. The angled lamp socket of claim 2 wherein said housing disc further comprises a molded post on the rear side of the disc that engages a detent in the housing when the disc is snapped into said housing.

10. The housing disc of claim 9 wherein said rear of said housing disc further comprises plastic molded finger-like projections capable of placing a normal force on a wire lead.

10

11. The angled lamp socket of claim 2 wherein the rear of said body further comprises a plurality of molded projections capable of placing a force on a wire lead to provide strain relief.

12. A method for assembling an angled lamp socket of the type wherein a longitudinal lamp axis of a lamp to be inserted into the front end of an angled lamp socket will extend at an angle to a plurality of wire leads to be placed into the housing, comprising the steps of:

inserting the housing disc into the housing such that said housing disc snaps into said housing with the molded post on the rear surface of said housing disc contacting the rear portion of said housing; and

inserting a plurality of IDC contacts into the body cavity such that a contact lead surface of each IDC contact extends away from the front of said body and a bottom portion of each IDC contact member extends below the rear of said body;

13. The method of claim 12 further including the step of attaching the body to the housing.

14. The method of claim 13 wherein the body is of the type wherein said body cavity comprises a front end into which a lamp may be inserted and an opposite rear end, said step of inserting a portion of said body into the housing cavity comprising the step of snapping said rear end of said body into the housing cavity such that said rear of said body snaps into place in said housing such that the bottom of the IDC contacts are approximately 5.3mm

from the wire leads.

15. The method of claim 12 further including the step of sealing said IDC contact members within the housing.

5

16. The method of claim 15 wherein the housing is a type that includes a flange adjacent to said housing cavity, and an annular gasket, and further including the step of inserting said portion of said body through said annular gasket before the step of inserting said portion of said body into said housing cavity.

10

17. The method of claim 12 further including the step of inserting wire leads into the apertures in the housing.

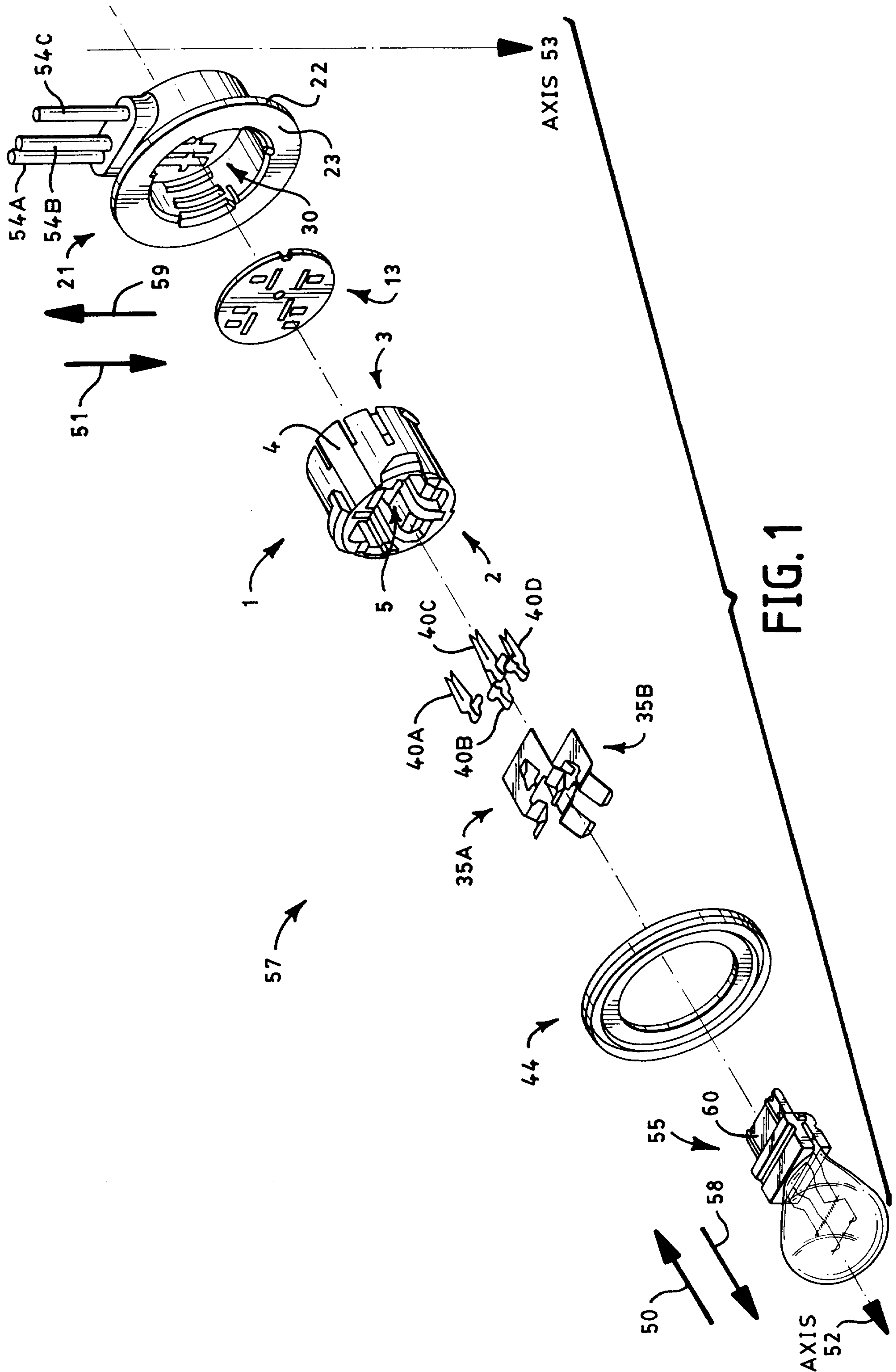
18. The method of claim 17 further comprising the step of inserting a plurality of wire leads into the holes in the housing in a second direction that is at an angle to the first direction, said wire leads entering the housing and being guided by said grooves in the bottom of said housing and deflecting said finger-like projections protruding from the rear of the housing disc such that said finger-like projections exert a normal force on said wire leads providing resistance against easy removal of said wire leads.

