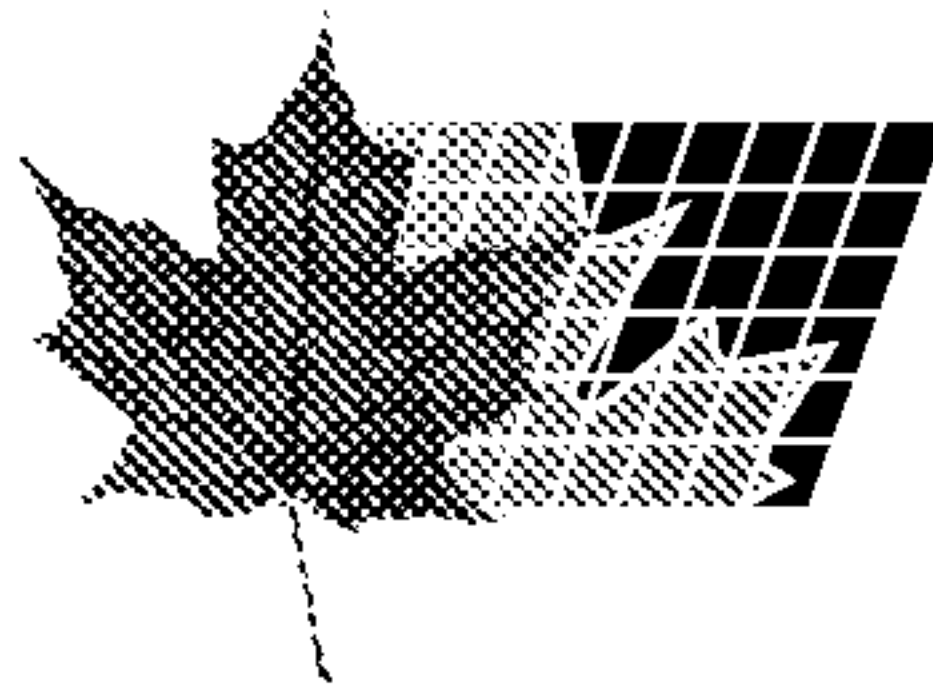




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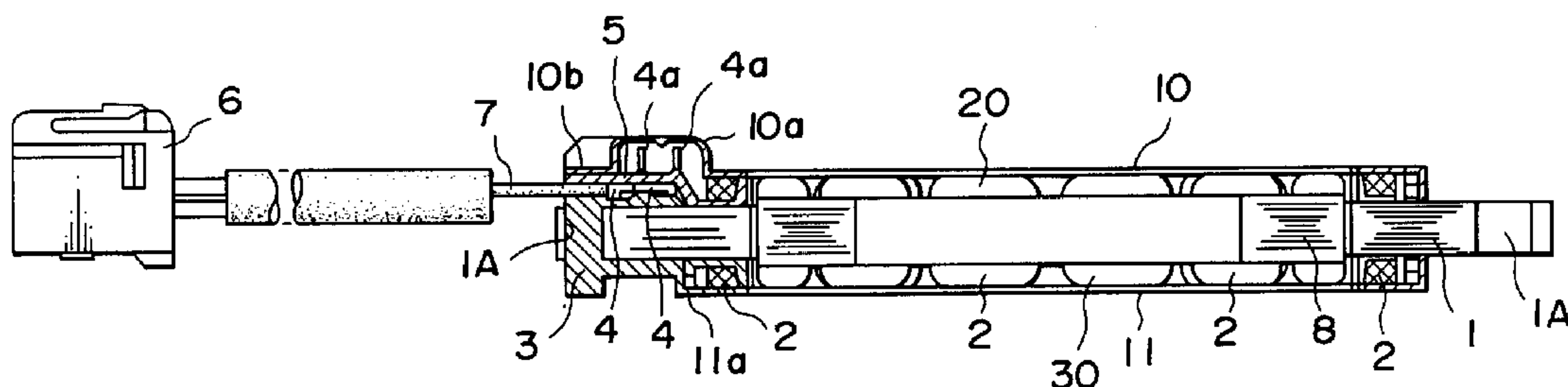
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(30) 1997/09/24 (9-258862) JP

(30) 1997/09/24 (9-258861) JP

(54) **BORNIER DE CONNEXION POUR RESOLVEUR**

(54) **TERMINAL PIN STRUCTURE OF RESOLVER**



(57) Bornier de connexion de résolveur comprenant un corps en plastique retenant les broches de connexion auxquelles un fil est connecté. Le bornier est monté sur un élément de protection inférieur. Ce dernier est relié à l'extrémité d'un stator et à des bobines reliées à des éléments des broches de connexion faisant saillie à partir du corps en plastique. L'invention proposée permet donc d'éviter un soudage inégal des bobines au fil, ce qui se produit habituellement lorsque les bobines sont soudées directement au fil par un procédé manuel. Ainsi, le soudage peut être effectué facilement, les écarts de qualité peuvent être éliminés et l'utilisabilité peut être améliorée.

(57) A terminal pin structure of a resolver having a plastic body for holding terminal pins to which a lead wire is connected is mounted on an undercover. The undercover is connected to the end of a stator and coils connected to projecting portions of terminal pins extending from the plastic body. With this arrangement, dispersed soldering of coils to a lead wire which conventionally arises when the coils are directly soldered to the lead wire by a manual operation can be eliminated and thus, soldering can be easily carried out, variability in quality can be eliminated and operability can be improved.

## ABSTRACT OF THE DISCLOSURE

A terminal pin structure of a resolver having a plastic body for holding terminal pins to which a lead wire is connected is mounted on an undercover. The undercover is connected to the end of a stator and coils connected to projecting portions of terminal pins extending from the plastic body. With this arrangement, dispersed soldering of coils to a lead wire which conventionally arises when the coils are directly soldered to the lead wire by a manual operation can be eliminated and thus, soldering can be easily carried out, variability in quality can be eliminated and operability can be improved.

## TERMINAL PIN STRUCTURE OF RESOLVER

The present invention relates to a terminal pin structure of a resolver, and more particularly, to an improved method of connecting coils on a stator to terminal pins associated therewith.

Conventionally used prior art resolvers are such that a lead wire is secured in the slot of a stator and the ends of coils are connected to the lead wire by solder.

10        Since conventional resolvers are arranged as described above, connecting the lead wire to the coils by solder is difficult, leading to operation and reliability difficulties.

An object of one embodiment of the present invention is to alleviate these difficulties and provide a terminal pin structure of a resolver capable of reliable operation by connecting coils disposed to a stator to terminal pins disposed to a lead wire.

20        In accordance with one aspect of the present invention, there is provided a terminal pin structure of a resolver having a rotor rotatably mounted to an inside of a ring-shaped stator and coils disposed to the ring-shaped stator and connected to a lead wire, comprising: a plastic body for holding terminal pins, the terminal pins connecting the lead wire and including projecting portions to the body positioned on an undercover mounted to an end of the ring-shaped stator, the coils connected to the

projecting portions of the terminal pins projecting from the plastic body.

Having thus generally described the invention, reference will now be made to the accompanying drawings, illustrating preferred embodiments and in which:

FIG. 1 is a sectional view showing a terminal pin structure of a resolver according to one embodiment of the present invention;

FIG. 2 is a plan view of FIG. 1;

10      FIG. 3 is a view showing an arrangement of a terminal pin of FIG. 1;

FIG. 4 is a view of an arrangement of a projecting portion of FIG. 3;

FIG. 5 is a view showing an arrangement of another example of FIG. 3;

FIG. 6 is a view showing an arrangement of a projecting portion of FIG. 5;

FIG. 7 is a view showing an arrangement of another example of FIG. 3;

20      FIG. 8 is a view showing an arrangement of another example of FIG. 3;

FIG. 9 is a view showing an arrangement of another example of FIG. 3;

FIG. 10 is an enlarged sectional view of a main portion of FIG. 1;

FIG. 11 is a sectional view of FIG. 10;

FIG. 12 is a sectional view showing another example of FIG. 11;

FIG. 13 is a sectional view showing another example of FIG. 12;

FIG. 14 is a sectional view showing another example of FIG. 13;

FIG. 15 is a sectional view showing another example of FIG. 14;

FIG. 16 is a sectional view showing another example of FIG. 15;

FIG. 17 is a sectional view showing another example of  
10 FIG. 16;

FIG. 18 is a sectional view showing another example of FIG. 17;

FIG. 19 is a view of a coupling arrangement of each coil protection cover;

FIG. 20 is a sectional view showing another example of a main portion of FIG. 1;

FIG. 21 is a sectional view showing another example of FIG. 20;

FIG. 22 is a sectional view showing another example of  
20 FIG. 20;

FIG. 23 is a view of an arrangement showing another mounting structure of an undercover;

FIG. 24 is a sectional view showing another mounting structure of FIG. 23;

FIG. 25 is a sectional view showing another mounting structure of FIG. 24;

FIG. 26 is a perspective view showing a portion of the undercover;

FIG. 27 is a view describing an operation of FIG. 26;

FIG. 28 is a plan view of FIG. 26;

FIG. 29 is a perspective view showing another example of FIG. 26;

FIG. 30 is a view describing an operation of FIG. 29;

and

FIG. 31 is a plan view of FIG. 29.

Similar numerals employed in the text denote similar elements.

10        A preferable embodiment of a terminal pin structure of a resolver according to the present invention will be described below with reference to the drawings.

Generally denoted by numeral 1 in FIG. 1 and FIG. 2 is a ring-shaped stator in a ring-shape having a multiple-layer structure and coils 2 arranged, for example, as one-phase-excited and two-phase-output type, positioned in a slit (not shown) on an inner edge of the ring-shaped stator 1. Insulation cover members 20, 30 formed to a ring shape are interposed between the coils 2 and the ring-shaped  
20 stator 1 in an upward/downward direction and the coils 2 are insulated from the ring-shaped stator 1 by the insulation cover members 20, 30.

An undercover 3, having a generally C-shaped cross-section, is disposed to a slot 1A at one location of an end 1a of the ring-shaped stator 1 and a plastic body 5, which holds one or a plurality of terminal pins 4. The body 5 is composed of plastic and positioned on the upper surface of the undercover 3. The body 5 is formed integrally with the

insulation cover member 20. The projecting portions 4a of the terminal pins 4 pass through the plastic body 5 and project upwardly. The ends of the coils 2 are connected to the projecting portions 4a.

The respective terminal pins 4 are attached by pressure to a lead wire 7 connected to a connector 6 by pressure attachment. Although not shown, the undercover 3 is inserted into slot 1A formed in the outer periphery of stator 1.

