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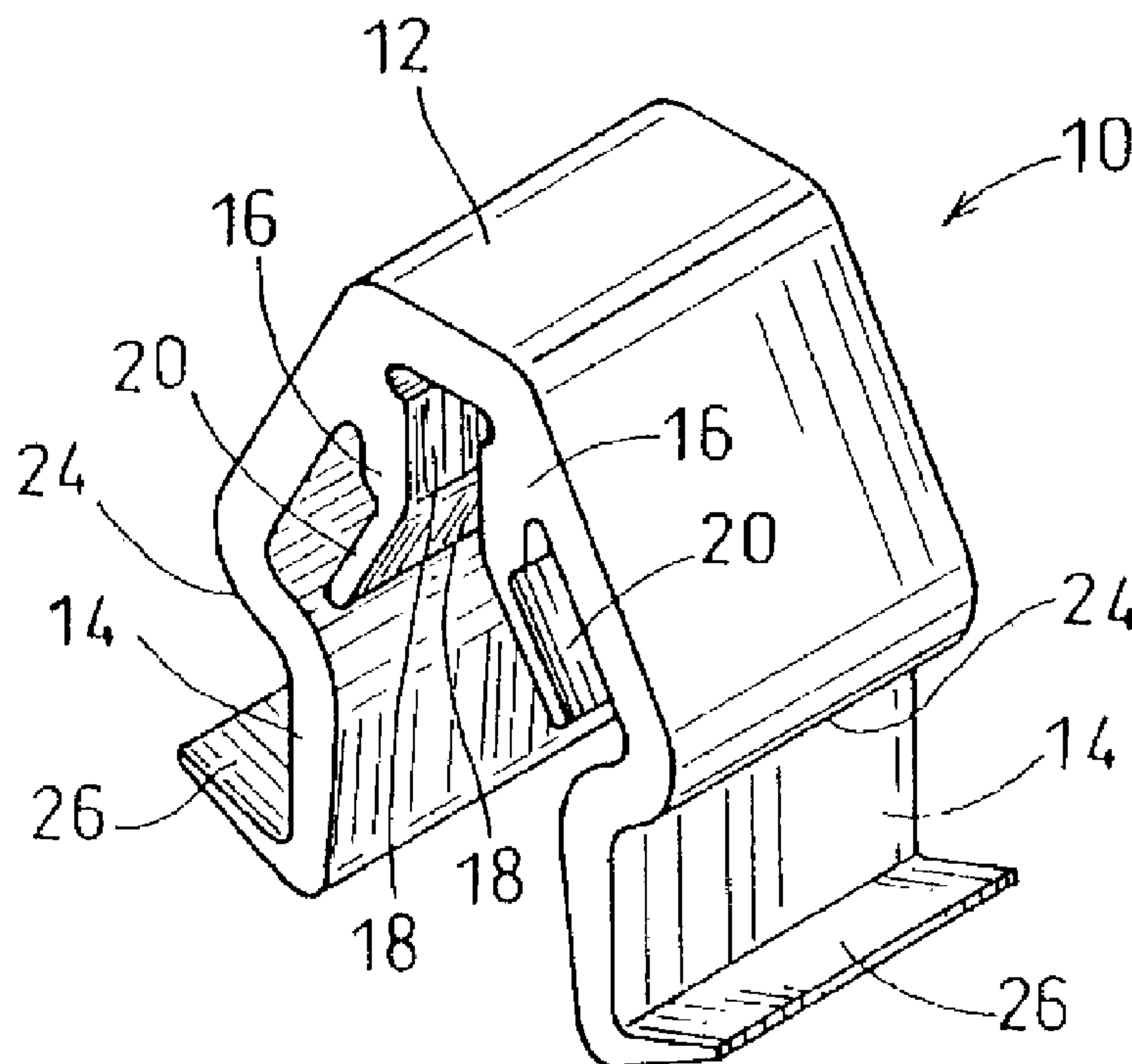
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(54) Titre : FIXATION

(54) Title: FASTENER



(57) Abrégé/Abstract:

A fastener used for mounting a mounting object having an insertion rib onto a support body having a mounting aperture. The fastener is previously fitted to the insertion rib of the mounting object and then inserted into the mounting aperture of the support body by pressing the insertion rib thereinto, thereby removably mounting the mounting object on the support body. The fastener includes a fastener body having a shoulder portion. The shoulder portion is adapted to elastically engage an inner edge of the mounting aperture of the support body when the fastener is inserted into the mounting aperture with the insertion rib. The fastener further includes a gripper portion provided on the fastener body and having at least one gripper surface and at least one engagement projection formed thereon. The gripper surface is adapted to contact the insertion rib of the mounting object when the fastener is fitted to the insertion rib. The engagement projection is adapted to engage a slot formed in the insertion rib of the mounting object when the fastener is fitted to the insertion rib.

ABSTRACT OF THE DISCLOSURE

A fastener used for mounting a mounting object having an insertion rib onto a support body having a mounting aperture. The fastener is previously fitted to the insertion rib of the mounting object and then inserted into the mounting aperture of the support body by pressing the insertion rib thereinto, thereby removably mounting the mounting object on the support body. The fastener includes a fastener body having a shoulder portion. The shoulder portion is adapted to elastically engage an inner edge of the mounting aperture of the support body when the fastener is inserted into the mounting aperture with the insertion rib. The fastener further includes a gripper portion provided on the fastener body and having at least one gripper surface and at least one engagement projection formed thereon. The gripper surface is adapted to contact the insertion rib of the mounting object when the fastener is fitted to the insertion rib. The engagement projection is adapted to engage a slot formed in the insertion rib of the mounting object when the fastener is fitted to the insertion rib.

## FASTENER

Background of the Invention

## 1. Field of the Invention

The present invention relates to a clip or fastener used for removably mounting an instrument cluster, a center cluster or other members (which will be referred to as a "cluster" hereinafter) to an instrument panel of an automobile.

## 2. Description of the Prior Art

Conventionally, a fastener of this type is made of a spring metal plate. As shown in FIG. 15, the conventional fastener 200 is constituted of a substantially V-shaped fastener body 201 and a pair of opposed gripper tongues 202 inwardly stamped out from the fastener body 201. The fastener body 201 has opposed shoulder portions 206 each of which is designed to engage an inner edge of a mounting aperture 242 formed in an instrument panel 240 on which a cluster 230 having an insertion rib 232 is to be mounted. Further, one of the gripper tongues 202 is formed with an engagement lip 204 which may engage a thin slot 234 formed in the insertion rib 232 of the cluster 230 when the fastener 200 is fitted to the insertion rib 232 by engaging the gripper tongues 202 with the insertion rib 232.

The fastener 200 is previously fitted to the insertion

rib 232 of the cluster 230 by engaging the gripper tongues 202 with the insertion rib 232. The insertion rib 232 of the cluster 230 with the fastener 200 is pressed into the mounting aperture 242 of the instrument panel 240 until seating surfaces 237 of the cluster 230 contact an outer surface of the instrument panel 240. At this time, as shown in FIG. 15, the fastener 200 is inserted into the mounting aperture 242 with the insertion rib 232 of the cluster 230, so that the shoulder portions 206 of the fastener body 201 securely engages the inner edge of the mounting aperture 242. As a result, the insertion rib 232 is fixed in the mounting aperture 242 of the instrument panel 240. Thus, the cluster 230 is mounted on the instrument panel 240.

However, the conventional fastener 200, when fitted to the insertion rib 232 of the cluster 230, may easily incline or loosen since the gripper tongues 202 of the fastener 200 cannot be sufficiently stabilized on the insertion rib 232. This is because each gripper tongue 202 is of the point-contact type, which provides a very small area of contact with the insertion rib 232. As a result, troublesome work is required to mount the cluster 230 onto the instrument panel 240. Further, in a worse case, the fastener 200 fitted to the insertion rib 232 may accidentally fall off from the insertion rib 232 during handling of the cluster 230 before the cluster 230 is mounted on the instrument

panel 240.

#### Summary of the Invention

It is an object of the present invention to provide a fastener which may be sufficiently stabilized on an insertion rib of a cluster or mounting object when it is fitted thereto, thereby facilitating work to mount the mounting object onto an instrument panel or support body and preventing accidental falling off of the fastener from the insertion rib.

It is another object of the present invention to provide a fastener which may steadily mount a mounting object on a support body without producing looseness therebetween if there is a variation in thickness of the instrument panel.

The present invention provides a fastener used for mounting a mounting object having an insertion rib onto a support body having a mounting aperture. The fastener is previously fitted to the insertion rib of the mounting object and then inserted into the mounting aperture of the support body by pressing the insertion rib thereinto, thereby removably mounting the mounting object on the support body. The fastener includes a fastener body having a shoulder portion. The shoulder portion is adapted to elastically engage an inner edge of the mounting aperture of



the support body when the fastener is inserted into the mounting aperture with the insertion rib. The fastener further includes a gripper portion provided on the fastener body and having at least one gripper surface and at least one engagement projection formed thereon. The gripper surface is adapted to contact the insertion rib of the mounting object when the fastener is fitted to the insertion rib. The engagement projection is adapted to engage a slot formed in the insertion rib of the mounting object when the fastener is fitted to the insertion rib.

With the fastener of the present invention, the gripper surface of the gripper portion contacts the insertion rib of the mounting object when the fastener is fitted to the insertion rib of the mounting object. Further, the engagement projection engages the slot formed in the rib of the mounting object when the fastener is fitted to the insertion rib of the mounting object. Thus, the fastener is sufficiently stabilized on the insertion rib of the mounting object when it is fitted thereto. Therefore, the mounting object can be easily mounted on the support body. Additionally, the fastener can be effectively prevented from accidental falling off from the insertion rib of the mounting object.

The fastener may have a stabilizer provided on the fastener body. The stabilizer is adapted to elastically

engage an outer surface of the support body when the fastener is inserted into the mounting aperture of the support body.

With the fastener thus constructed, when the fastener is inserted into the mounting aperture of the support body, the shoulder portion elastically engages the inner edge of the mounting aperture of the support body, and simultaneously, the stabilizer elastically engages the outer surface of the support body. Thus, the mounting object can be steadily mounted on the support body without producing looseness therebetween if there is a variation in thickness of the support body. Therefore, the mounting object can be effectively prevented from shaking on the support body if the support body is vibrated. This may lead to elimination of noisy sound due to vibration of the support body.

Further, the fastener body may be designed so that the shoulder portion engages the inner edge of the mounting aperture of the support body when the insertion rib of the mounting object is pressed into the mounting aperture of the support body until a seating surface formed on the mounting object contacts an outer surface of the support body.

With the fastener thus constructed, the mounting object can be steadily mounted on the support body without producing looseness therebetween.

The present invention will become more fully apparent

from the claims and the description as it proceeds in connection with the drawings.