20

19. The method of claim 12 further including the step of terminating the wire leads with the IDC Lamp contact members.

20. The method of claim 19 further comprising the step of exerting a force on the body in the first direction causing said body to snap further into the housing such that the rear portion of the body makes contact with the front of the housing disc, the IDC contacts pass through the slits in said housing disc and terminate the wire leads creating an electrical contact, and the plastic molded portions protruding from the rear of said body pass through the holes in said housing disc and engage the wire leads to provide strain relief on said wire leads.

30



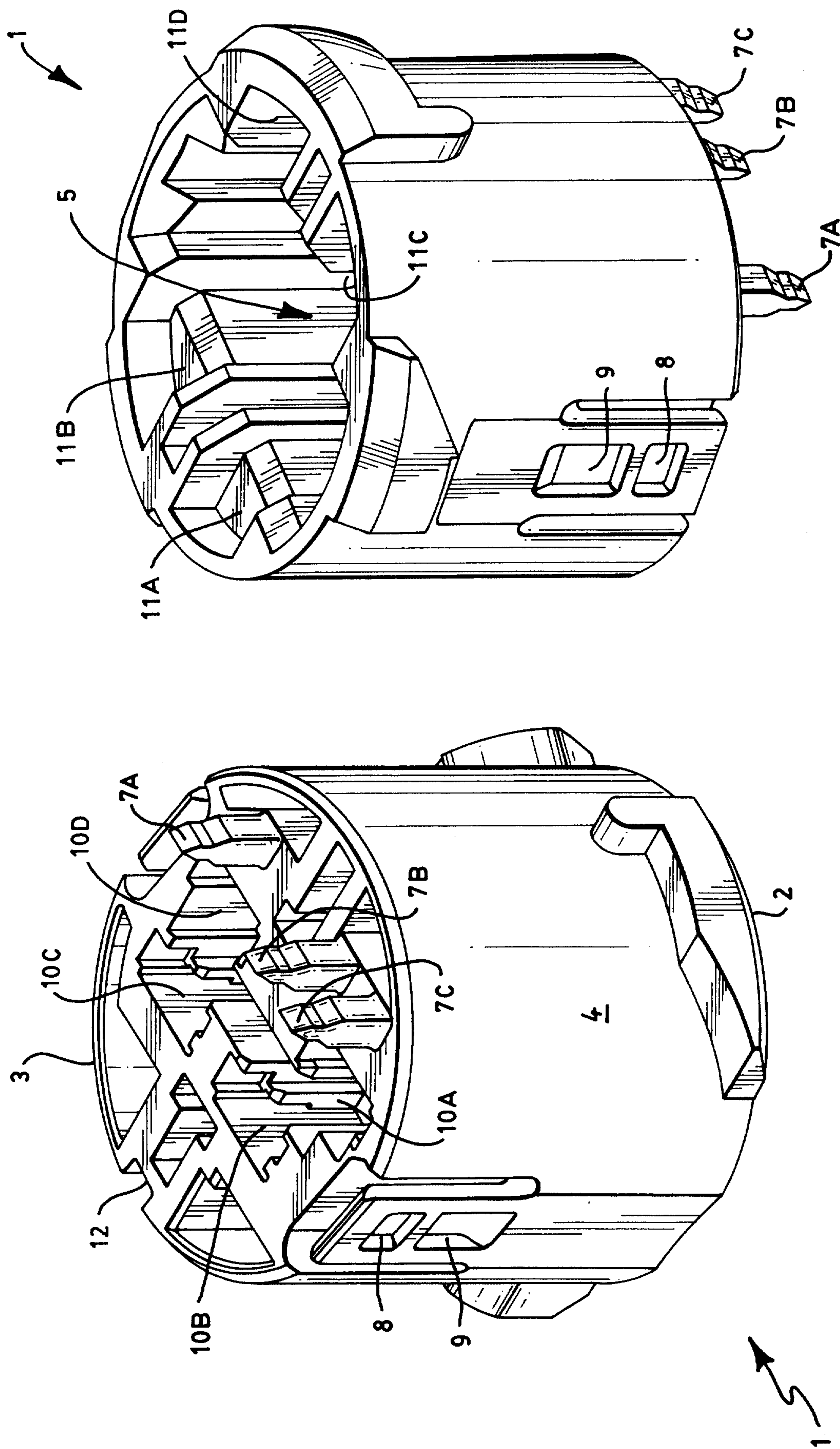


FIG. 2A

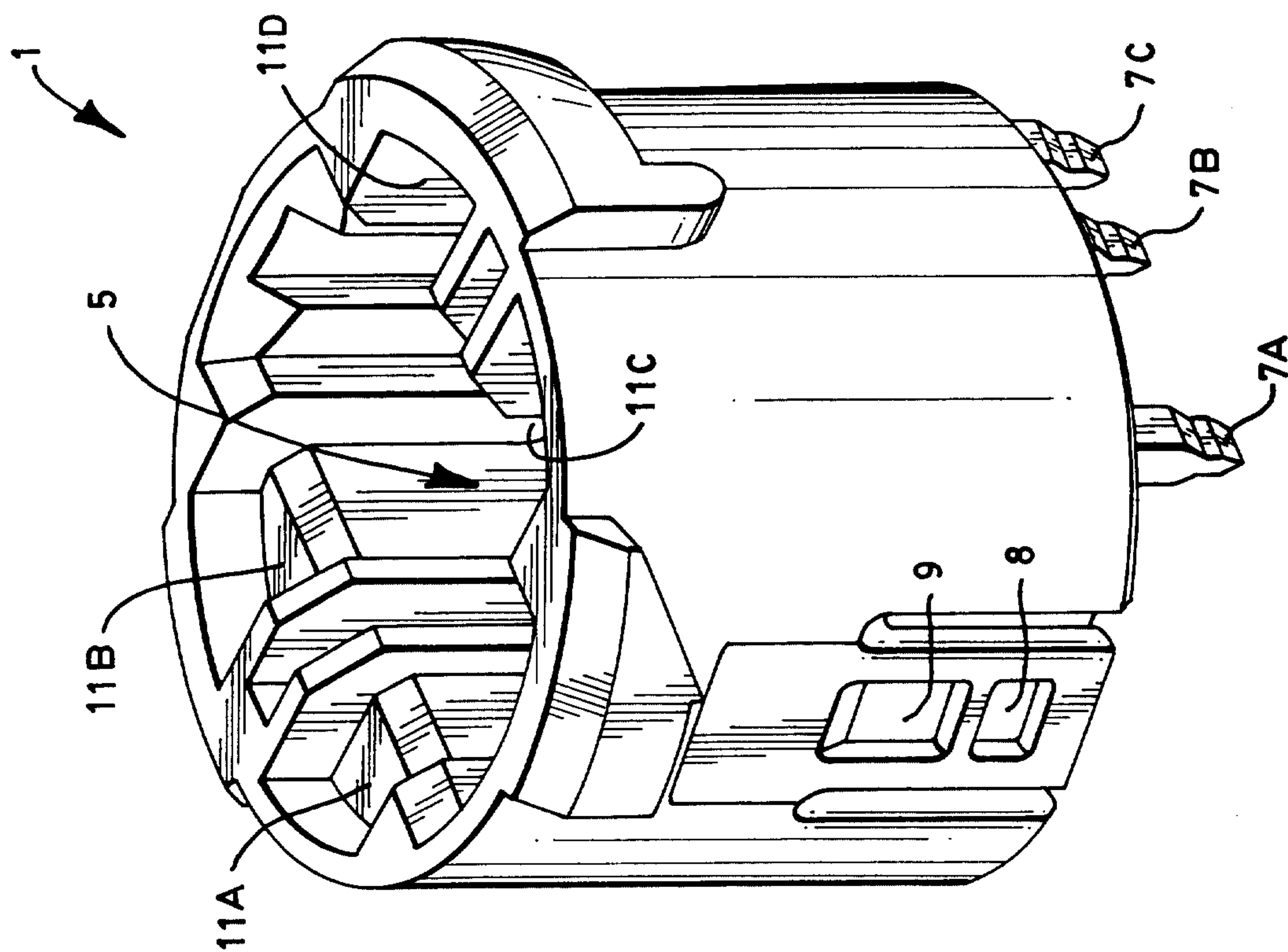


FIG. 2B

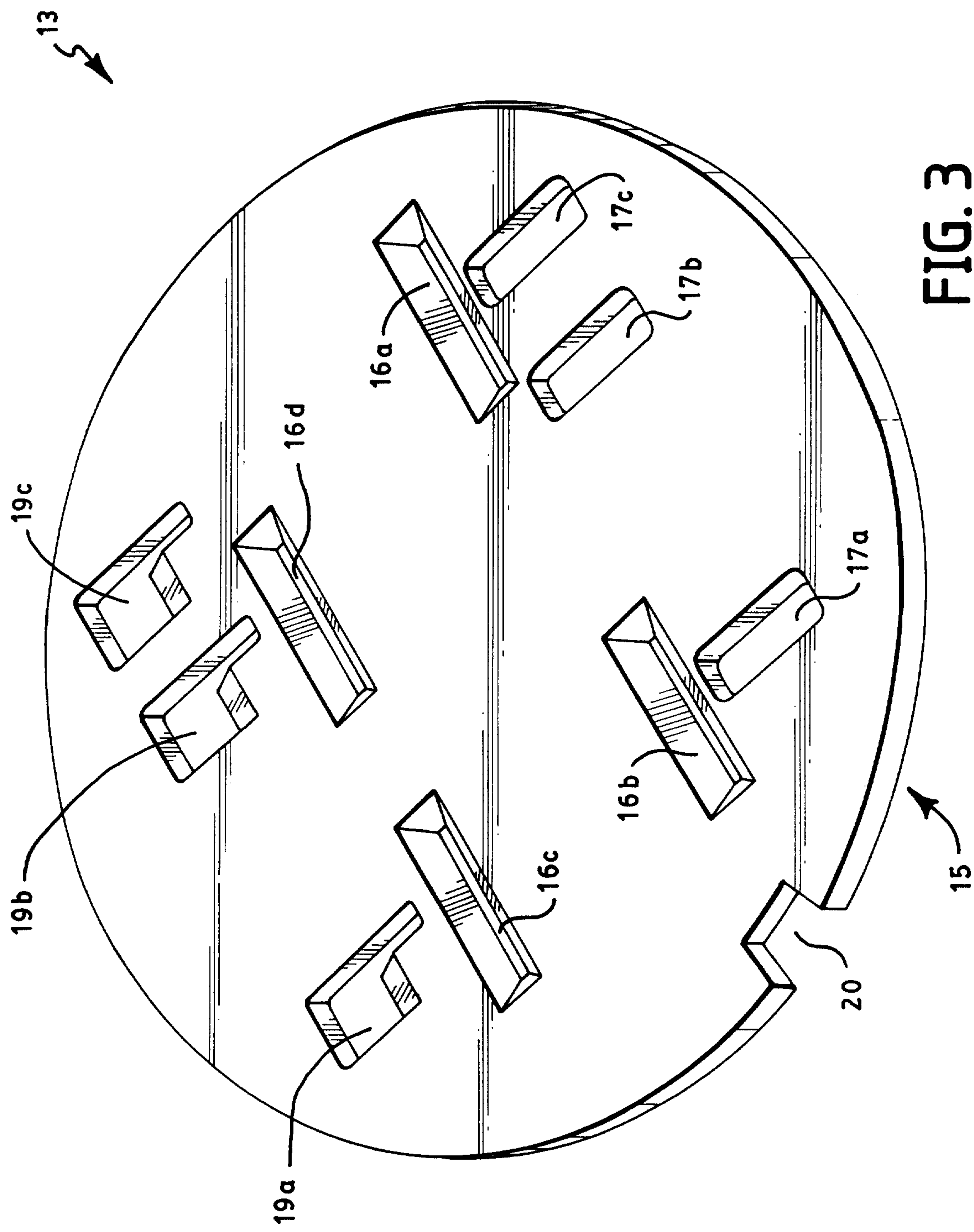


FIG. 3

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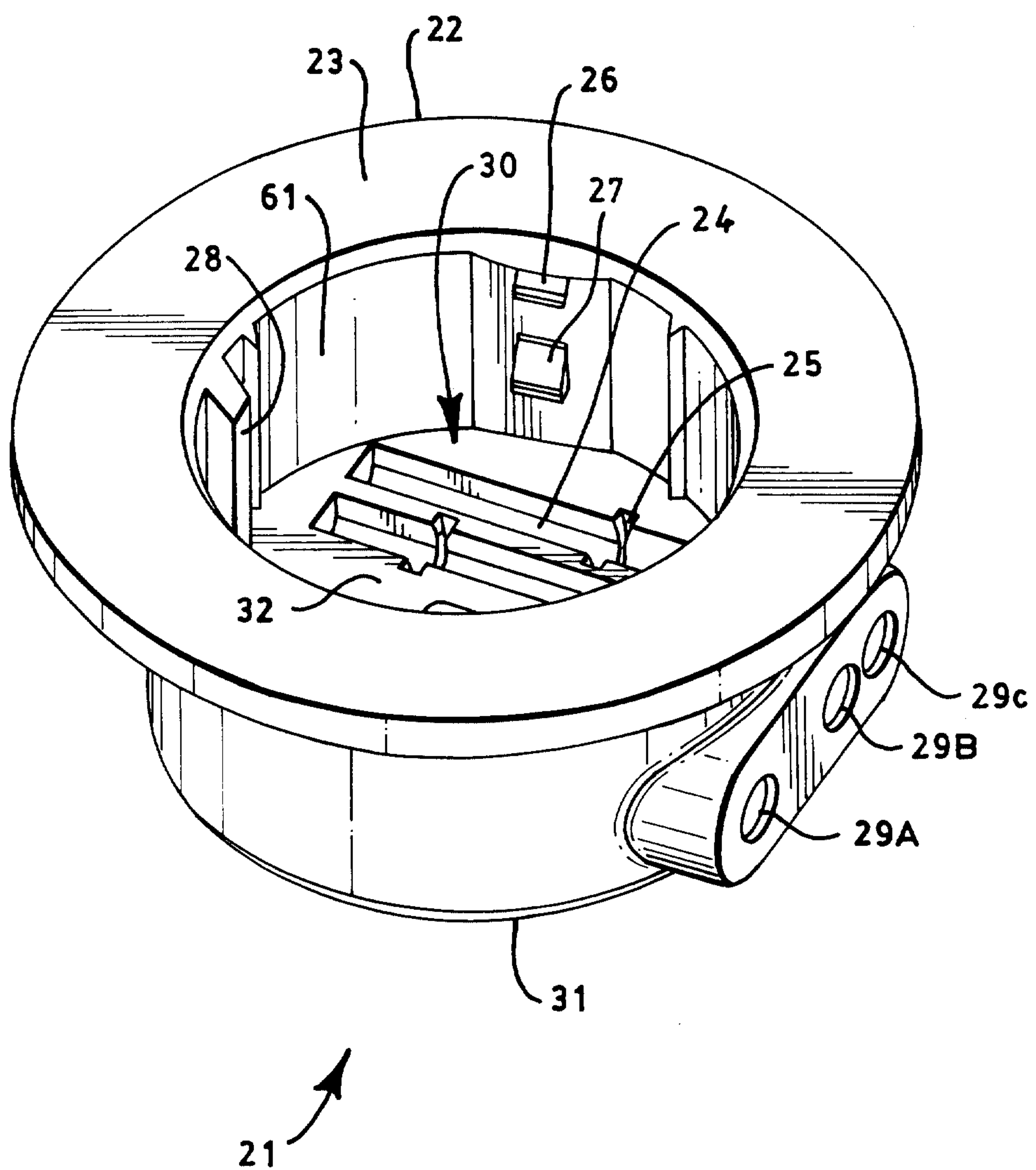