10 A rotor 8, generally circular in shape, is connected to a ring-shaped multiple-layer structure (which may alternately be an integrally sintered structure in place of the multiple-layer structure) or a variable reactance type (VR type), is rotatably mounted in the ring-shaped stator 1. First and second ring-shaped coil protection covers 10, 11 are disposed on both surfaces of the ring-shaped stator 1. The first coil protection cover 10 covers the upper surfaces of the respective coils 2 and the insulation cover member 20 as well as plastic body 5 and projecting portions 20 4a. A bulging portion 10a, in the form of a projecting and bulging shape so as to sufficiently cover the projecting portions 4a, is formed integrally with the coil protection cover 10 at a position corresponding to the projecting portions 4a.

An end 10b of the first coil protection cover 10 is coupled to plastic body 5 by melting, an adhesive or the like, whereas the second coil protection cover 11, covering the lower surfaces of the respective coils 2 and the

insulation cover member 30 as well as an end 11a thereof, is coupled to the undercover 3 by melting, adhering or the like.

The terminal pins 4 are arranged as shown in FIG. 3 to FIG. 9. In greater detail, the projecting portions 4a are substantially cross-shaped in FIG. 3 and FIG. 4; rod-shaped in FIG. 5 and FIG. 6 and a twofolded shape in FIG. 7 through FIG. 9. The ends of the coils 2 are electro-mechanically connected to the projecting portions 4a by  
10 being wound therearound.

As shown in FIG. 10 or FIG. 11, an end 10b of the first coil protection cover 10 is coupled with the plastic body 5 by a fusing portion 100, an adhesive or the like, whereas the second coil protection cover 11, which covers the lower surfaces of the respective coils 2 as well as an end 11a thereof, is coupled with the undercover 3 by fusing, adhering or the like.

The following alternative mounting structures of the coil protection cover 10 may be employed in addition to the  
20 aforesaid respective arrangements with similar results.

The mounting structure includes, for example, a situation where the plastic body 5 is positioned inside the undercover 3 as shown in FIG. 12; the coil protection cover 10 is coupled with the plastic body 5 using a stepped coupling portion 101 as shown in FIG. 13; the coil protection cover 10 is coupled with the plastic body 5 using a caulking portion 102 as shown in FIG. 14; the coil protection cover 10 is coupled with the plastic body 5

using a hook portion 103 as shown in FIG. 15; the coil protection cover 10 of FIG. 10 is partly tapered and coupled using a fusing portion 100 as shown in FIG. 16; the projection 5a of the plastic body 5 is caulked as shown in FIG. 17; a pair of the plastic bodies 5 located on both the surfaces of the stator 1 is clamped between a pair of the coil protection covers 10, 11 and the column 10c of the coil protection cover 10 is coupled by the fusing portion 100 as shown in FIG. 18; and a case that the projection 11b of the second coil protection cover 11 is caused to pass through a hole 105 formed to the recess 104 of the first coil protection cover 10 and coupled.

As shown in FIG. 20, the terminal pins 4 are held by a projection 3A which is formed to an end of the undercover 3 integrally therewith and abutted against the projecting portions 4a of the terminal pins 4. In this case, a plurality of projections 3b formed on the undercover 3 are abutted against the bottom surfaces of the terminal pins 4.

Further, as shown in FIG. 21, an overlaid cylindrical portion 5B is formed on the periphery of each of the through holes 5A of the plastic body 5 through which the projecting portions 4a of the plastic body 5 pass. This ensures that the projecting portions 4a can be securely held by the cylindrical portions 5B.

In a further example shown in FIG. 22, one pair of two-step terminal pins 4 are formed in the plastic body 5. The number of the terminal pins 4 is exemplary only. Although the undercover 3 may be disposed below the plastic

body 5 in the above insert molding, it is also possible to omit a portion of the undercover 3 so that the plastic body 5 is in direct contact with a surface of the ring-shaped stator 1.

Next, in another example shown in FIG. 23 in which the aforesaid example is shown, the engagement of the hook portion 3B of the undercover 3 with the claw portion 5C of the plastic body 5 permits the plastic body 5 to be coupled with the undercover 3 so that the terminal pins 4 are held  
10 as discussed in the previous example.

Although the undercover 3 is arranged to have the C-shaped cross section in FIG. 1, it may be coupled to the ring-shaped stator 1 by engaging claw 3D of undercover 3 for insertion into the U-shaped groove 1A of the ring-shaped stator 1 and engaged therewith as shown in FIG. 24. Alternatively, they can be coupled by an adhesive without using the coupling claw 3D. The coupling claw 3D is not limited to a fork-shape shown in FIG. 24 and it is also possible to form the coupling claw 3D as an integrally  
20 arranged, non-modified shape having a hole 3DA, as illustrated in FIG. 25.

The engaging claw 3D may be formed in a fork-shape with an arc-shaped recess 3Da to enhance elasticity and restoring force as shown in FIG. 26 to FIG. 28 or alternately, a fork-shape with respective pairs of claws 3Db as shown in FIG. 29 to FIG. 31. As a further arrangement, the portion shown by a dotted line in FIG. 29

may be made hollow to enhance an elastic force and a restoring force, in addition to the example shown in FIG. 24.

Since the terminal pin structure of the resolver according to the present invention is arranged as described above, the following advantage can be obtained.

In view of the fact that the plastic body, which holds the terminal pins having the lead wire connected thereto, is connected to the undercover, mounted to the stator and  
10 the coils are directly connected to the terminal pins, a soldering job is stably carried out, productivity improved and reliability enhanced relative to the conventional method of directly soldering a lead wire to coils.

Although embodiments of the invention have been described above, it is not limited thereto and it will be apparent to those skilled in the art that numerous modifications form part of the present invention insofar as they do not depart from the spirit, nature and scope of the claimed and described invention.

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

1. A terminal pin structure of a resolver having a rotor rotatably mounted to an inside of a ring-shaped stator and coils disposed to the ring-shaped stator and connected to a lead wire, comprising: a plastic body for holding terminal pins, said terminal pins connecting said lead wire and including projecting portions to said body positioned on an undercover mounted to an end of said ring-shaped stator, said coils connected to said projecting portions of said terminal pins projecting from said plastic body.

2. A terminal pin structure of a resolver according to claim 1, wherein said terminal pins are L-shaped.

3. A terminal pin structure of a resolver according to claim 1 or 2, wherein said projecting portions of said terminal pins are cross-shaped.

4. A terminal pin structure of a resolver according to claim 1 or 2, wherein said projecting portions of said terminal pins comprise a twofold shape by folds.

5. A terminal pin structure of a resolver according to claim 1, comprising a first coil protection cover and second coil protection cover disposed on both the surfaces

of said ring-shaped stator having a ring shape for covering said coils and a bulging portion associated with said first coil protection cover for covering said projecting portions, wherein said first coil protection cover is coupled to said plastic body.

6. A terminal pin securing structure of a resolver according to claim 1, wherein said plastic body holding said terminal pins having said lead wire is disposed on said undercover mounted to an end of said ring-shaped stator and said projection of said undercover being abutted against said terminal pins.

7. A terminal pin securing structure of a resolver according to claim 6, wherein said terminal pin securing structure includes through holes through which said projecting portions of said terminal pins pass, cylindrical portions formed on peripheries of said through holes, said cylindrical portions extending along said projecting portions.

8. A terminal pin securing structure of a resolver according to claim 6, wherein said undercover includes a hook portion said hook portion being engageable with a claw portion on said plastic body.

9. A terminal pin securing structure of a resolver according to claim 1, including a terminal pins insert molded to said plastic body.

10. A terminal pin securing structure of a resolver according to claim 1, including a resilient engaging claw on said undercover engageable with a groove of said ring-shaped stator.