Brief Description of the Drawings

FIG. 1 is an elevational view of a fastener according to a first embodiment of the present invention;

FIG. 2 is a perspective view of the fastener;

FIG. 3 is a perspective view of the fastener cut in half;

FIG. 4 is an elevational view of the fastener in use;

FIG. 5(A) is a fragmentary perspective view of a cluster showing an insertion rib thereof;

FIG. 5(B) is an elevational view of the insertion rib;

FIG. 6 is an elevational view of a fastener according to a second embodiment of the present invention;

FIG. 7 is a perspective view of the fastener;

FIG. 8 is an elevational view of the fastener in use;

FIG. 9 is an elevational view of a fastener according to a third embodiment of the present invention;

FIG. 10 is a perspective view of the fastener;

FIG. 11 is an elevational view of the fastener in use;

FIG. 12 is an elevational view of a fastener according to a fourth embodiment of the present invention;

FIG. 13 is a perspective view of the fastener;

FIG. 14 is an elevational view of the fastener in use;



and

FIG. 15 is an elevational view of a conventional fastener in use.

#### Detailed Description of the Preferred Embodiment

Preferred embodiments of the present invention will be described in detail with reference to the drawings. It should be noted, however, that the present invention is not limited to the following embodiments.

A first embodiment of the present invention will now be described with reference to FIGS. 1 to 5(B).

As shown in FIGS. 1 to 3, a fastener 10 is integrally formed by injection molding of resin. The fastener 10 is mainly constituted of a substantially inverted V-shaped fastener body 12 having end portions, a pair of opposed legs 14 provided on the end portions of the fastener body 12, and a pair of opposed gripper tongues 16 as a gripper portion provided on an inner surface of the fastener body 12.

The gripper tongues 16 include a pair of flattened gripper surfaces 18 disposed in substantially parallel opposed relation and are dimensioned such that the distance between the gripper surfaces 18 is slightly smaller than the thickness of an insertion rib of a cluster (which will be hereinafter described). The gripper tongues 16 are provided with a pair of outwardly extending guide lips 20. As will

be appreciated, the guide lips 20 may act as a guide member to reliably introduce the insertion rib of the cluster into a space between the gripper surfaces 18. Moreover, each gripper surface 18 is provided with an engagement projection 22. The engagement projection 22 is arranged in the middle of the gripper surface 18 and includes an inclined leading surface so that the insertion rib of the cluster is easily introduced into the space between the gripper surfaces 18. It is to be noted that gripper tongues 16 can be spread to broaden the space between the gripper surfaces 18 since the gripper tongues 16 are deformable because of its elasticity.

The fastener body 12 has a pair of opposed outer shoulder portions 24 which extend along juncture portions of the fastener body 12 and the legs 14. Further, each leg 14 is provided with a stabilizer lip 26 which is outwardly projected from the free end thereof. As will be easily understood, the outer shoulder portions 24 and the legs 14 can be displaced outwardly and inwardly (laterally as viewed in FIG. 1) since the fastener body 12 has elastic deformability. Additionally, the stabilizer lip 26 can be deformed upwardly and downwardly (vertically as viewed in FIG. 1) because of its elasticity.

Referring to FIGS. 5(A) and 5(B), partly shown therein is a cluster 30 as a mounting object which is to be mounted

on an instrument panel (which will be hereinafter described) by the fastener 10. The cluster 30 is integrally formed with a plurality of the insertion ribs 32 (one of which is shown for illustration purposes) to which the fastener 10 is to be applied. The cluster 30 is also provided with a pair of plate-like projections 36 between which the insertion rib 32 is retained. The insertion rib 32 has a transversely elongated thin slot 34 which is dimensioned to be engageable with the engagement projections 22 of the gripper tongues 16 of the fastener 10. Additionally, each projection 36 includes a pair of shouldered seating surfaces 37.

The operation of the fastener 10 thus constructed will now be described in connection with the process for mounting the cluster onto the instrument panel as a support body.

As shown in FIG. 4, the fastener 10 is pressed to the insertion rib 32 of the cluster 30, with the forward end of the insertion rib 32 positioned between the guide lips 20 of the gripper tongues 16. As a result, the rib 32 is introduced into the space between the gripper surfaces 18 of the gripper tongues 16 while spreading the gripper tongues 16. When the rib 32 is sufficiently inserted into the space, the gripper surfaces 18 squeezingly contact both side surfaces of the rib 32, and simultaneously, the engagement projections 22 formed on the gripper tongues 16 engage the thin slot 34 of the rib 32. Thus, the fastener 10 is

previously and stably fitted to the insertion rib 32 of the cluster 30.

Thereafter, the insertion rib 32 of the cluster 30 with the fastener 10 is pressed into a mounting aperture 42 formed on the instrument panel 40, so that the fastener 10 fitted to the insertion rib 32 is inserted into the mounting aperture 42 of the instrument panel 40 while inwardly flexing the fastener body 12. At this time, the outer shoulder portions 24 of the fastener body 12 elastically engage an inner edge 46 of the mounting aperture 42, and simultaneously, the stabilizer lips 26 elastically engage an outer surface 44 of the instrument panel 40. As a result, the insertion rib 32 of the cluster 30 is fixed in the mounting aperture 42 of the instrument panel 40 by the fastener 10. Thus, the cluster 30 is removably mounted on the instrument panel 40.

It is to be noted that the fastener 10, when fitted to the insertion rib 32 of the cluster 30, cannot easily incline or loosen since the gripper tongues 16 of the fastener 10 is sufficiently stabilized on the insertion rib 32. This is because each gripper tongue 16 provides a large area of contact with the insertion rib 32. Therefore, the insertion rib 32 of the cluster 30 with the fastener 10 can be easily pressed into the mounting aperture 42 formed on the instrument panel 40. This may eliminate troublesome

work to mount the cluster 30 onto the instrument panel 40. Moreover, the fastener 10 can be effectively prevented from accidentally falling off from the insertion rib 32 during handling of the cluster 30.

Additionally, the stabilizer lips 26 elastically engage the outer surface 44 of the instrument panel 40, thereby stabilizing the fastener 10 in the mounting aperture 42. Therefore, the fastener 10 permits steady mounting of the cluster 30 on the instrument panel 40 if there is a variation in thickness of the instrument panel 40. This is because the stabilizer lips 26 may compensate for the differences of the thickness to properly engage the outer surface 44 of the instrument panel 40.

To remove the cluster 30 from the instrument panel 40 for maintenance or other purposes, the cluster 30 may be simply pulled. When the cluster 30 is pulled, the fastener body 12 of the fastener 10 is inwardly flexed to disengage the outer shoulder portions 24 of the fastener body 12 from the inner edge 46 of the mounting aperture 42, so that the insertion rib 32 of the cluster 30 is pulled out from the mounting aperture 42. Thus, the cluster 30 is removed from the instrument panel 40.

It should be noted that the cluster 30 can be removed from the instrument panel 40, with the fastener 10 fitted to the insertion rib 32 of the cluster 30. This is because the



fastener 10 is reliably fitted to the insertion rib 32. As a result, the cluster 30 can be remounted on the instrument panel 40 without any additional work.

A second embodiment of the present invention modified from the first embodiment will now be described with reference to FIGS. 6 to 8, wherein constructions and operation identical with or similar to those of the first embodiment will not be explained.

As shown in FIGS. 6 and 7, a fastener 50 is mainly constituted of a substantially inverted V-shaped fastener body 52 having end portions, a pair of opposed legs 54 provided on the end portions of the fastener body 52, and a pair of opposed gripper tongues 56 provided on the inner surface of the fastener body 52.

The gripper tongues 56 include a pair of gripper surfaces 58 disposed in substantially parallel opposed relation. As will be apparent from the drawings, each gripper surface 58 has a surface area greater than that of the gripper surface 18 in the first embodiment. Each gripper surface 58 is also provided with an engagement projection 62. The engagement projection 62 is arranged in the distal end of the gripper surface 58 and has an inclined leading surface.

The fastener body 52 has a pair of opposed thickened portions which extend along juncture portions of the

fastener body 52 and the legs 54, thereby forming a pair of opposed outer shoulder portions 64 extending therealong. Further, each leg 54 is provided with a stabilizer lip 66 which is outwardly projected from the free end thereof.

The operation of the fastener 50 thus constructed will now be described in connection with the process for mounting a cluster (which is the same cluster as in the first embodiment) onto an instrument panel (which is the same instrument panel as in the first embodiment).

As shown in FIG. 8, like the fastener 10 in the first embodiment, the fastener 50 is pressed to the insertion rib 32 of the cluster 30. As a result, the rib 32 is introduced into a space between the gripper surfaces 58 of the gripper tongues 56. When the rib 32 is sufficiently inserted into the space, the gripper surfaces 58 squeezingly contact the both side surfaces of the rib 32, and simultaneously, the engagement projections 62 formed on the gripper tongues 56 engage the thin slot 34 of the rib 32. Thus, the fastener 50 is previously and stably fitted to the insertion rib 32 of the cluster 30.

Thereafter, the insertion rib 32 of the cluster 30 with the fastener 50 is pressed into the mounting aperture 42 formed on the instrument panel 40, so that the fastener 50 fitted to the insertion rib 32 is inserted into the mounting aperture 42. At this time, the shoulder portions 64 of the

fastener body 52 elastically engage the inner edge 46 of the mounting aperture 42, and simultaneously, the stabilizer lips 66 elastically engage the outer surface 44 of the instrument panel 40. As a result, the insertion rib 32 of the cluster 30 is fixed in the mounting aperture 42 of the instrument panel 40 by the fastener 50. Thus, the cluster 30 is removably mounted on the instrument panel 40.

A third embodiment of the present invention modified from the second embodiment will now be described with reference to FIGS. 9 to 11, wherein constructions and operation identical with or similar to those of the second embodiment will not be explained.

As shown in FIGS. 9 and 10, a fastener 70 is mainly constituted of a substantially inverted V-shaped fastener body 72 having end portions, a pair of opposed legs 74 provided on the end portions of the fastener body 72, and a pair of opposed gripper tongues 76 provided on the inner surface of the fastener body 72. As will be apparent from the drawings, the fastener 70 has a length greater than that of the fastener 50 of the second embodiment.

The gripper tongues 76 include a pair of gripper surfaces 78 disposed in substantially parallel opposed relation. Each gripper surface 78 is also provided with an engagement projection 82. The engagement projection 82 is arranged in the distal end of the gripper surface 78 and has

an inclined leading surface.

The fastener body 72 has a pair of opposed thickened portions which extend along juncture portions of the fastener body 72 and the legs 74, thereby forming a pair of opposed outer shoulder portions 84 extending therealong. Further, each leg 74 is provided with a stabilizer lip 86 which is outwardly projected from the free end thereof.

The operation of the fastener 70 thus constructed will now be described in connection with the process for mounting a cluster (which is the same cluster as in the first embodiment) onto an instrument panel (which is the same instrument panel as in the first embodiment).

As shown in FIG. 11, like the fastener 50 in the second embodiment, the fastener 70 is pressed to the insertion rib 32 of the cluster 30. As a result, the rib 32 is introduced into a space between the gripper surfaces 78 of the gripper tongues 76. When the rib 32 is sufficiently inserted into the space, the gripper surfaces 78 squeezingly contact the both side surfaces of the rib 32, and simultaneously, the engagement projections 82 formed on the gripper tongues 76 engage the thin slot 34 of the rib 32. Thus, the fastener 70 is previously and stably fitted to the insertion rib 32 of the cluster 30.