FIG. 4

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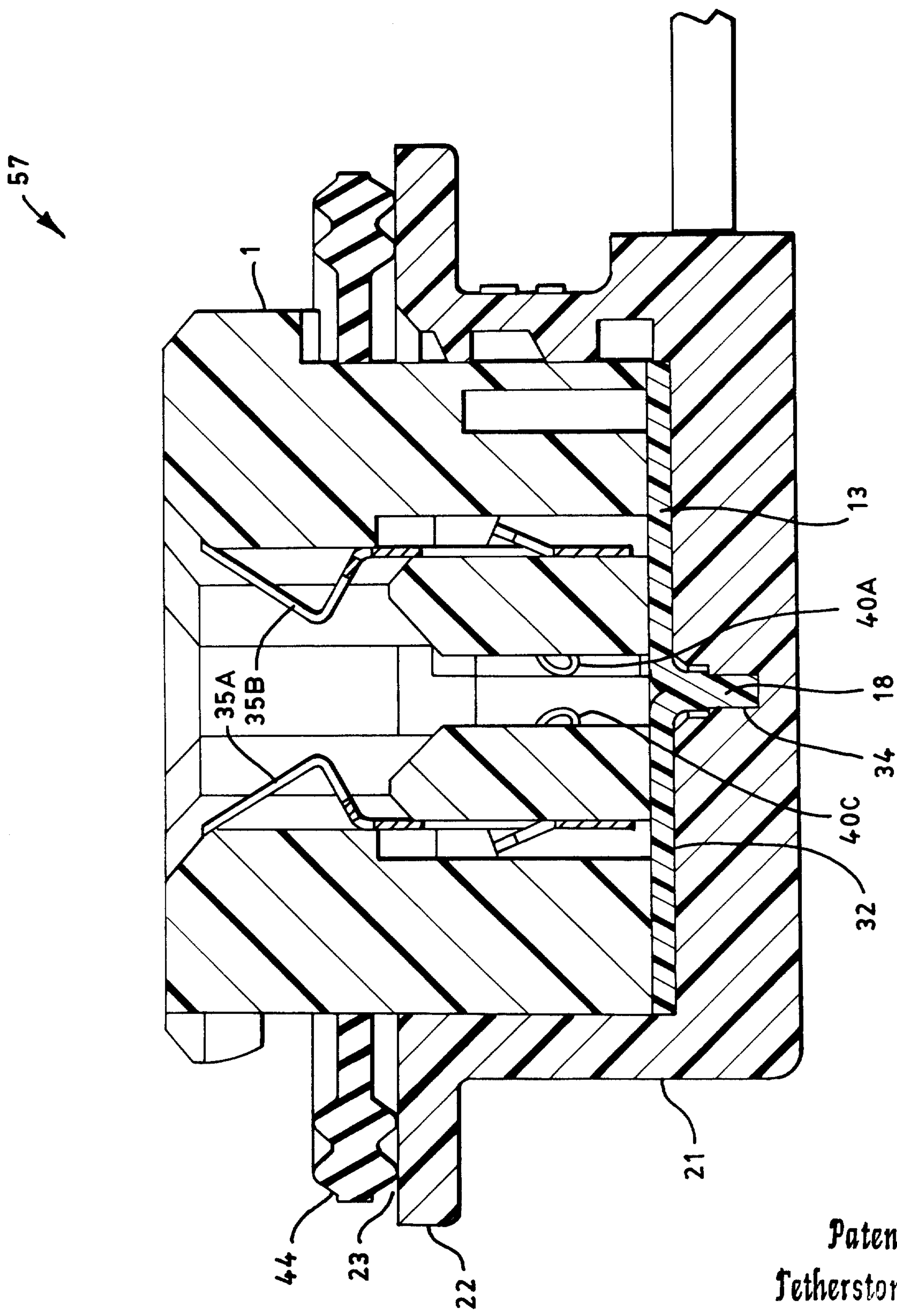