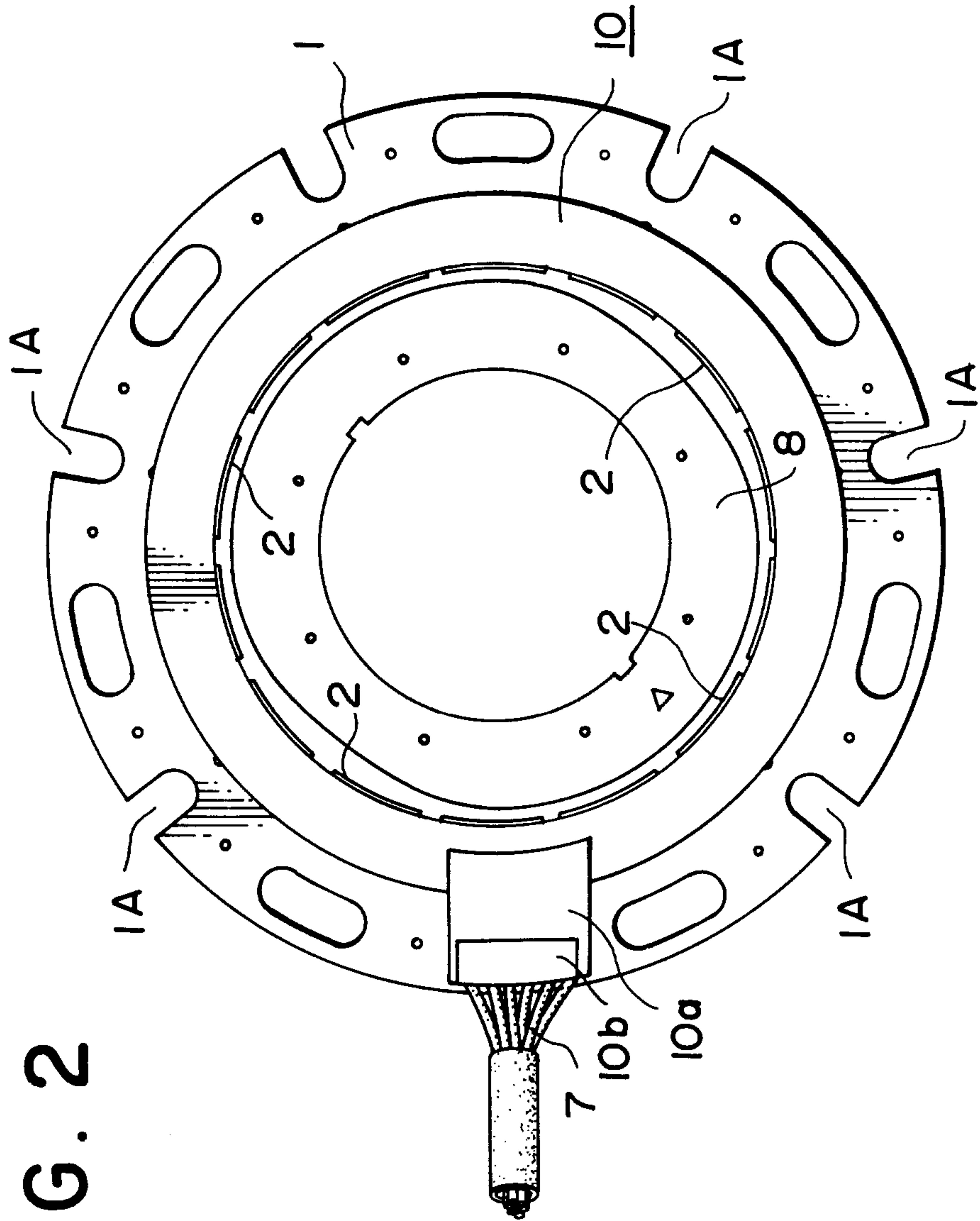


FIG. 2

FIG. 3

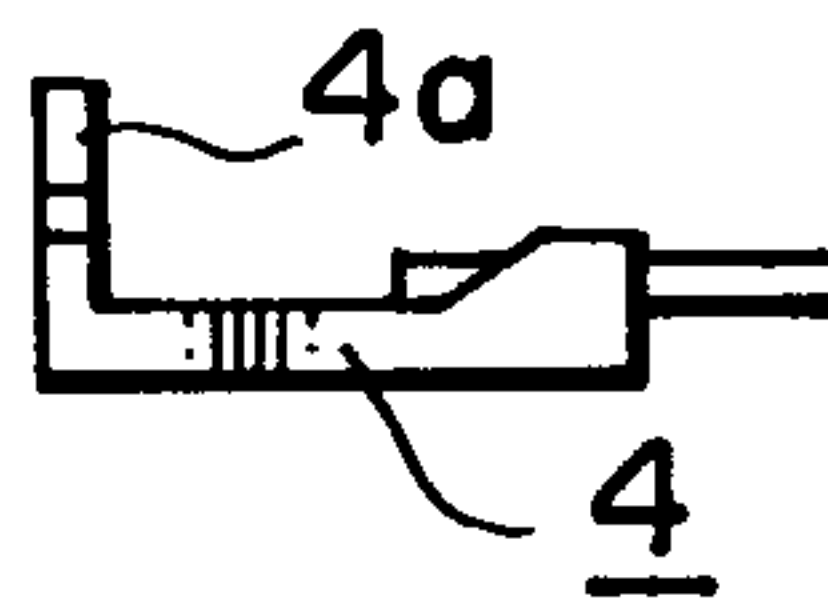
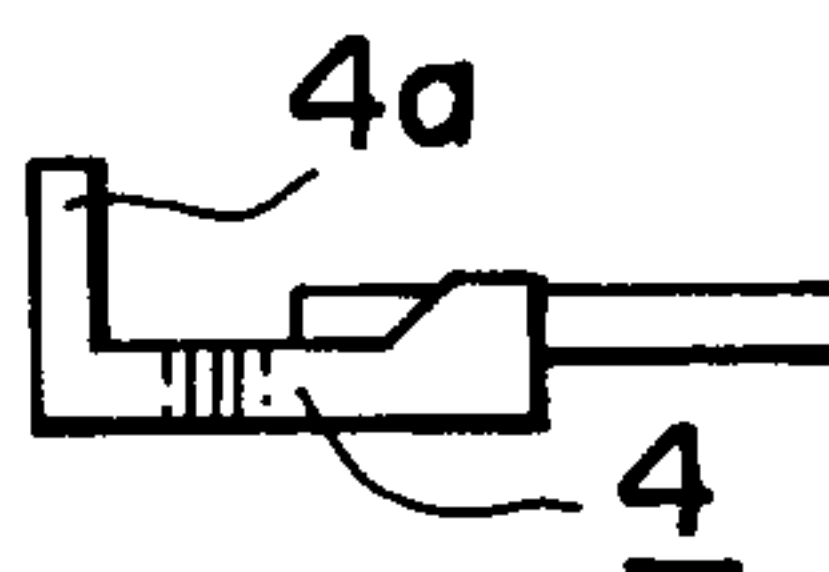