Thereafter, the insertion rib 32 of the cluster 30 with the fastener 70 is pressed into the mounting aperture 42

formed on the instrument panel 40 until the seating surfaces 37 of the cluster 30 contact the outer surface 44 of the instrument panel 40. At this time, the fastener 70 is inserted into the mounting aperture 42 with the insertion rib 32, so that the shoulder portions 84 of the fastener body 72 elastically engage the inner edge 46 of the mounting aperture 42. As a result, the insertion rib 32 of the cluster 30 is fixed in the mounting aperture 42 of the instrument panel 40 by the fastener 70, with the seating surface 37 urged to the outer surface 44 of the instrument panel 40. Thus, the cluster 30 is removably mounted on the instrument panel 40.

As will be apparent from FIG. 11, in this embodiment, the stabilizer lips 86 does not engage the outer surface 44 of the instrument panel 40. Therefore, the stabilizer lips 86 can be eliminated from the legs 74. In contrast, the stabilizer lips 86 can be dimensionally modified to effectively engage the outer surface 44 of the instrument panel 40, so as to increase stabilizing performance of the cluster 30 on the instrument panel 40.

A fourth embodiment of the present invention modified from the second embodiment will now be described with reference to FIGS. 12 to 14, wherein constructions and operation identical with or similar to those of the second embodiment will not be explained.



As shown in FIGS. 12 and 13, a fastener 90 is mainly constituted of a substantially inverted V-shaped fastener body 92 having end portions, a pair of opposed legs 94 provided on the end portions of the fastener body 92, and a pair of opposed gripper tongues 96 provided on the inner surface of the fastener body 92. As will be apparent from the drawings, the fastener 90 has a rounded outer shape which is somewhat different from the outer shape of the fastener 50 of the second embodiment.

The gripper tongues 96 include a pair of gripper surfaces 98 disposed in substantially parallel opposed relation. Each gripper surface 98 is also provided with an engagement projection 102. The engagement projection 102 is arranged in the distal end of the gripper surface 98 and has an inclined leading surface.

The fastener body 92 has a pair of opposed thickened portions which extend along juncture portions of the fastener body 92 and the legs 94, thereby forming a pair of opposed outer shoulder portions 104 extending therealong.

The operation of the fastener 90 thus constructed will now be described in connection with the process for mounting a cluster (which is the same cluster as in the first embodiment) onto an instrument panel (which is the same instrument panel as in the first embodiment).

As shown in FIG. 14, like the fastener 50 in the second

embodiment, the fastener 90 is pressed to the insertion rib 32 of the cluster 30. As a result, the rib 32 is introduced into a space between the gripper surfaces 98 of the gripper tongues 96. When the rib 32 is sufficiently inserted into the space, the gripper surfaces 98 squeezingly contact the both side surfaces of the rib 32, and simultaneously, the engagement projections 102 formed on the gripper tongues 96 engage the thin slot 34 of the rib 32. Thus, the fastener 90 is previously and stably fitted to the insertion rib 32 of the cluster 30.

Thereafter, the insertion rib 32 of the cluster 30 with the fastener 90 is pressed into the mounting aperture 42 formed on the instrument panel 40 until the seating surfaces 37 of the cluster 30 contact the outer surface 44 of the instrument panel 40. At this time, the fastener 90 is inserted into the mounting aperture 42 with the insertion rib 32, so that the shoulder portions 104 of the fastener body 90 elastically engage the inner edge 46 of the mounting aperture 42. As a result, the insertion rib 32 of the cluster 30 is fixed in the mounting aperture 42 of the instrument panel 40 by the fastener 90, with the seating surface 37 urged to the outer surface 44 of the instrument panel 40. Thus, the cluster 30 is removably mounted on the instrument panel 40.

As will be apparent from the drawings, in this

embodiment, no stabilizer lip is provided on the engagement lips 94. However, the engagement lips 94 can be provided with stabilizer lips to engage the outer surface 44 of the instrument panel 40, so as to increase stabilizing performance of the cluster 30 on the instrument panel 40.

Although in the above preferred embodiments, the fastener is used to mount the cluster onto the instrument panel, such a fastener may be used for many applications, for example, to mount a garnish, a molding and like members onto an automobile body. Additionally, the fastener may have various configurations, depending on the purposes.

The preferred embodiments herein described are intended to be illustrative of the invention and not to limit the invention to the precise form herein described. They are chosen and described to explain the principles of the invention and their application and practical use to enable others skilled in the art to practice the invention.

## WHAT IS CLAIMED IS:

1. A fastener used for mounting a mounting object having an insertion rib onto a support body having a mounting aperture, the fastener being previously fitted to the insertion rib of the mounting object and then inserted into the mounting aperture of the support body by pressing the insertion rib thereinto, thereby removably mounting the mounting object on the support body, comprising:

a fastener body having a shoulder portion, said shoulder portion being adapted to elastically engage an inner edge of the mounting aperture of the support body when the fastener is inserted into the mounting aperture with the insertion rib; and

a gripper portion provided on said fastener body and having at least one gripper surface and at least one engagement projection formed thereon, said at least one gripper surface being adapted to contact the insertion rib of the mounting object when the fastener is fitted to the insertion rib, said at least one engagement projection being adapted to engage a slot formed in the insertion rib of the mounting object when the fastener is fitted to the insertion rib.

2. The fastener as defined in claim 1 further comprising a stabilizer provided on said fastener body, said stabilizer

being adapted to elastically engage an outer surface of the support body when the fastener is inserted into the mounting aperture of the support body with the insertion rib.

3. The fastener as defined in claim 1, wherein said fastener body is dimensioned such that said shoulder portion engages the inner edge of the mounting aperture of the support body when the insertion rib of the mounting object is pressed into the mounting aperture of the support body until a seating surface formed on the mounting object contacts an outer surface of the support body.

4. The fastener as defined in claim 1, wherein said fastener body has a substantially V-shaped configuration, and wherein said gripper portion comprises a pair of opposed gripper tongues integrally formed on an inner surface of said fastener body.

5. The fastener as defined in claim 4, wherein said at least one gripper surface comprises a pair of flattened surfaces formed on said opposed gripper tongues and disposed in substantially parallel opposed relation, said opposed flattened surfaces squeezingly contacting both side surfaces of the insertion rib of the mounting object when the fastener is fitted to the insertion rib.



6. The fastener as defined in claim 4, wherein each of said gripper tongues is provided with a guide lip for guiding the insertion rib of the mounting object.