FIG. 5

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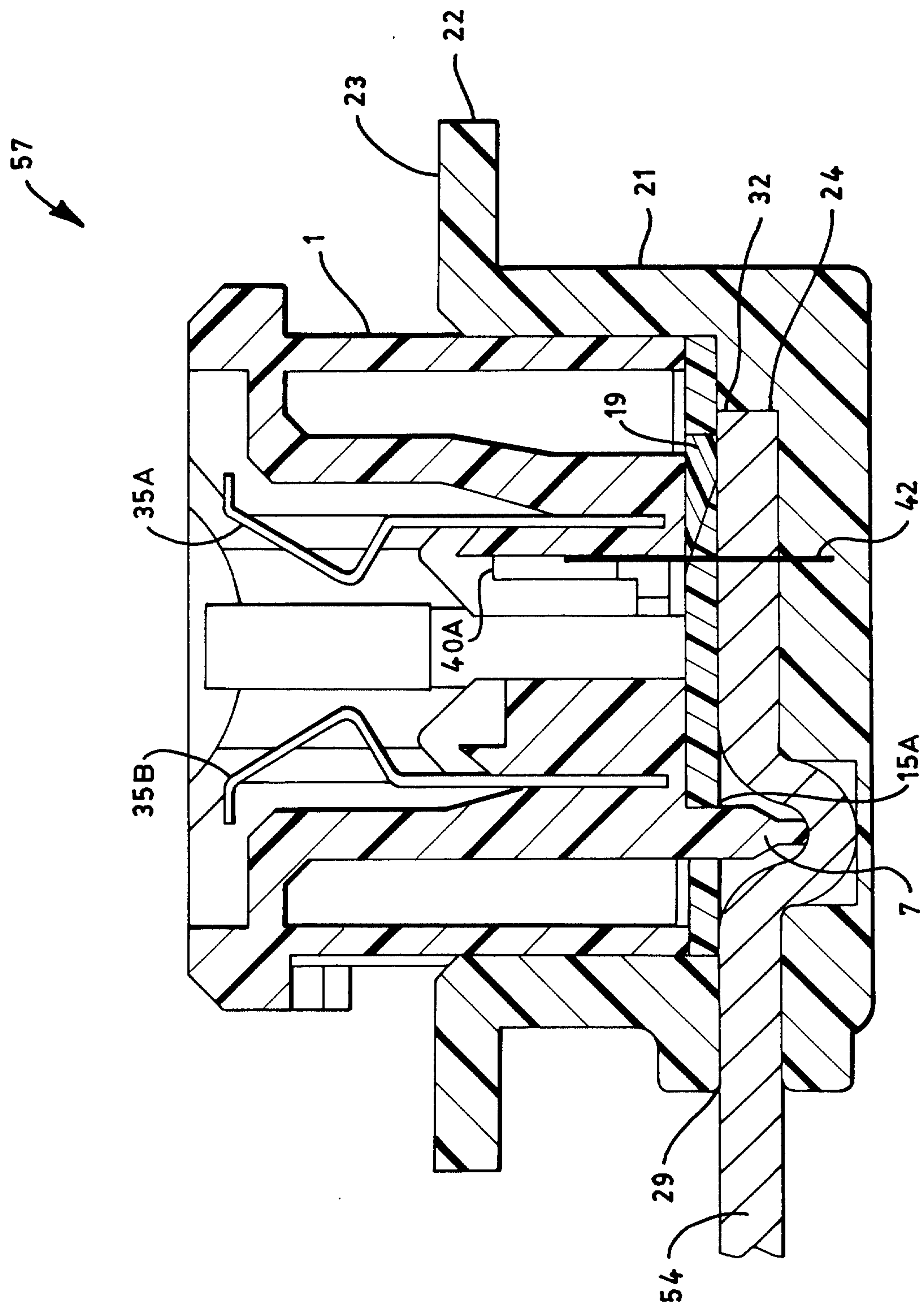
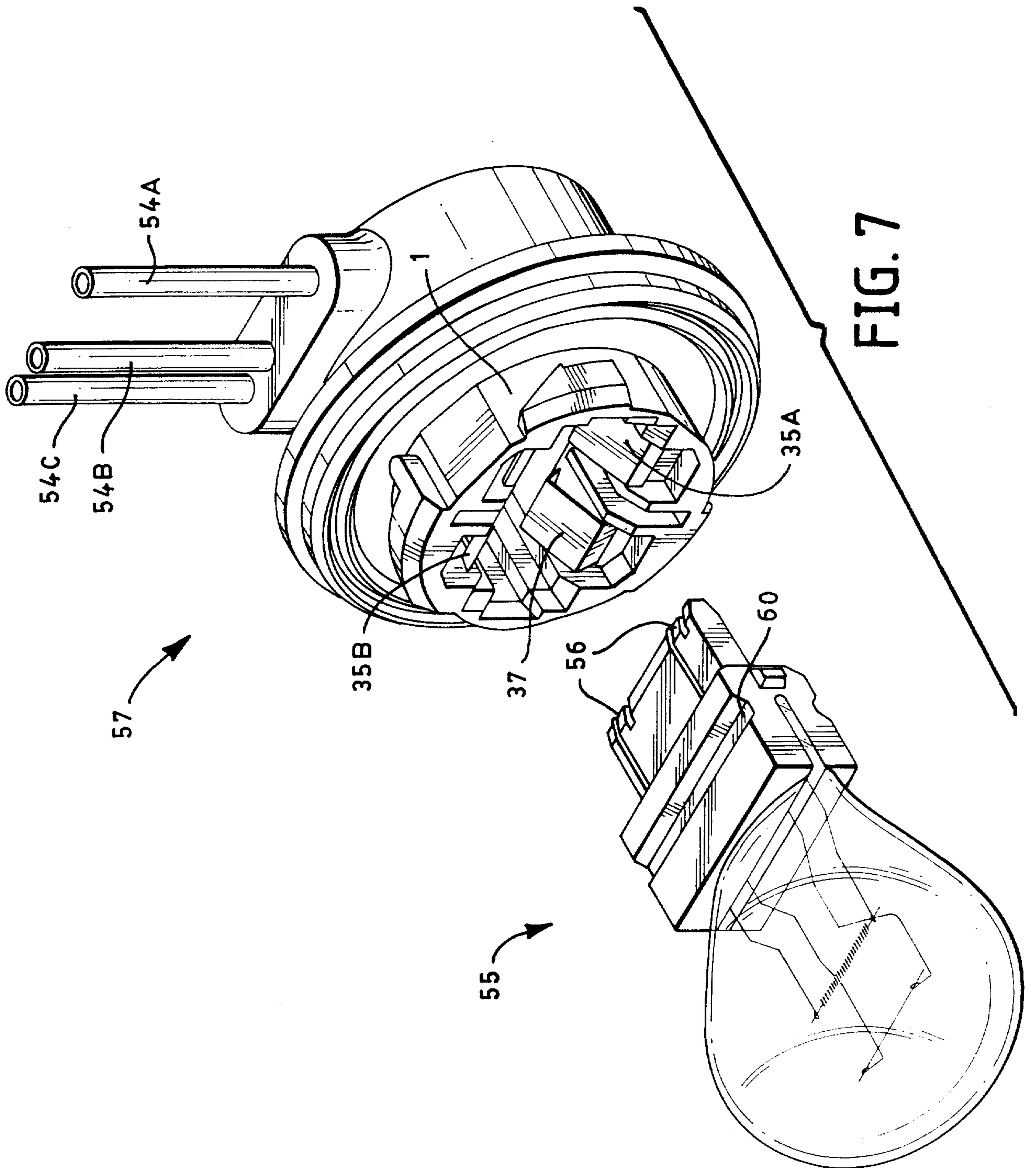