FIG. 4



FIG. 5



Marks & Clerk

FIG. 6

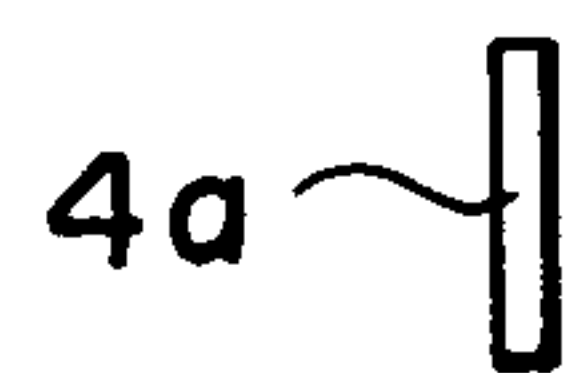


FIG. 7

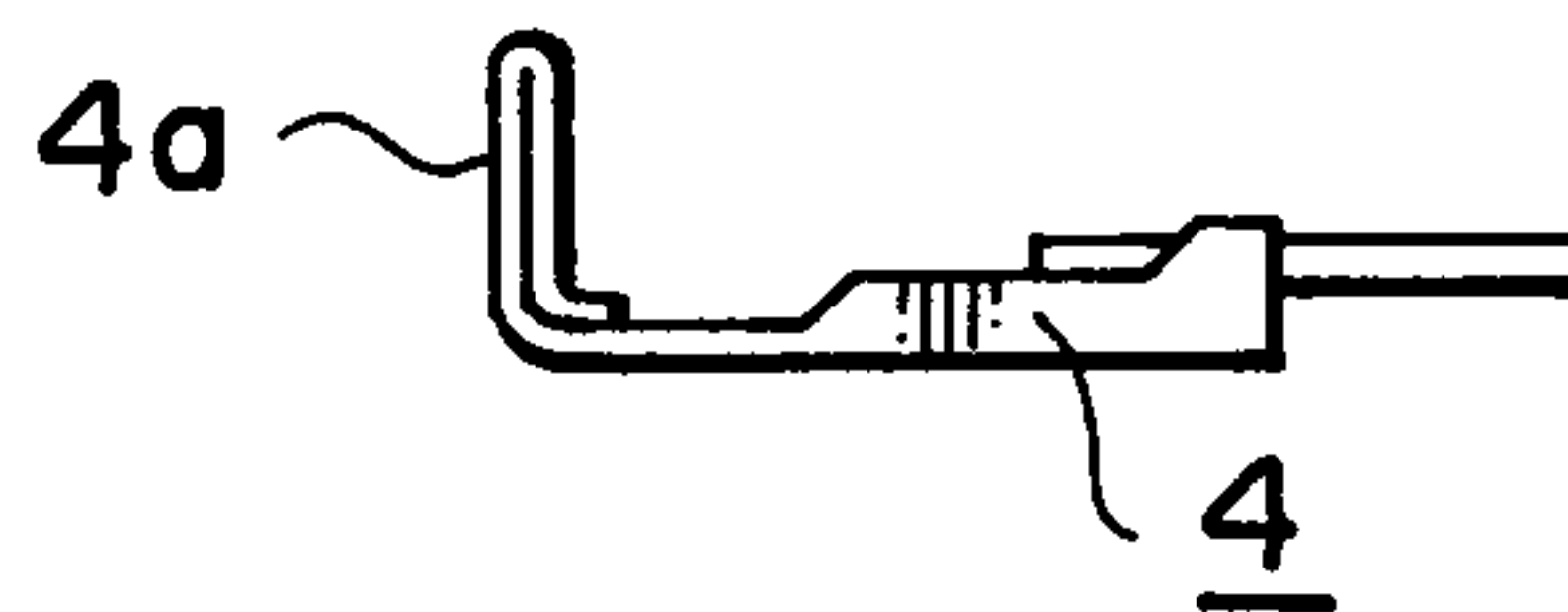


FIG. 8

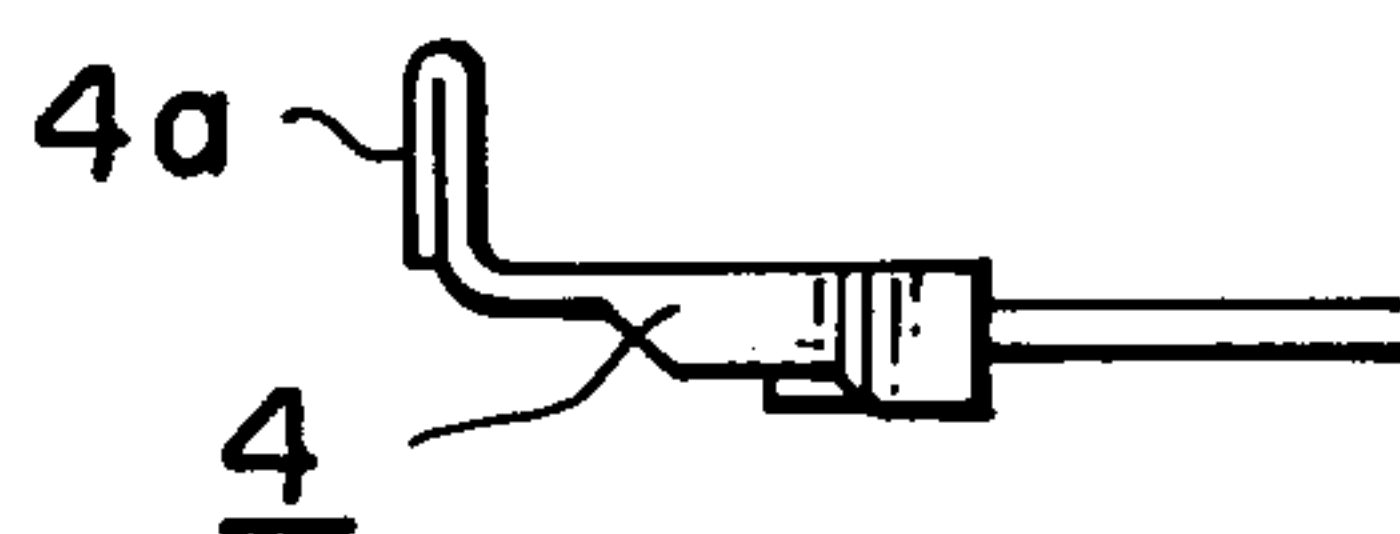