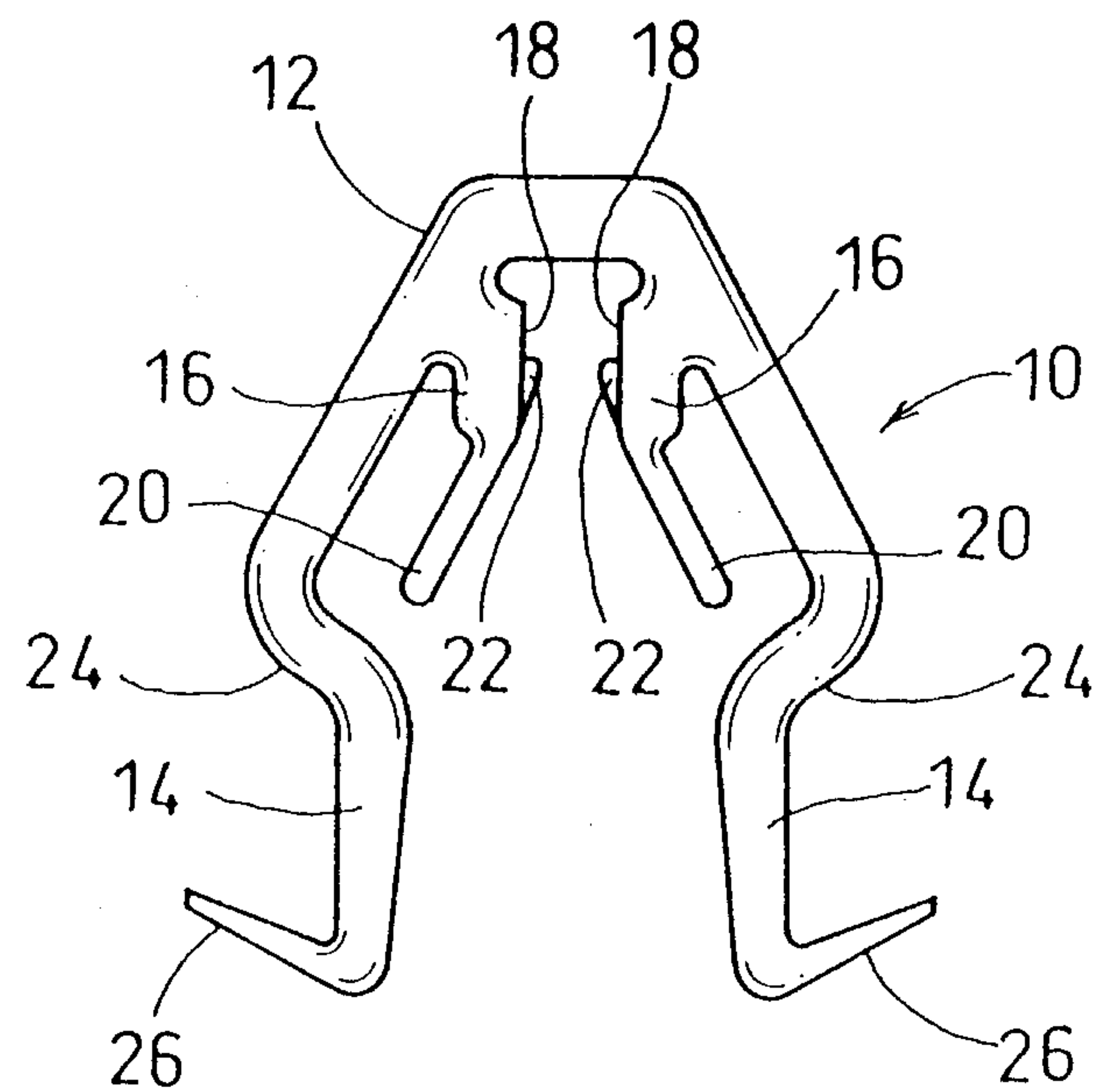


FIG.1

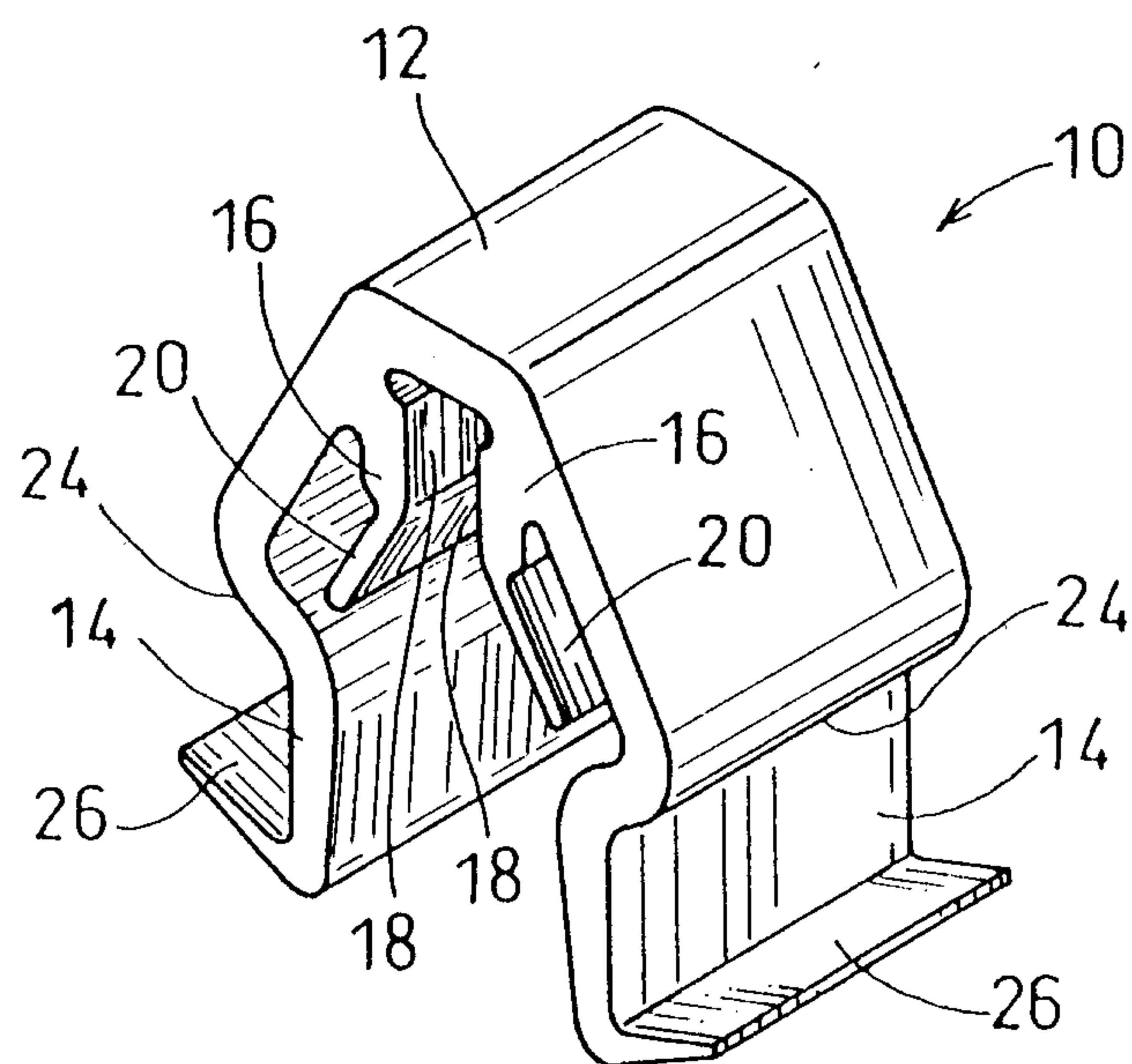


FIG.2

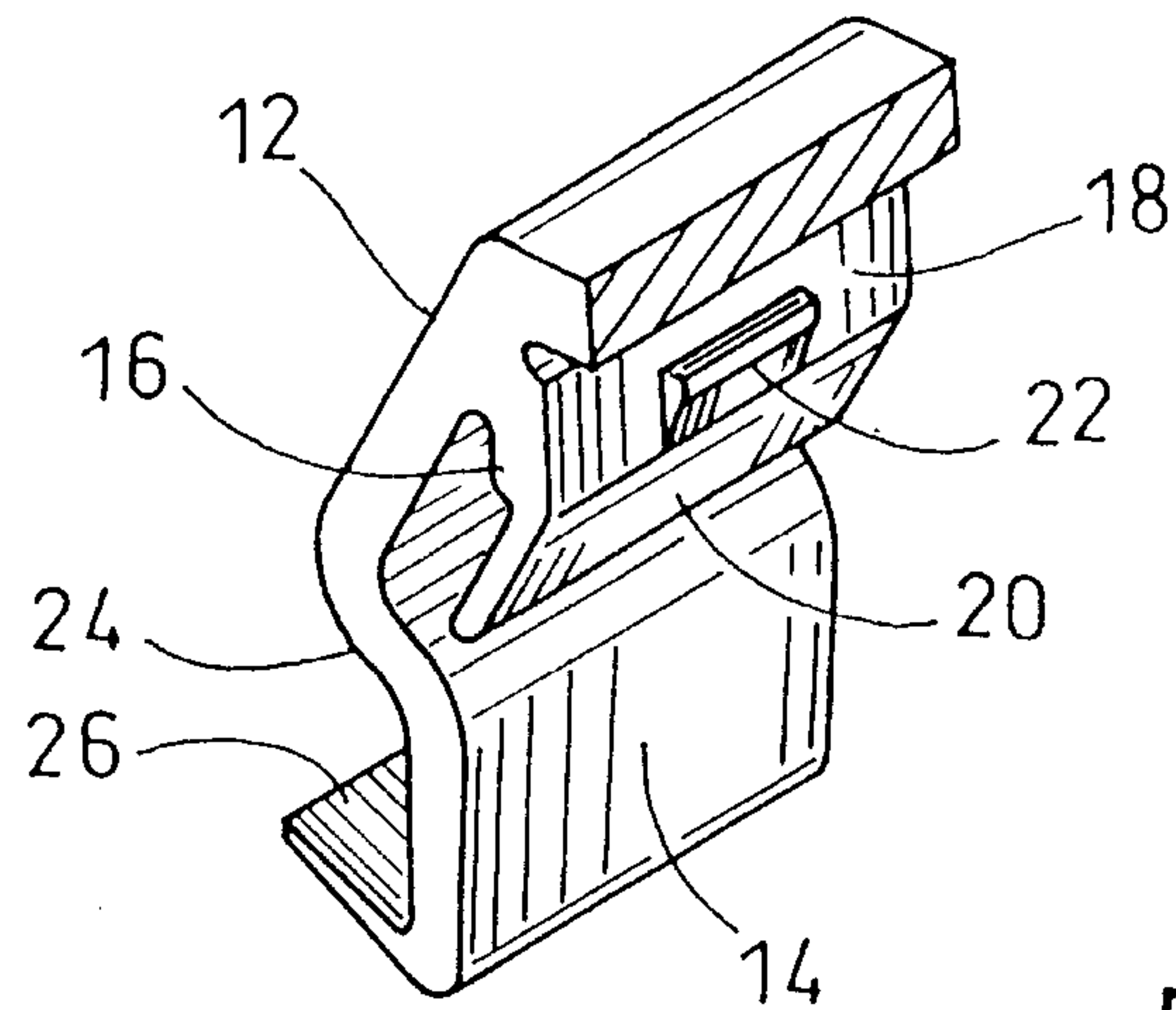


FIG. 3