FIG. 6

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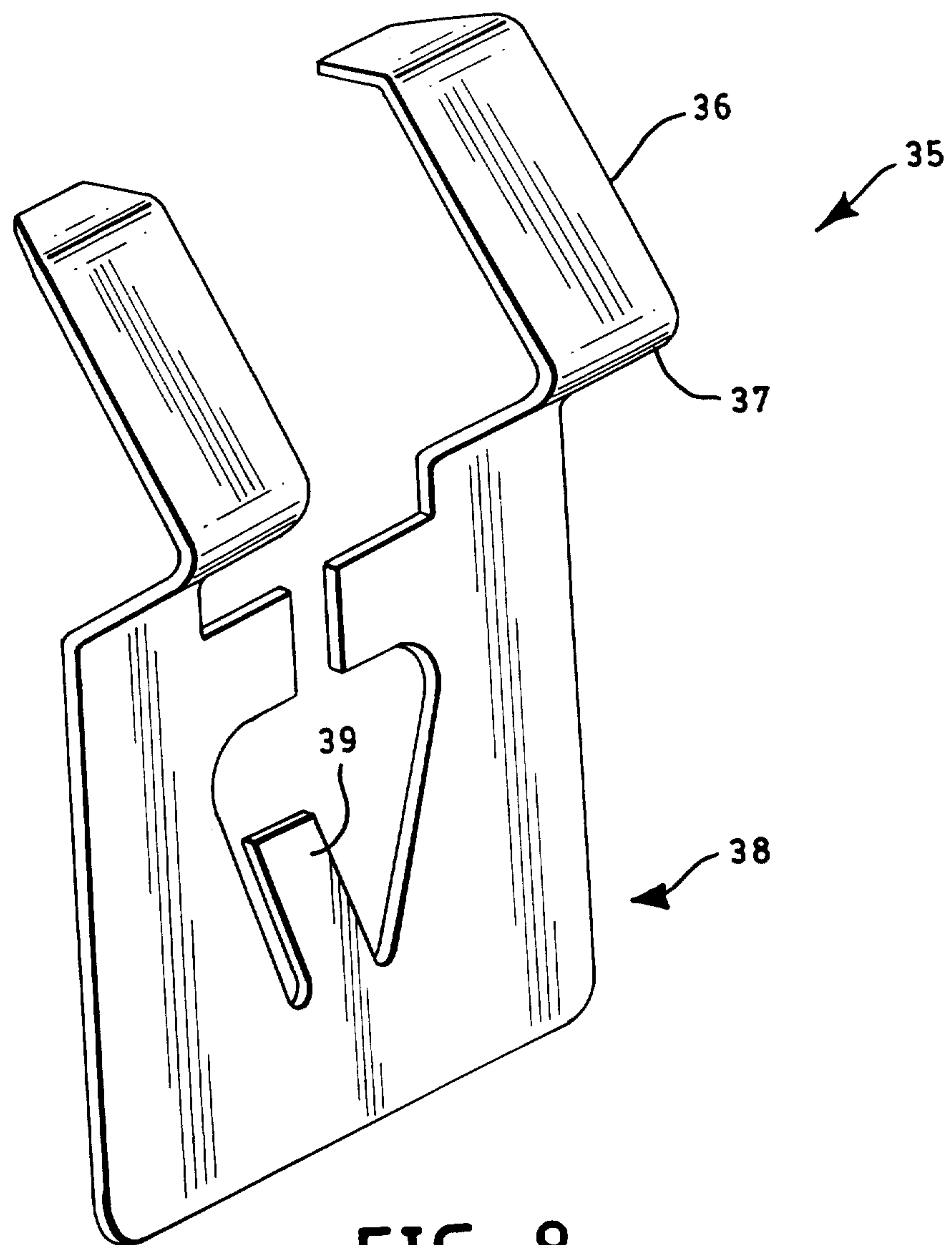