FIG. 9

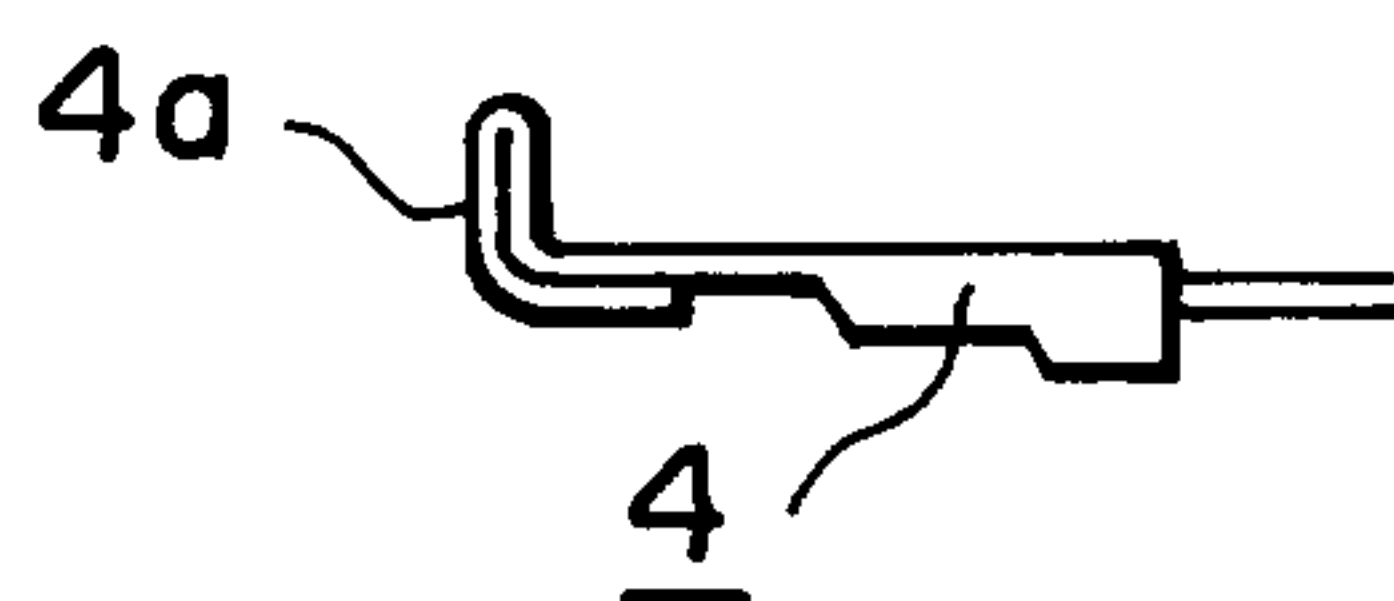


FIG. 10

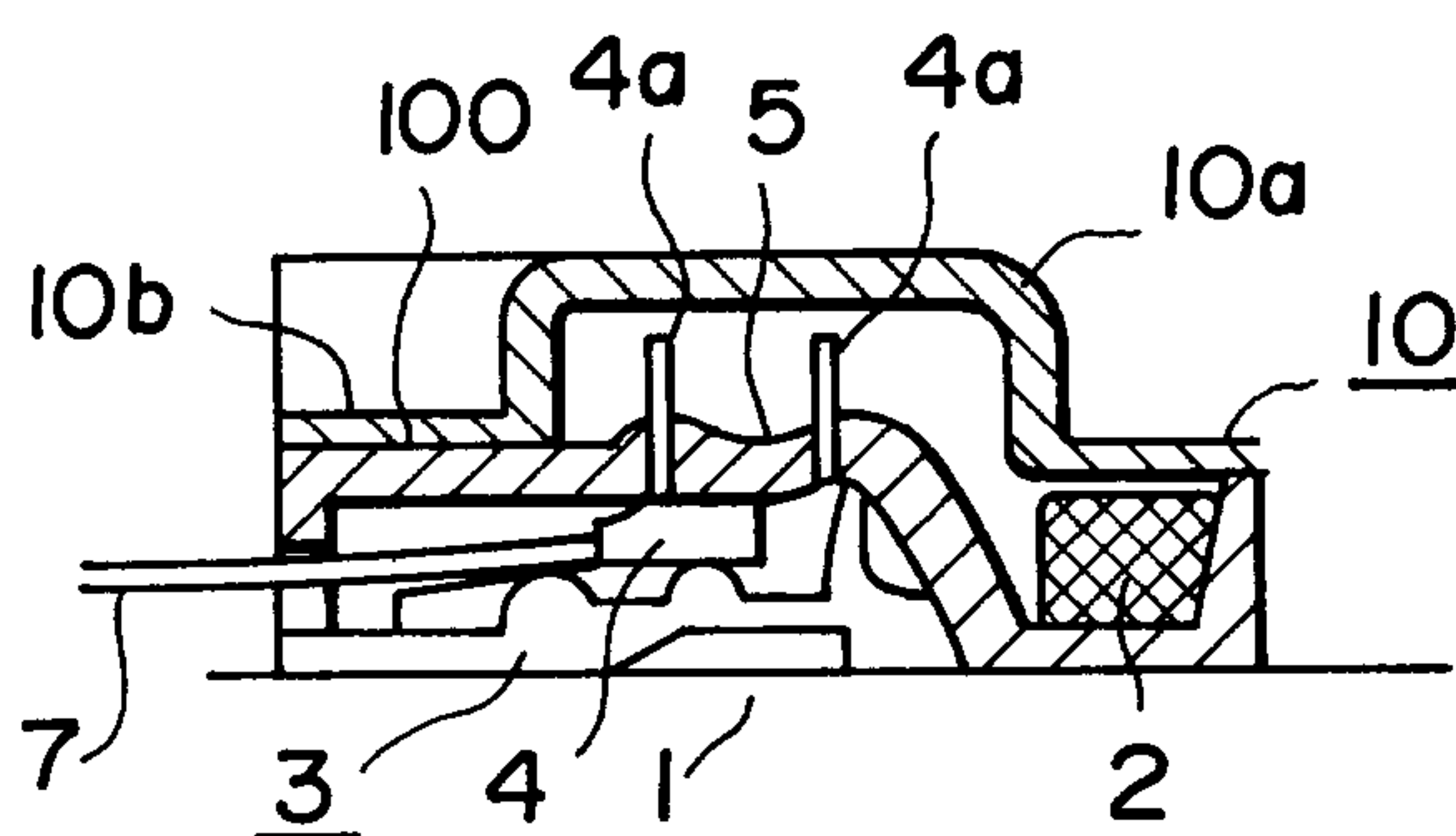


FIG. 11

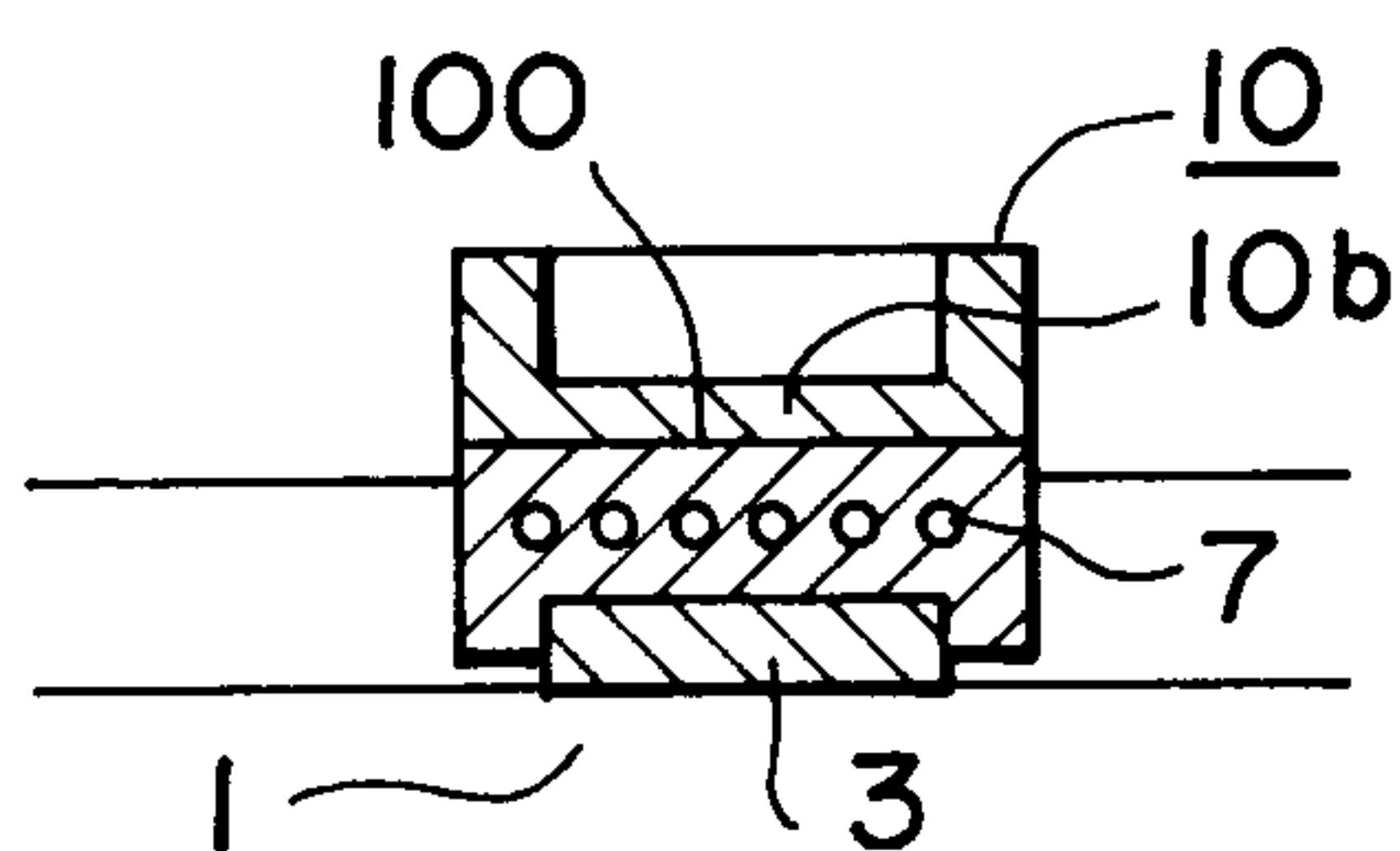


FIG. 12