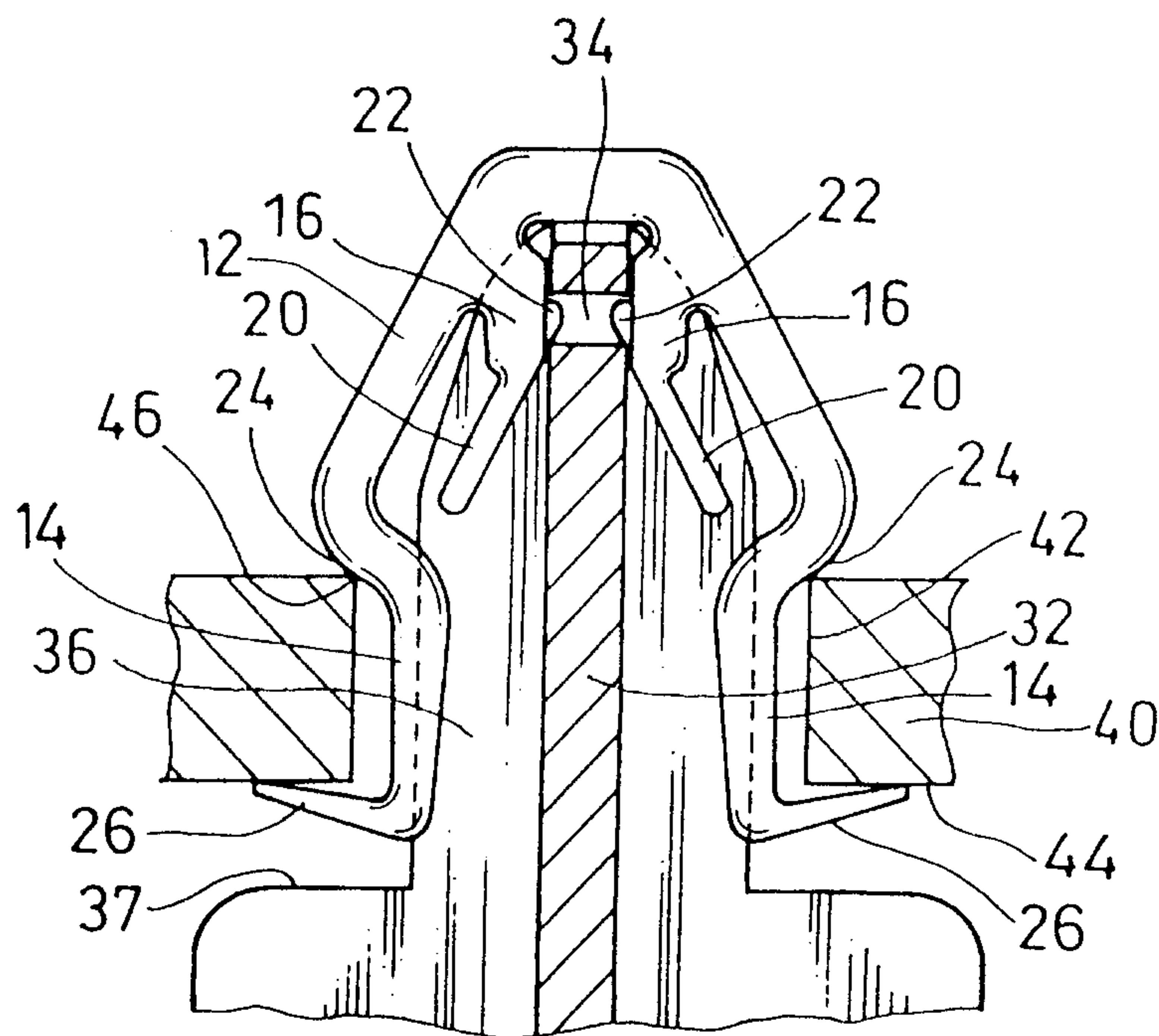


FIG. 4

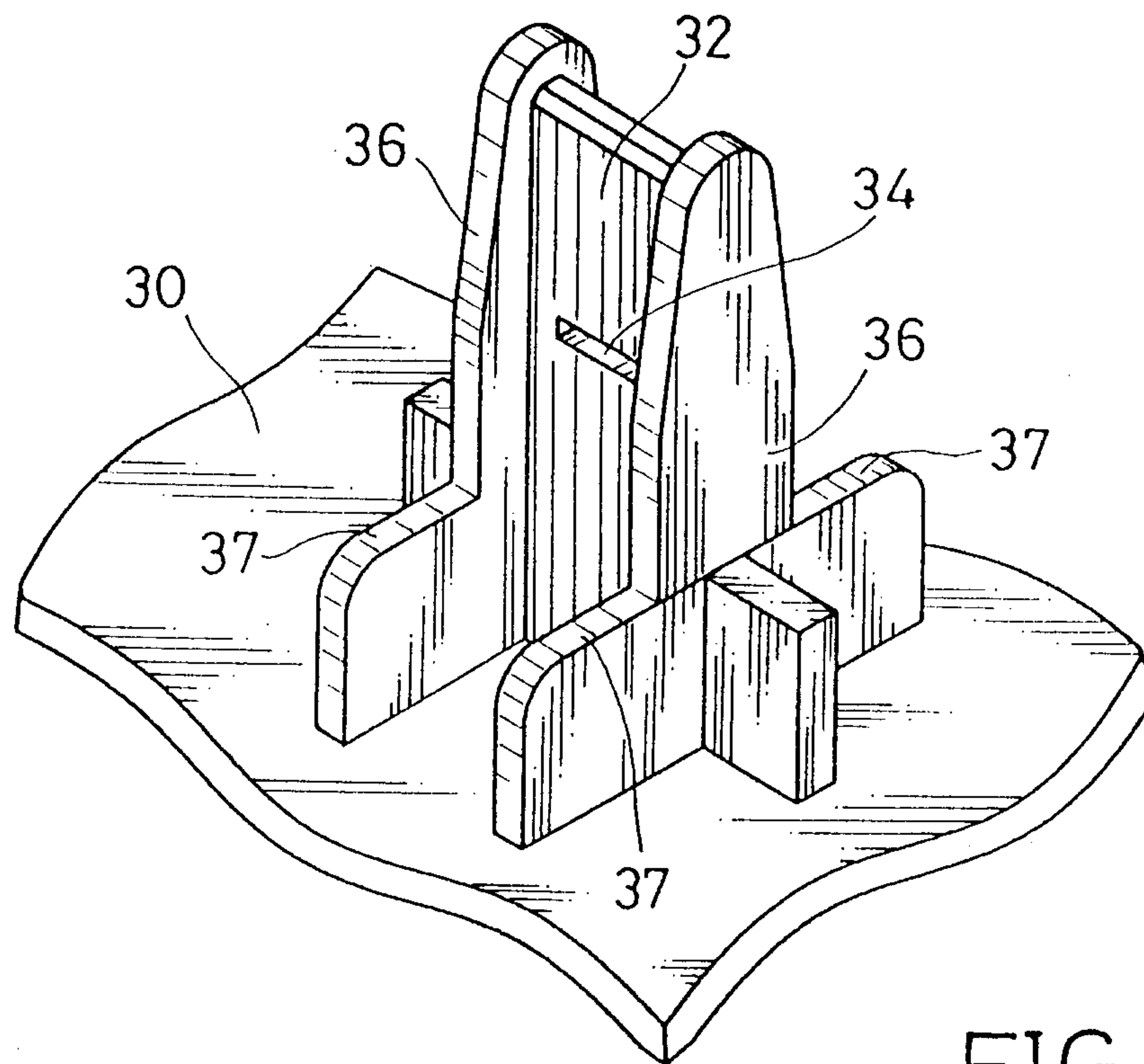


FIG. 5(A)

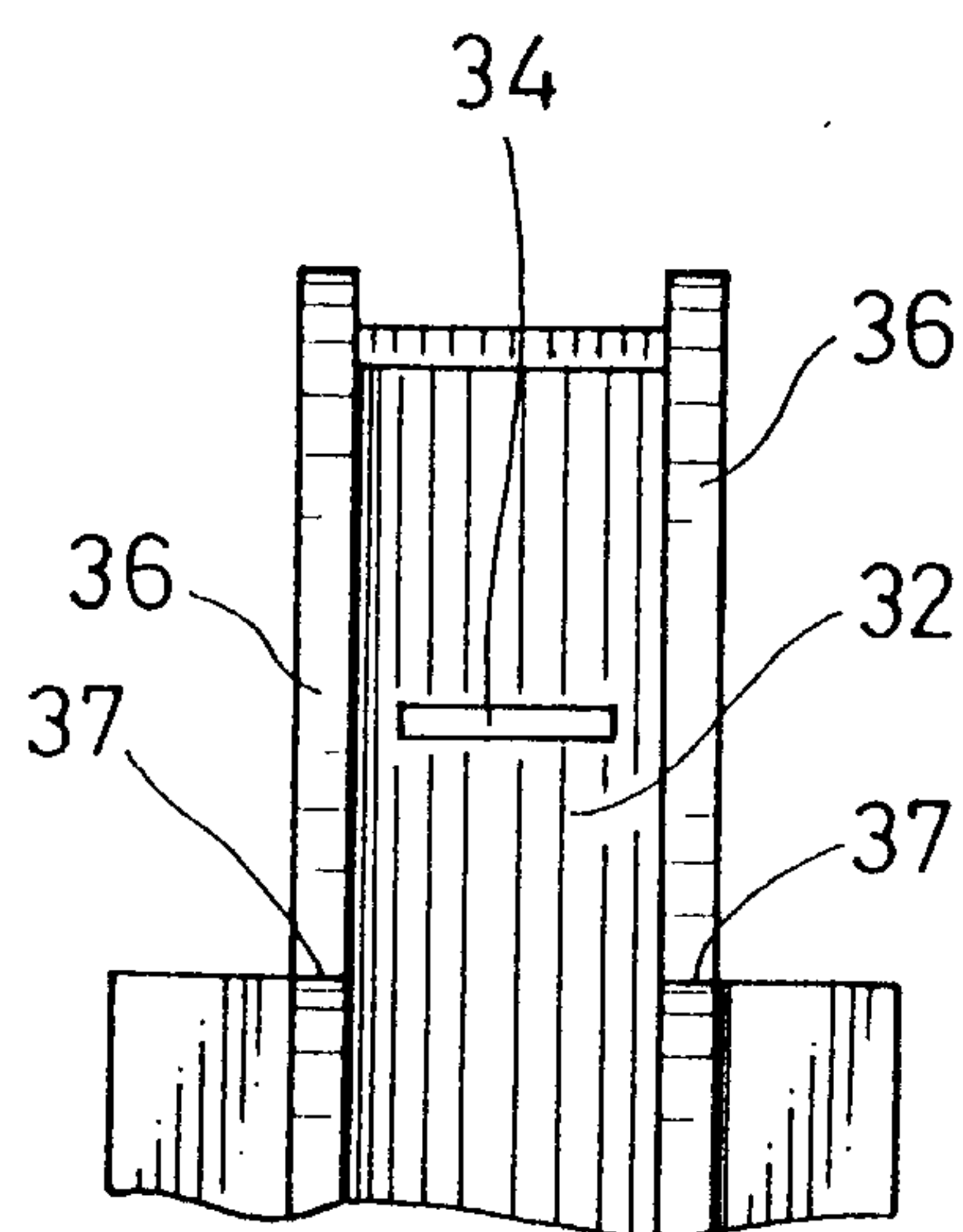


FIG. 5(B)