FIG. 8

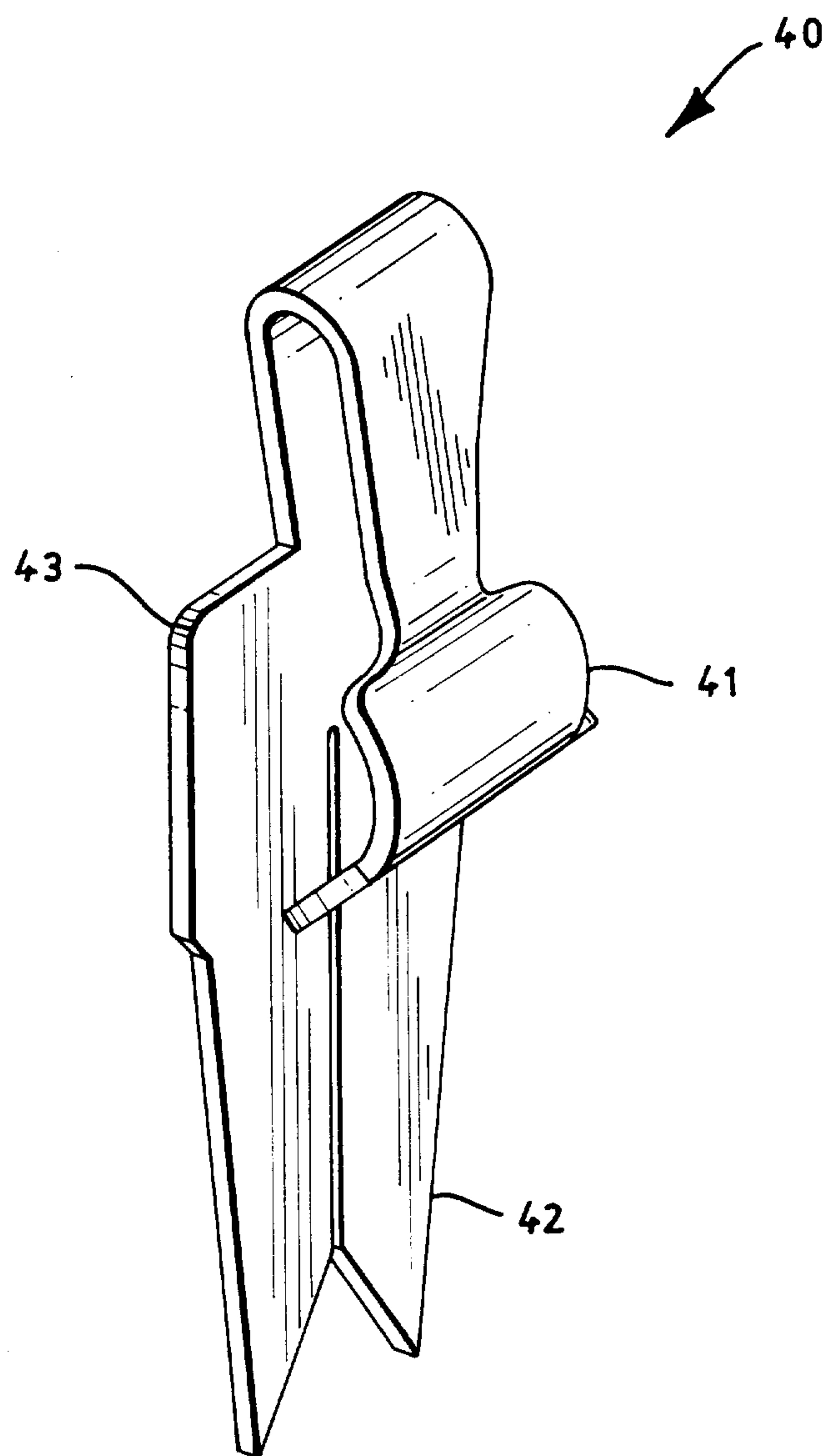


FIG. 9

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