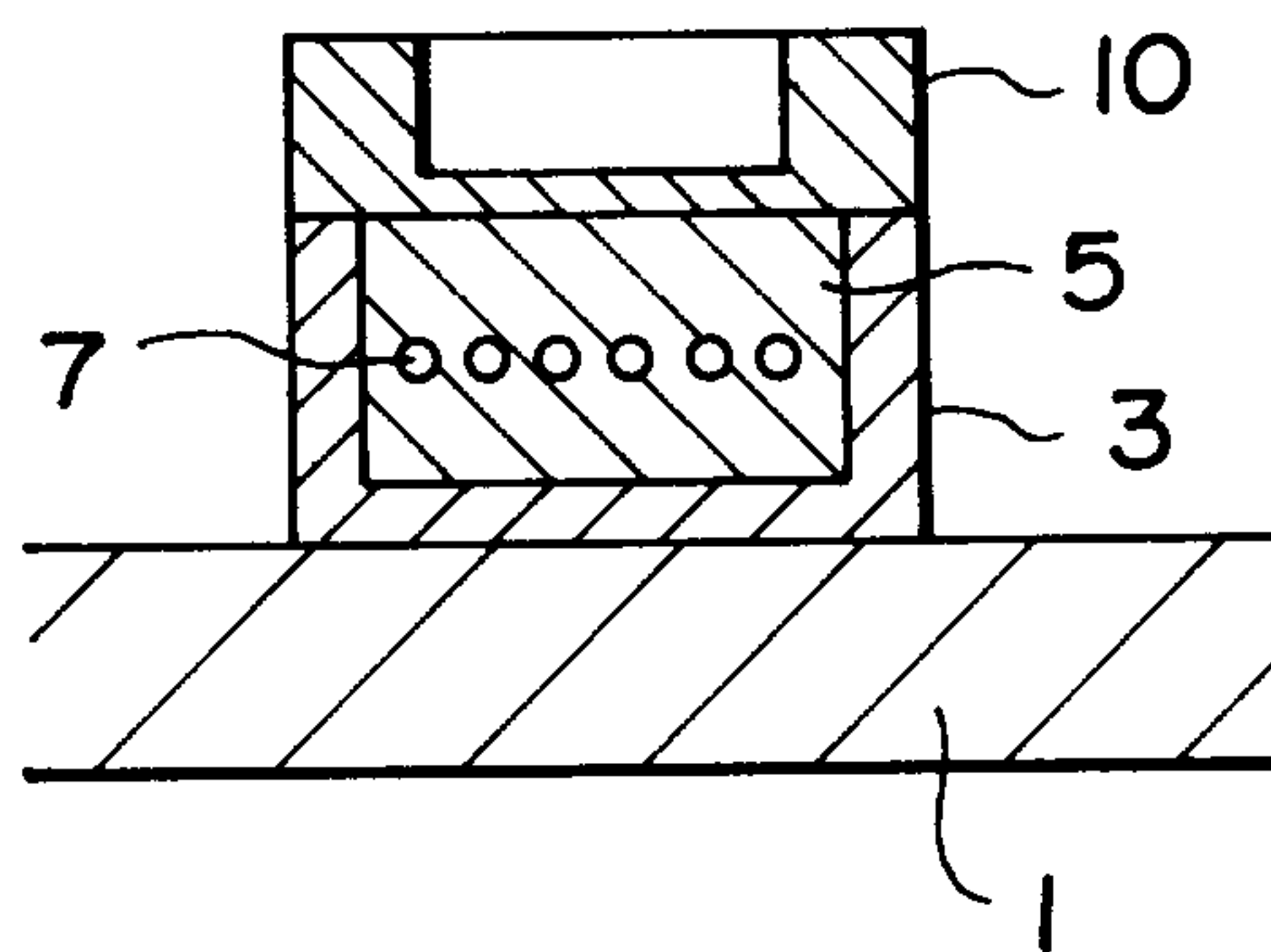


FIG. 13

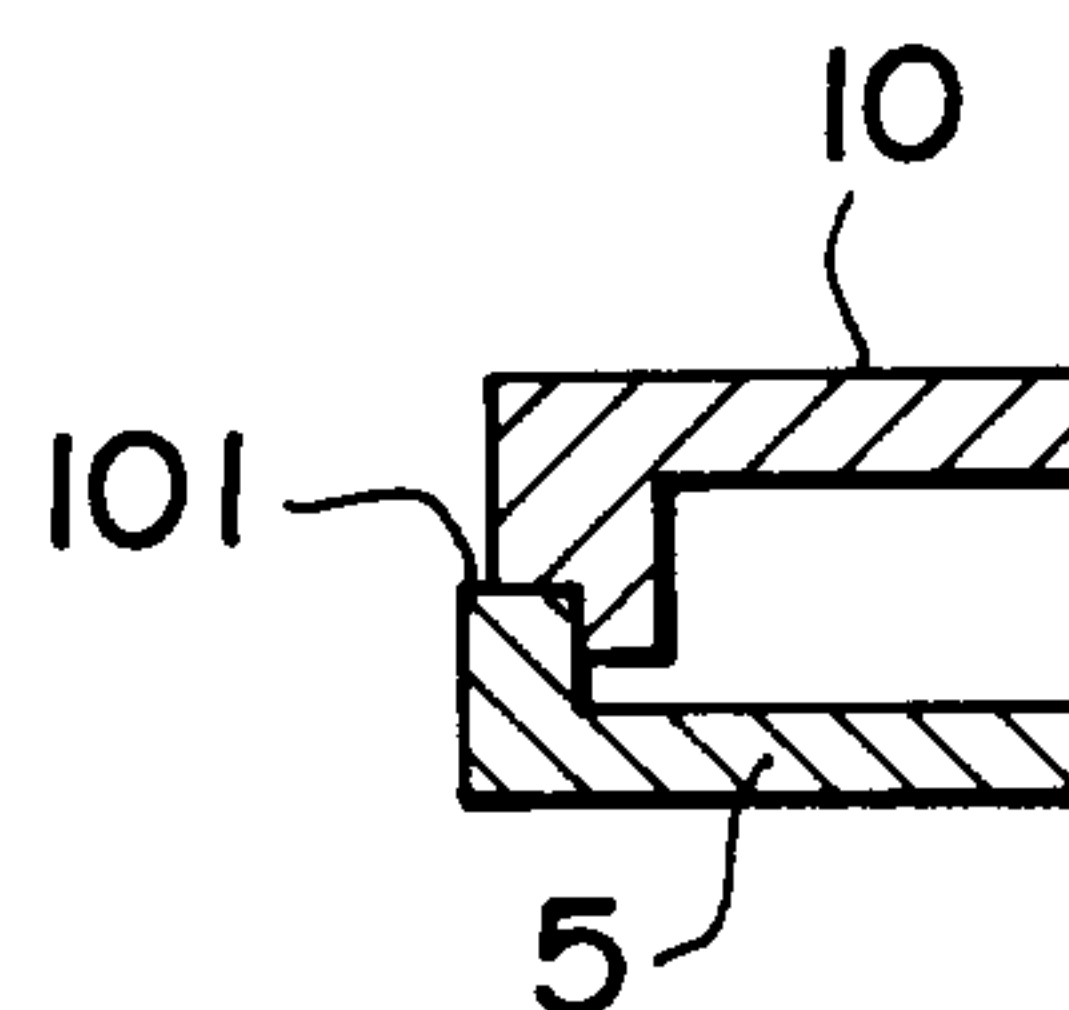


FIG. 14

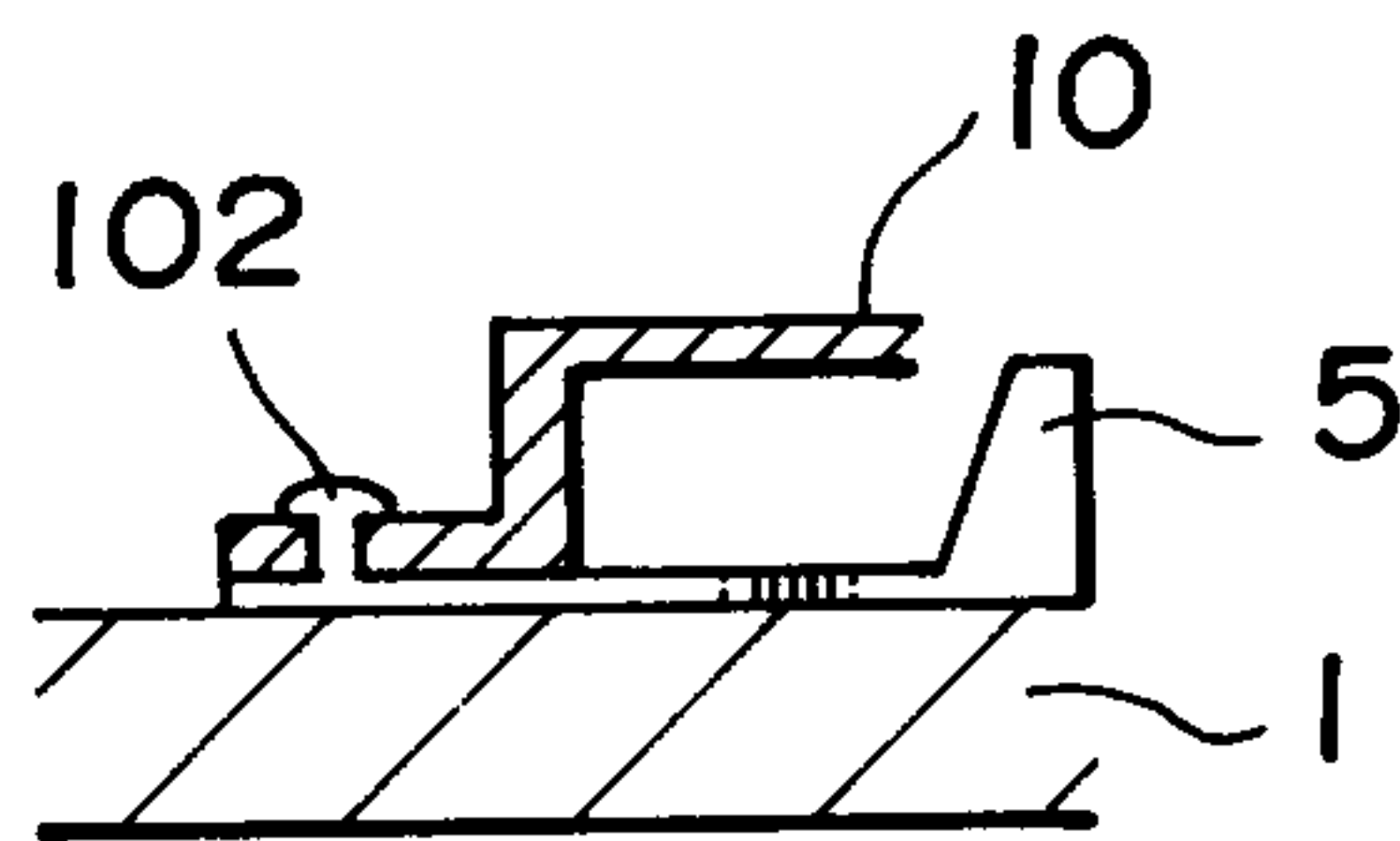


FIG. 15

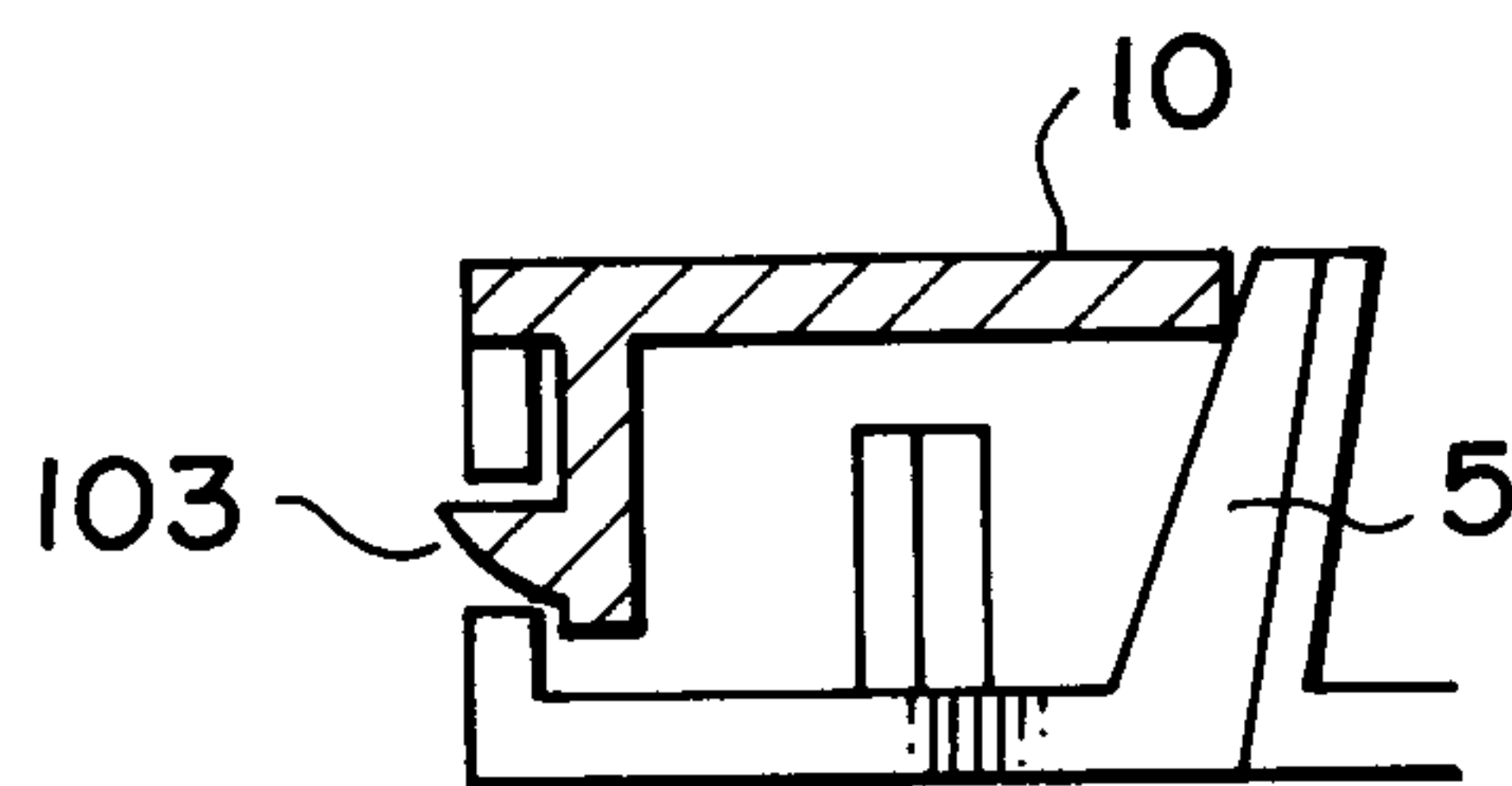