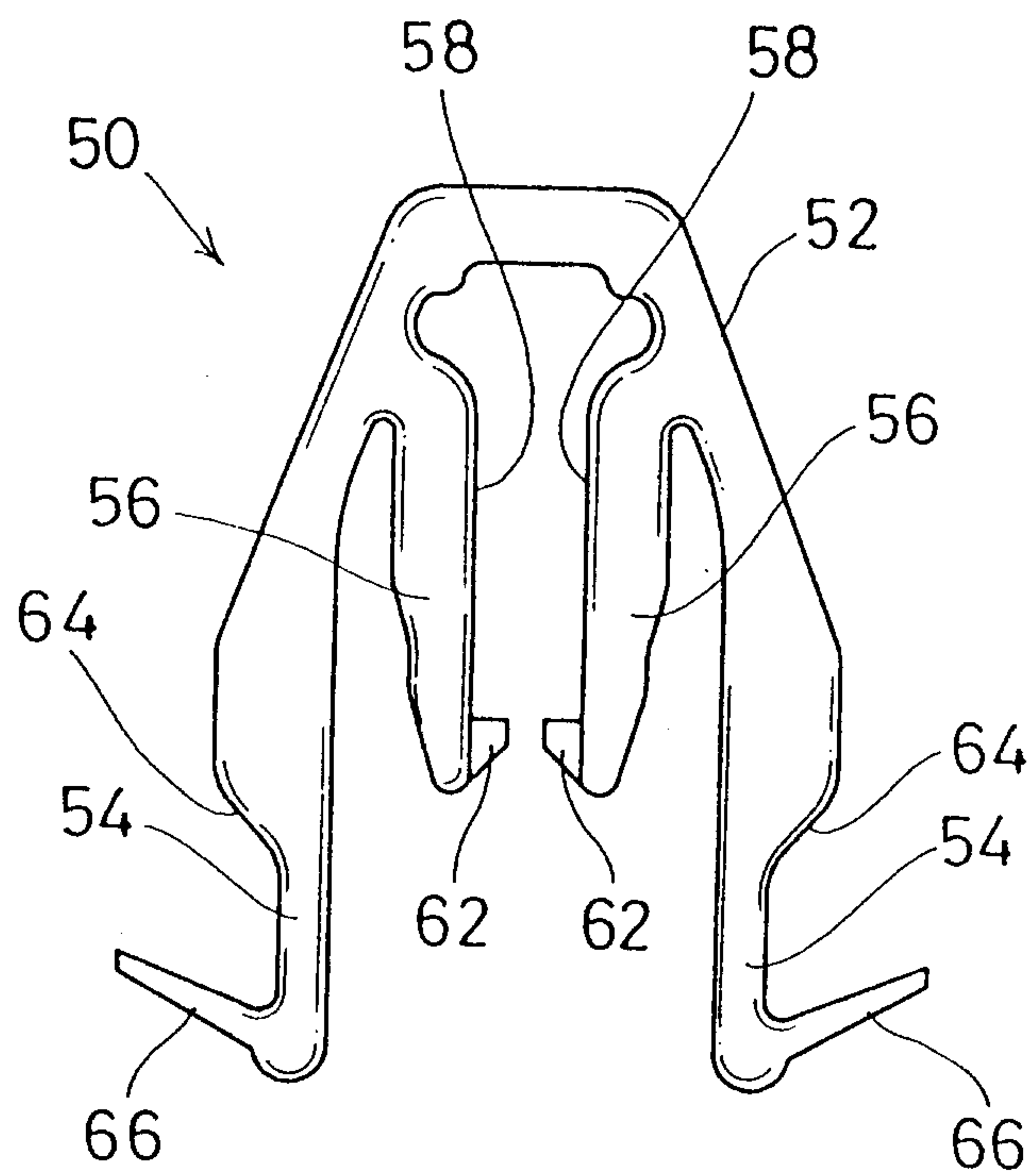


FIG. 6

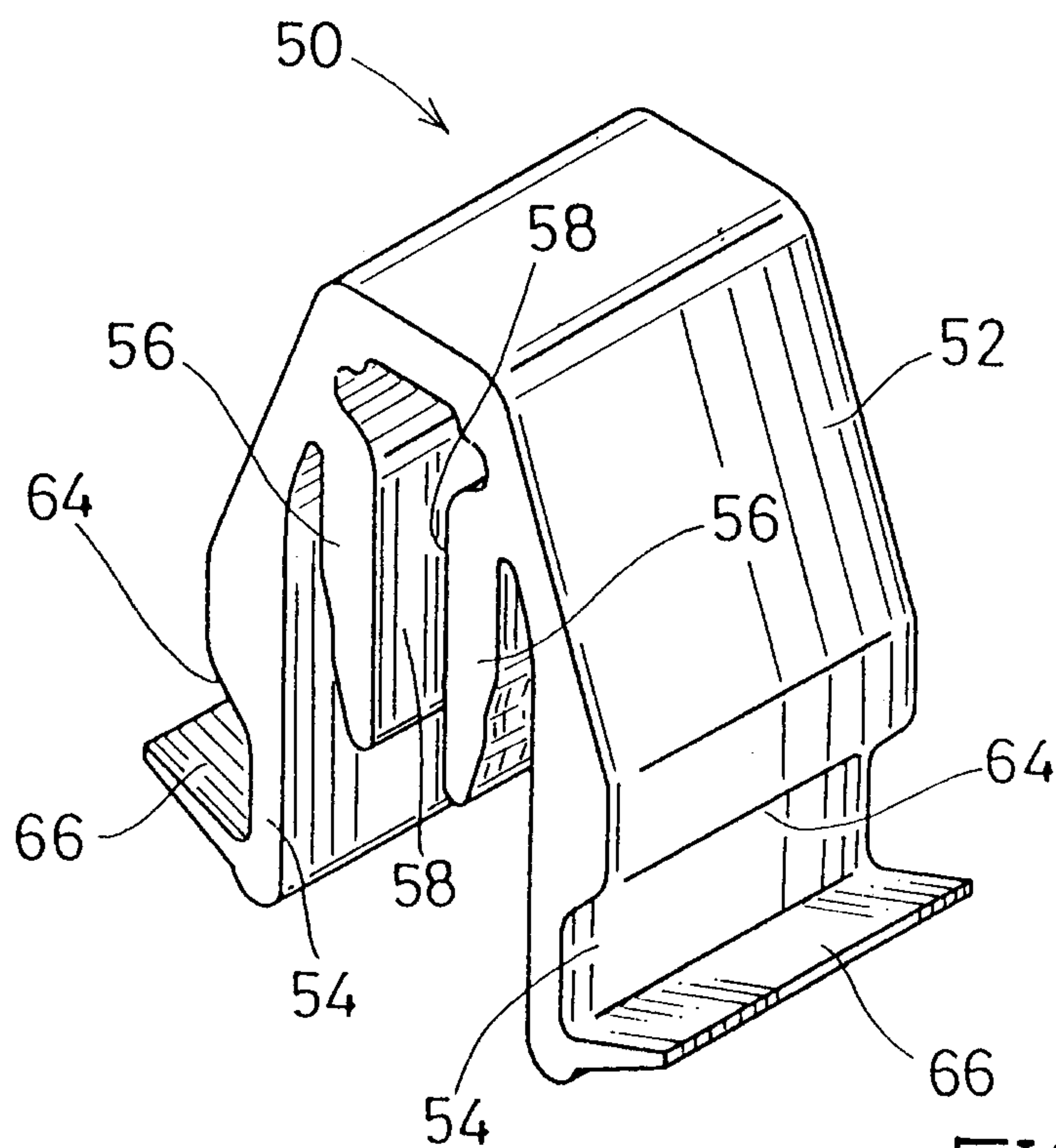


FIG. 7



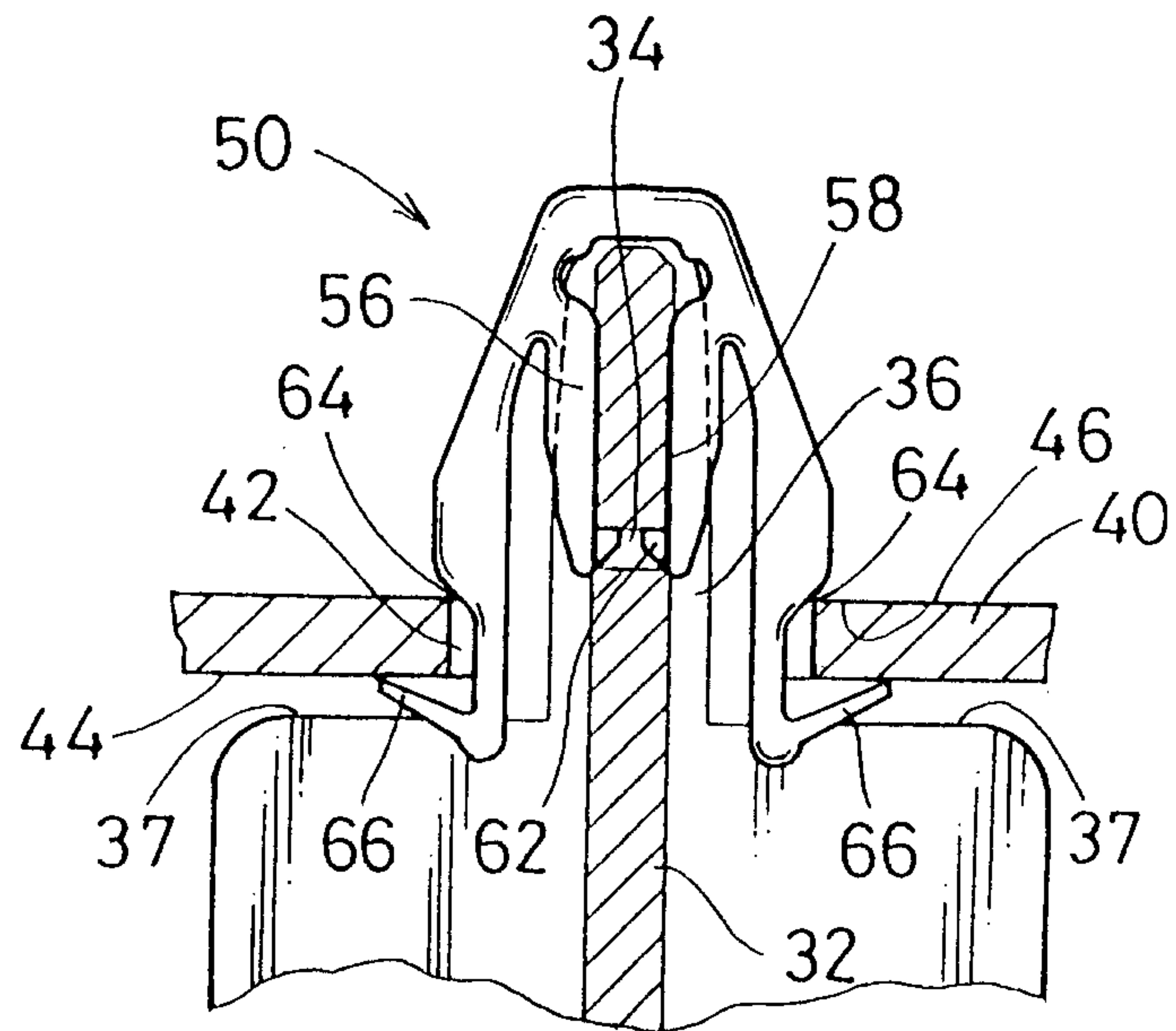


FIG. 8

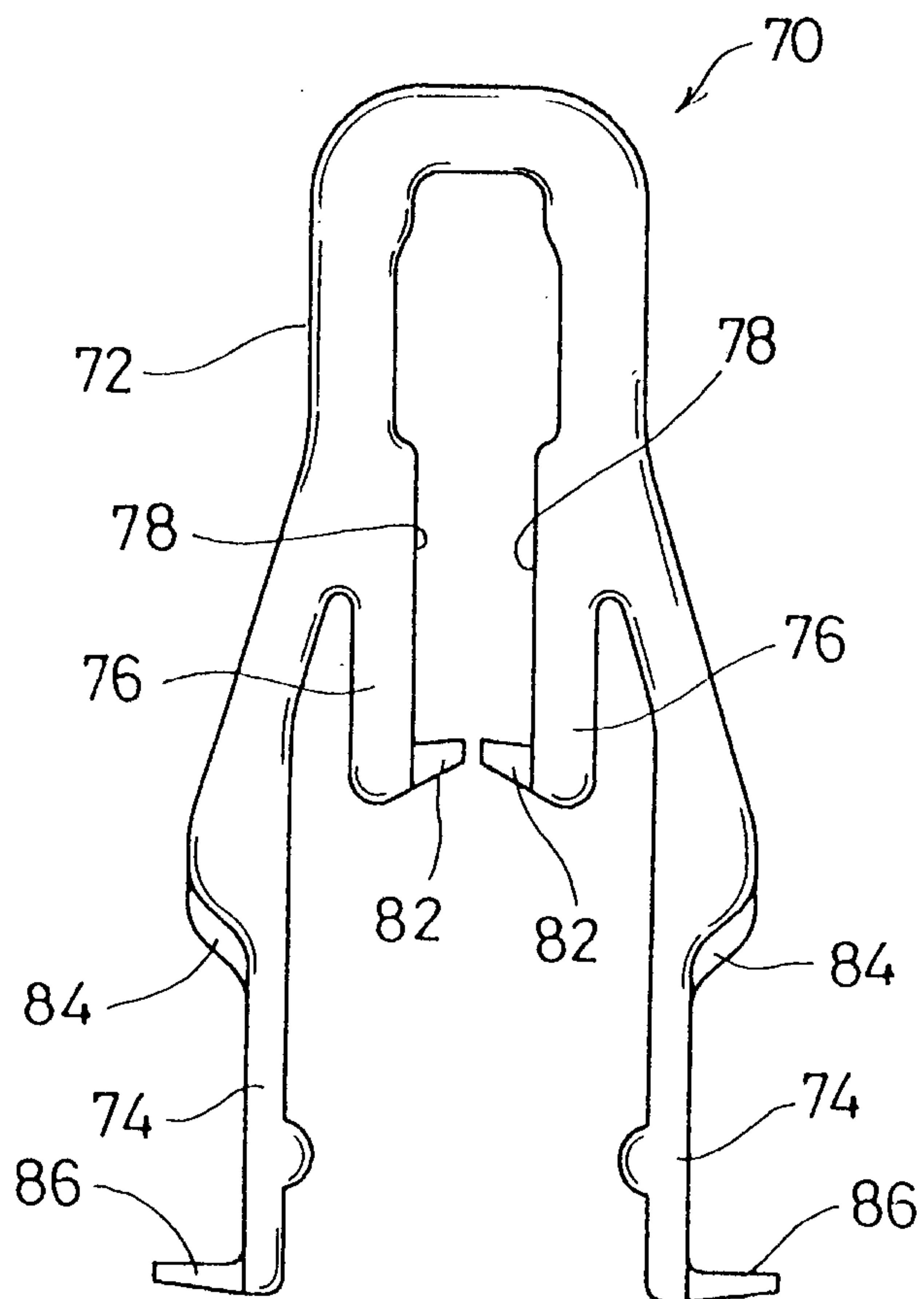