FIG. 16

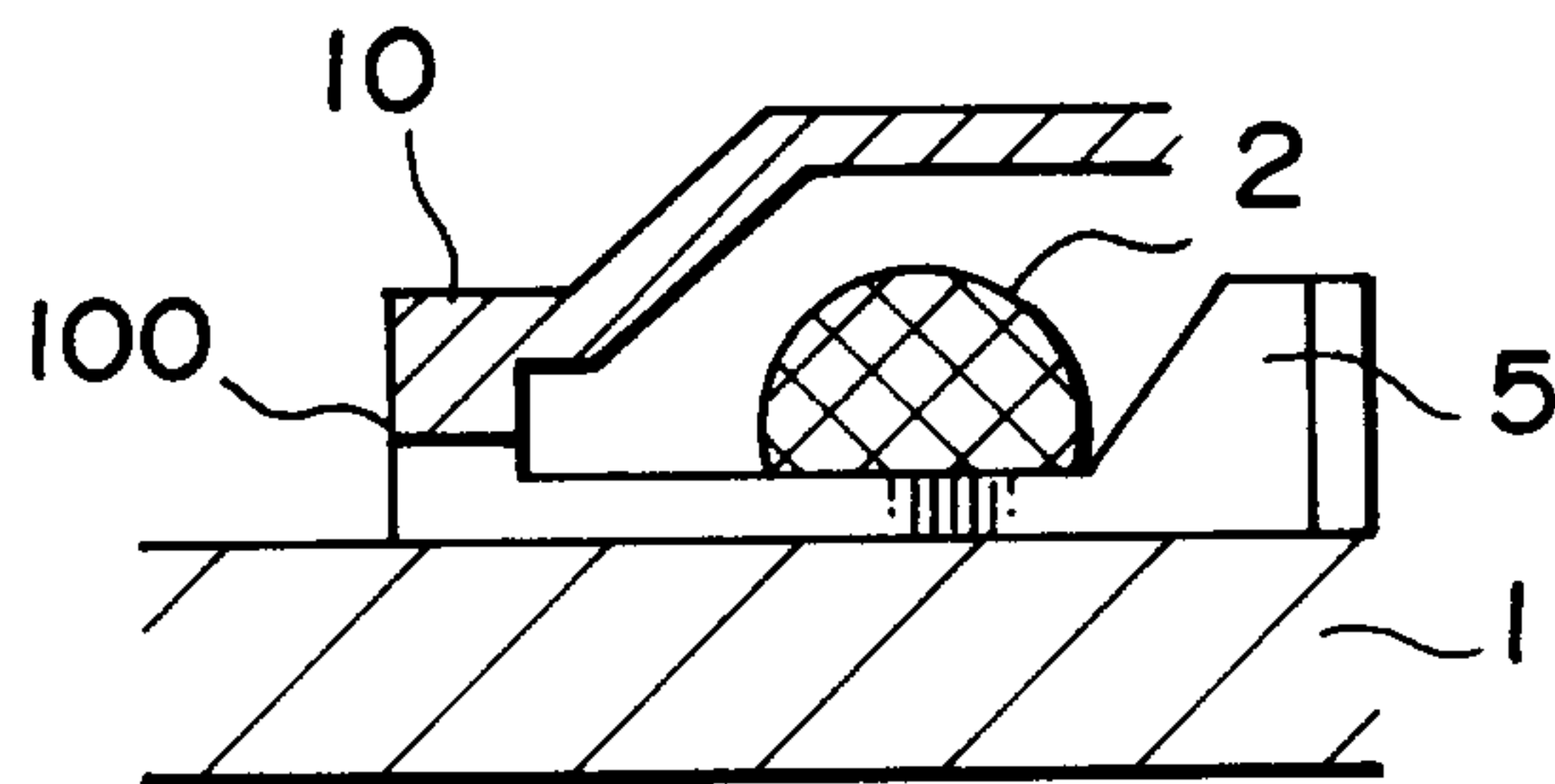


FIG. 17

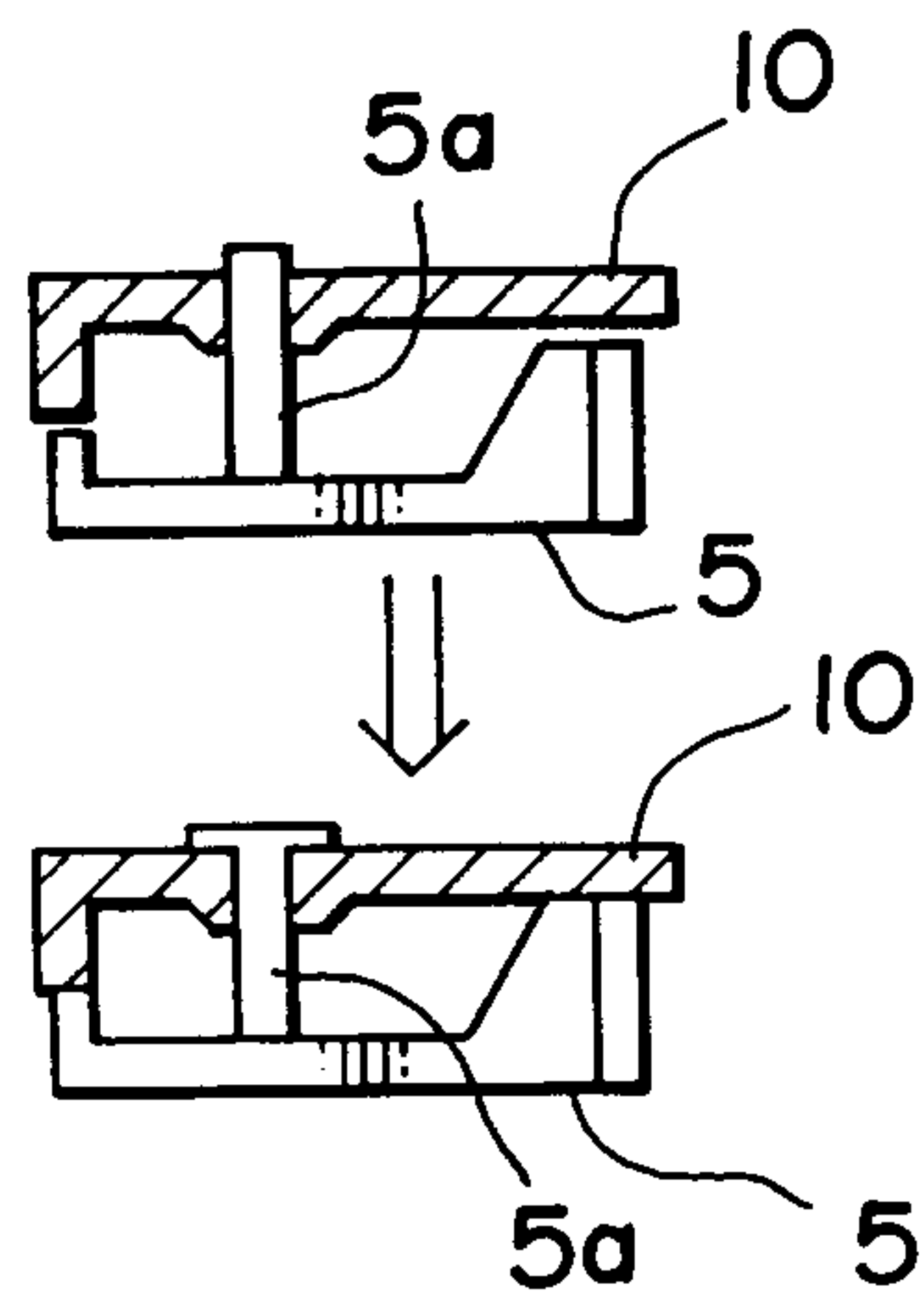


FIG. 18

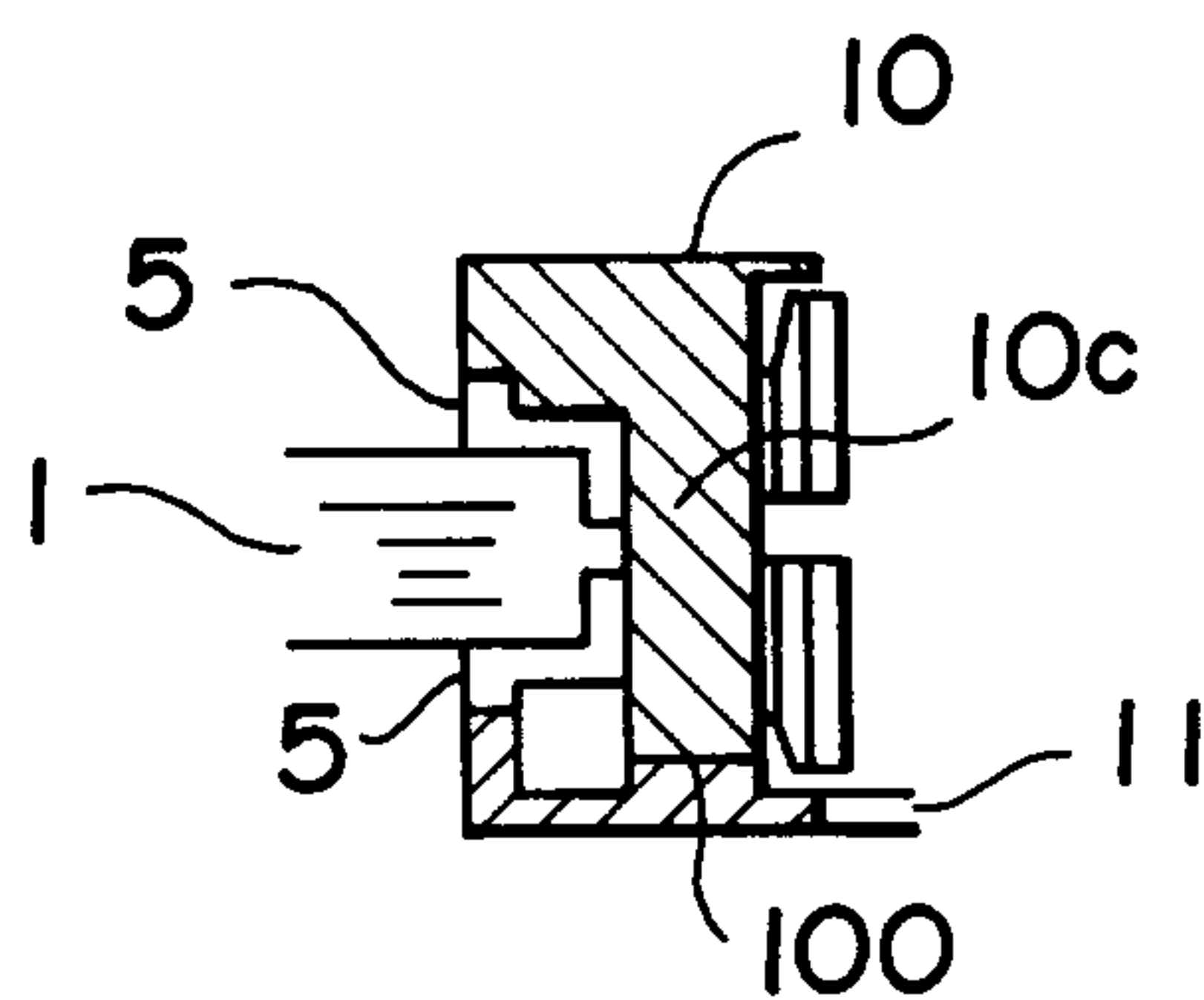


FIG. 19

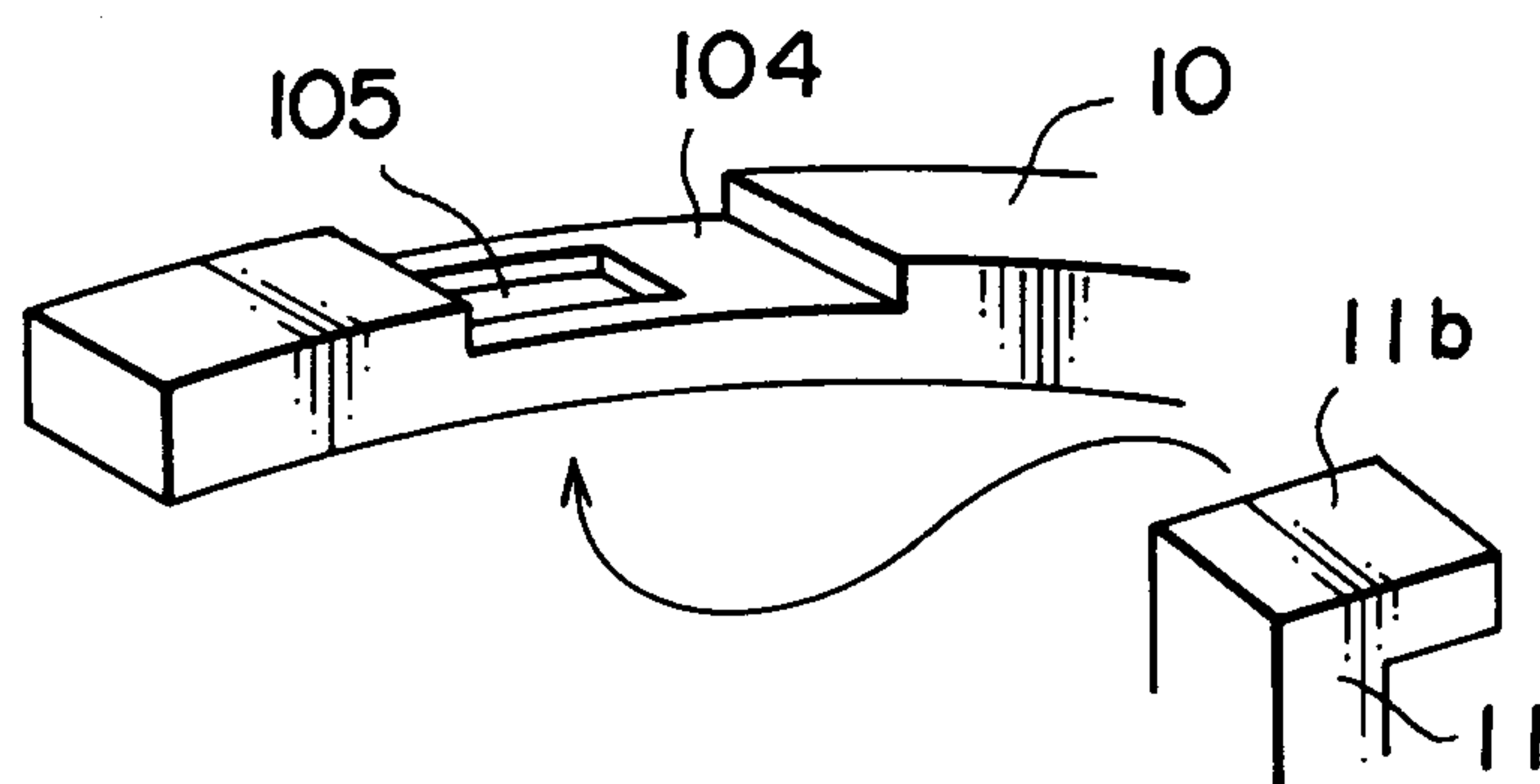