FIG. 9

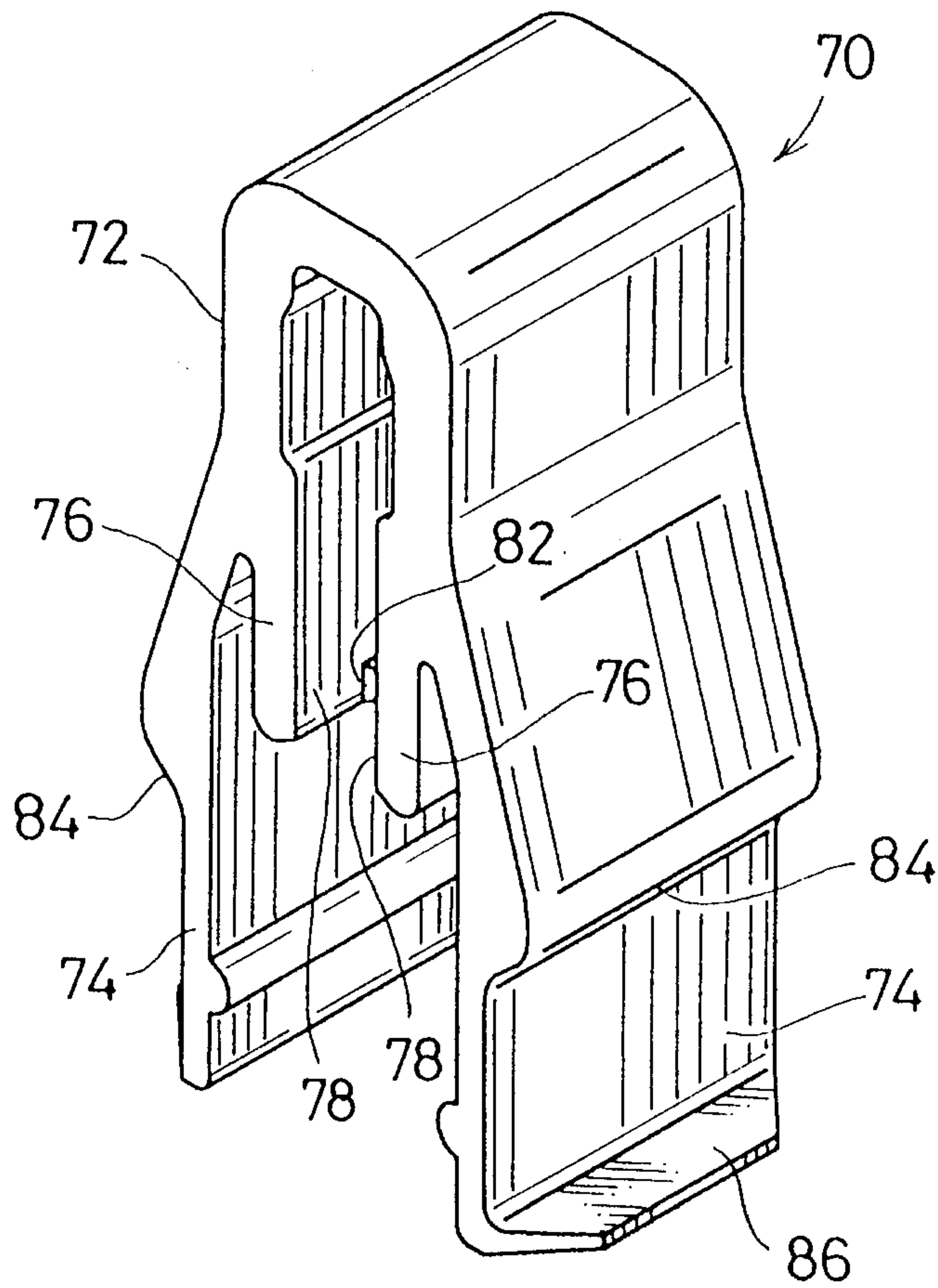


FIG. 10

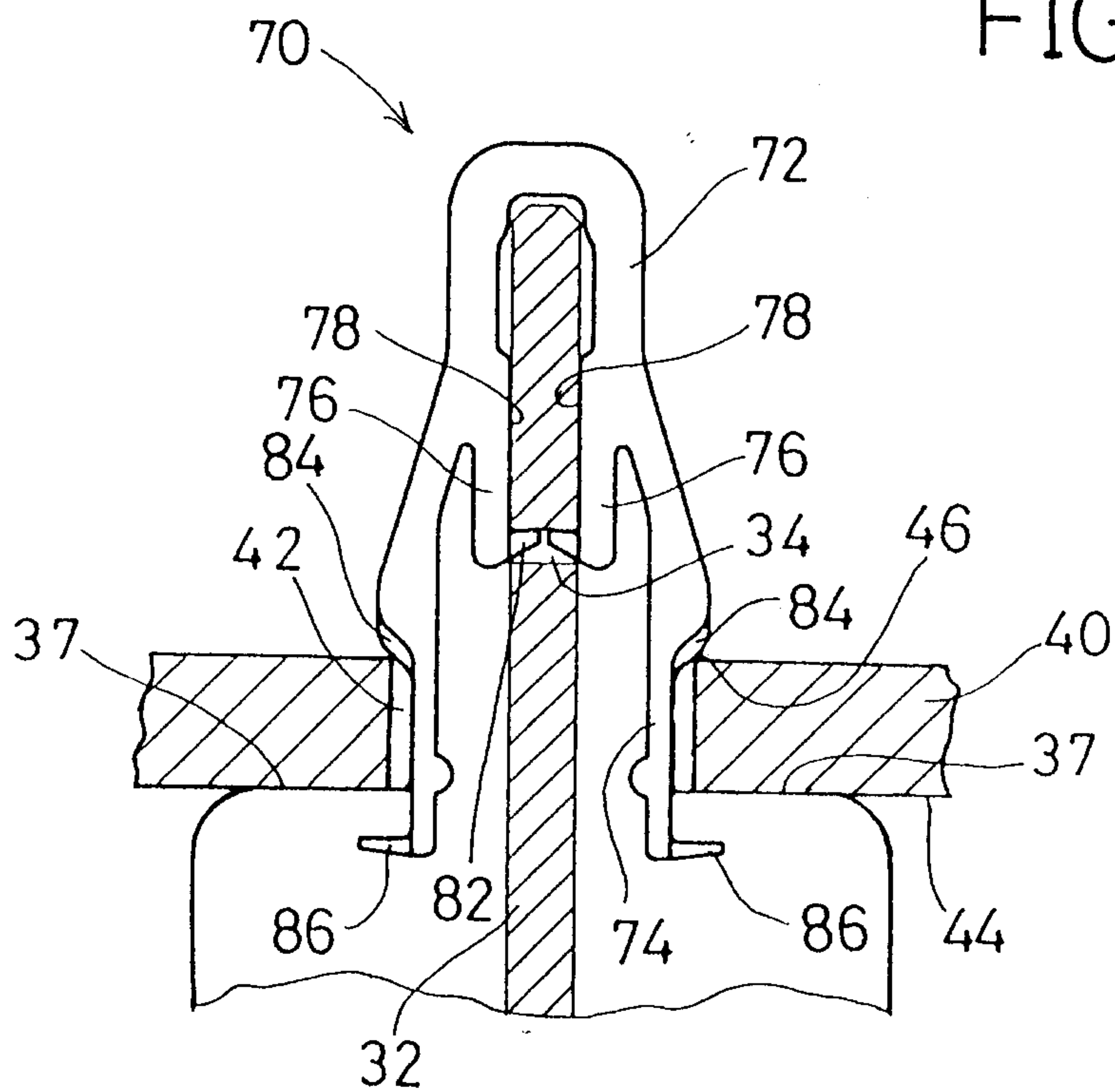


FIG. 11

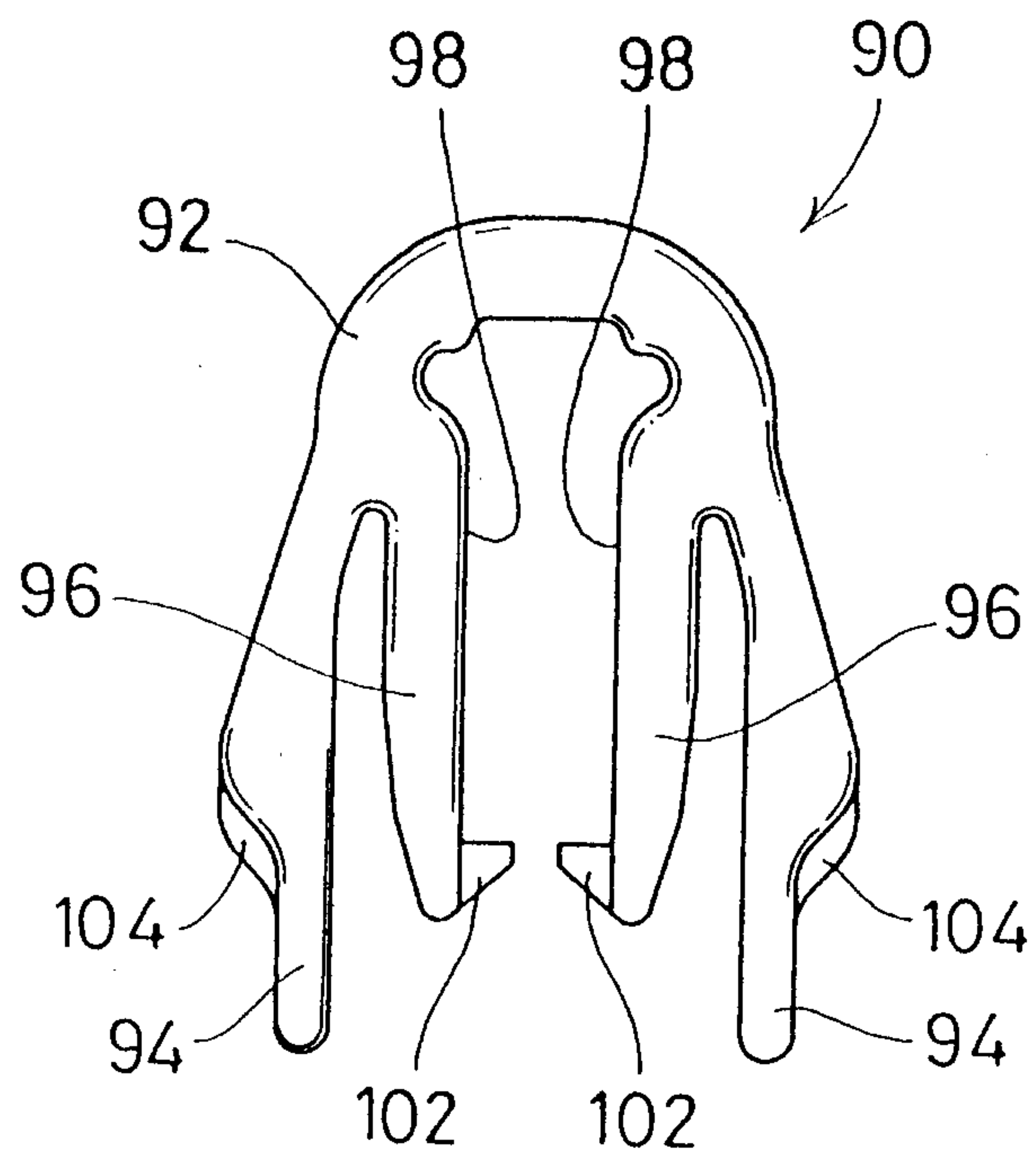


FIG. 12

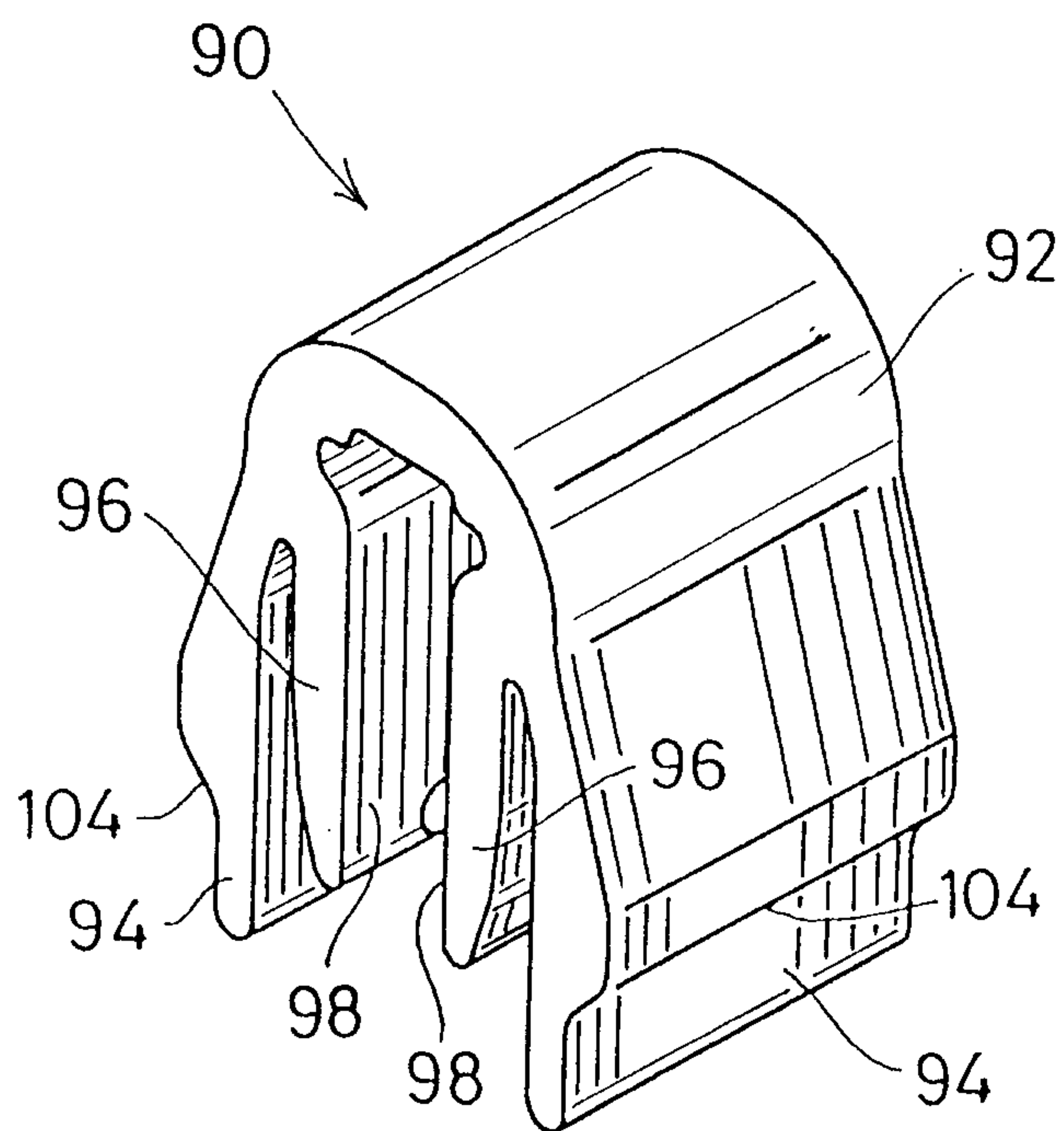


FIG. 13

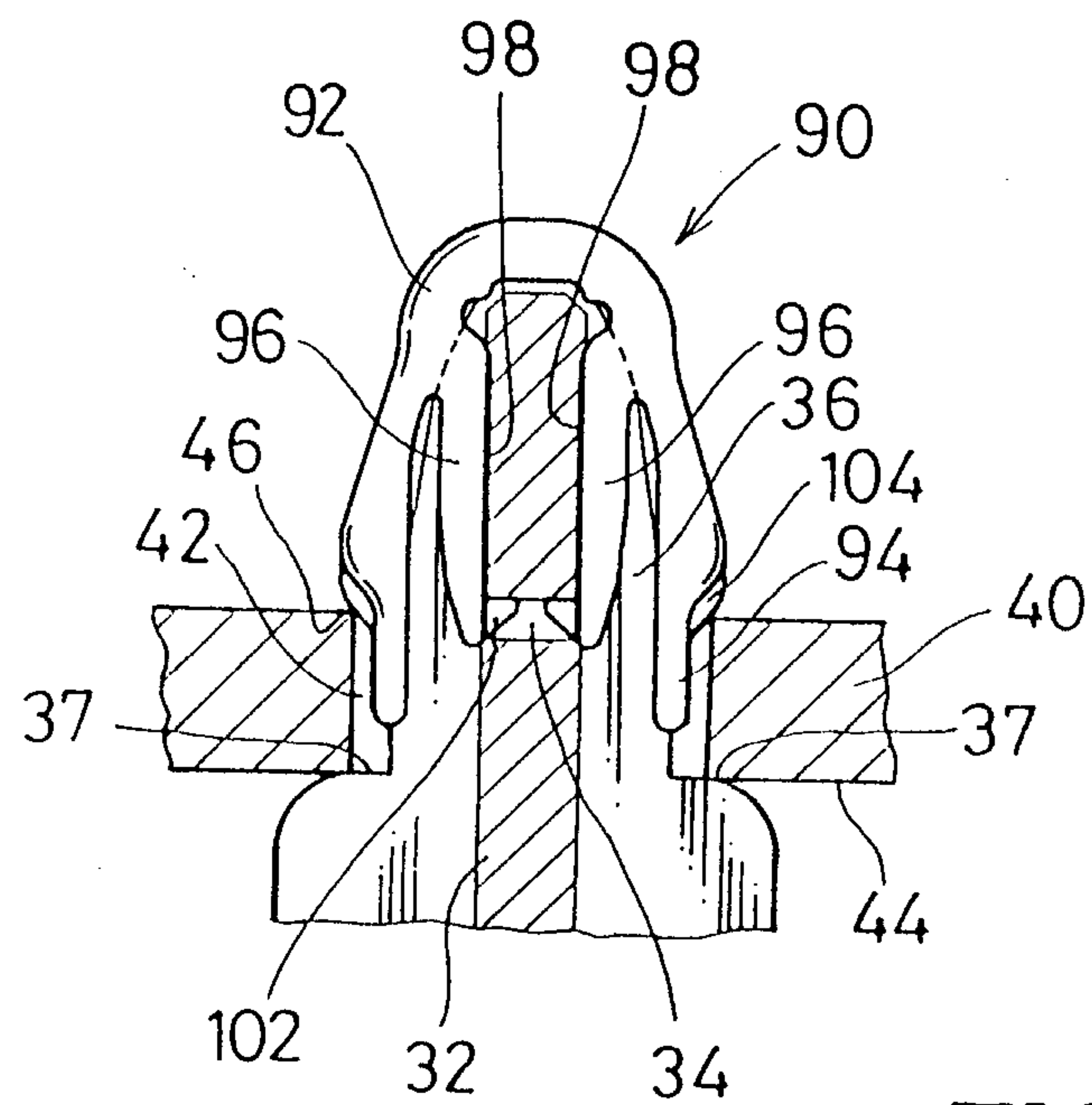


FIG.14

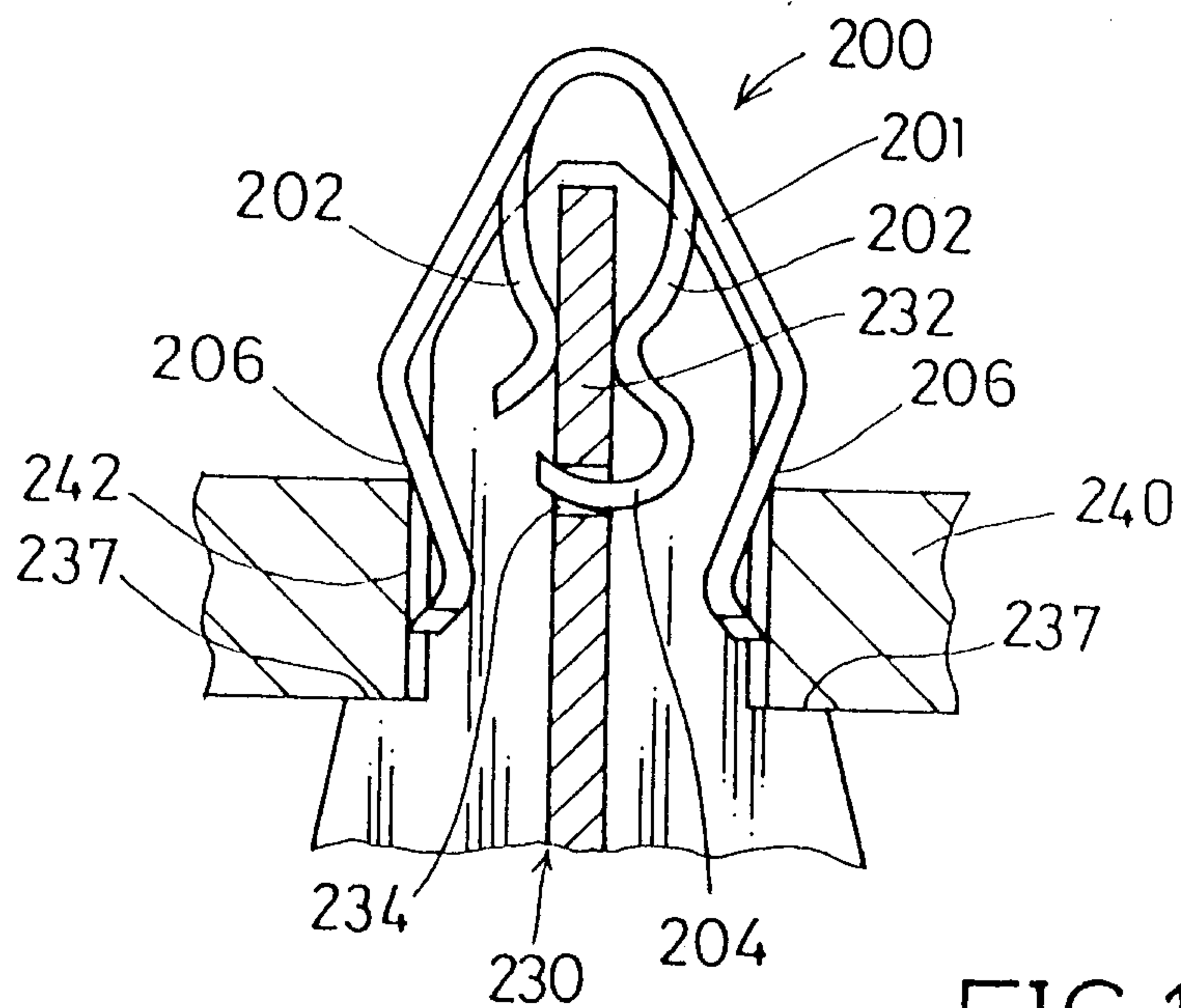


FIG.15  
PRIOR ART

Thanks a Clerk