FIG. 20

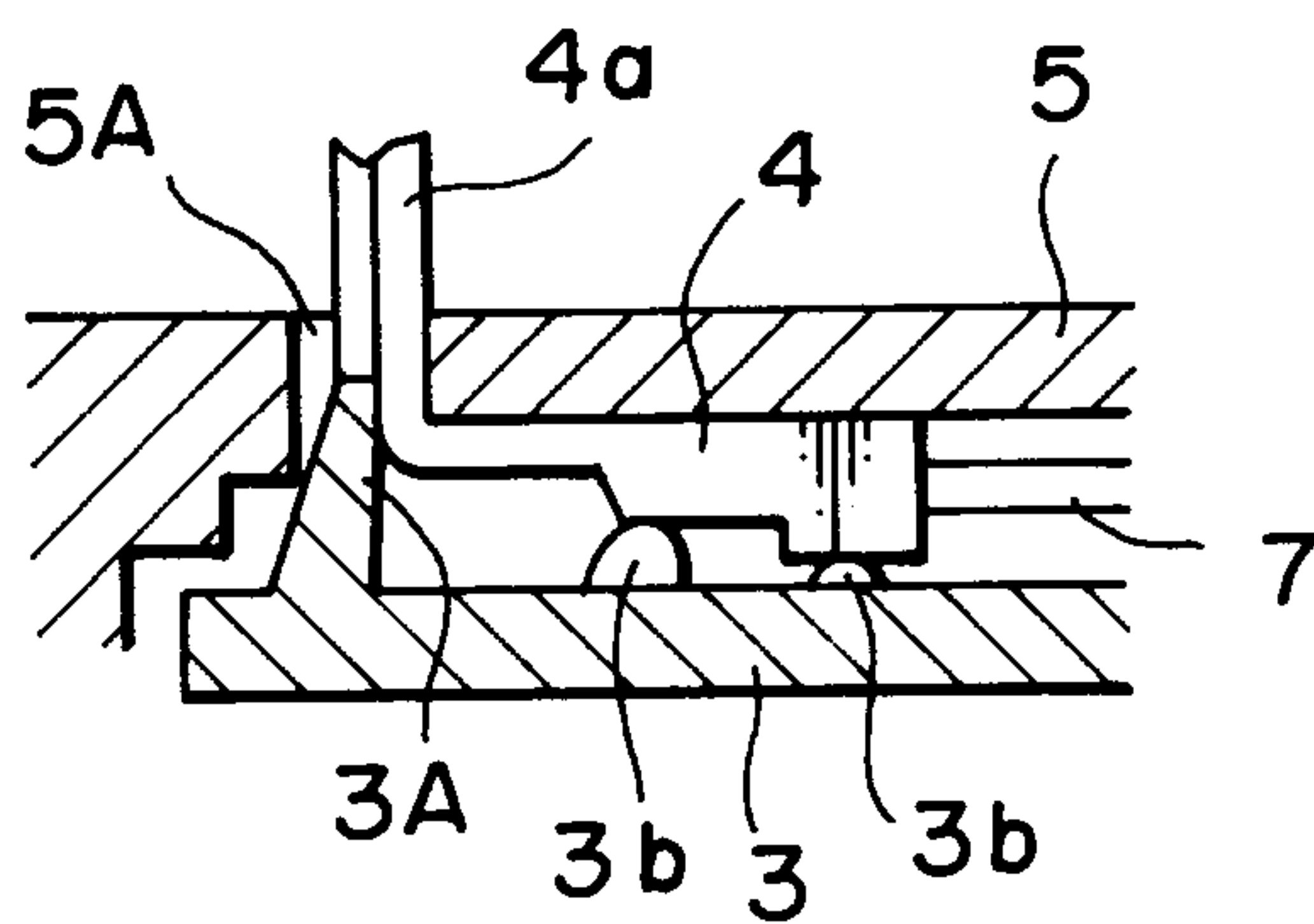


FIG. 21

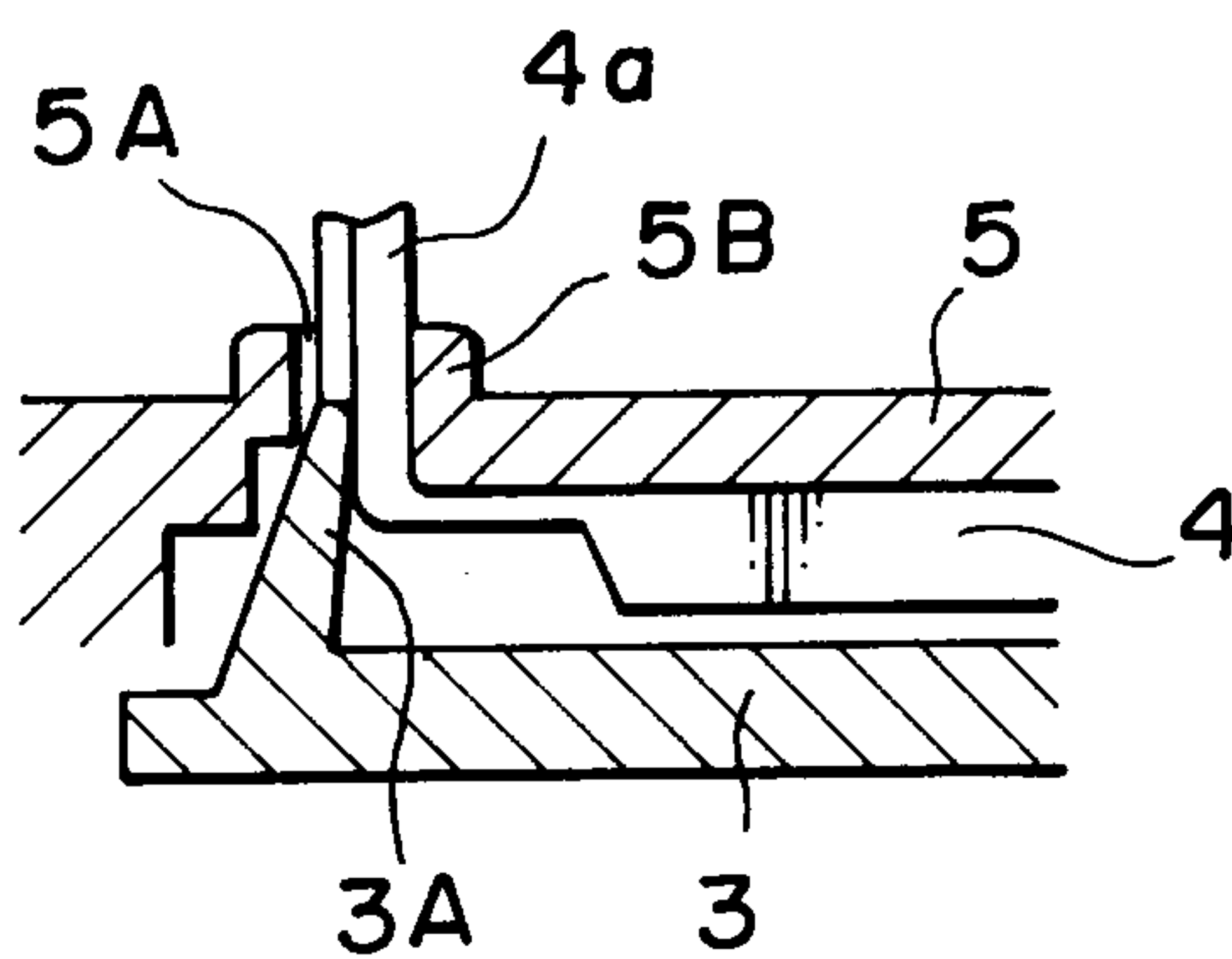


FIG. 22

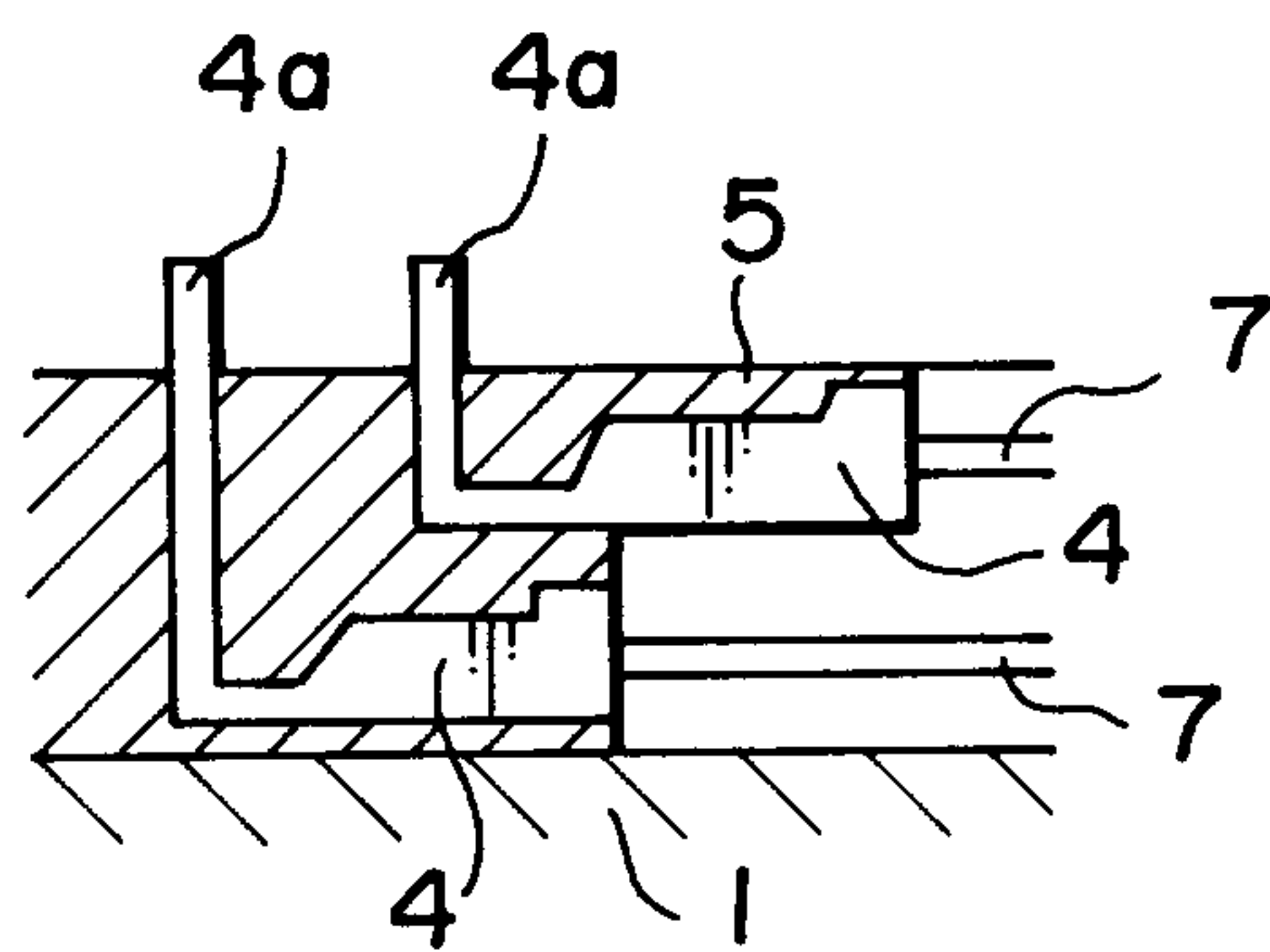


FIG. 23

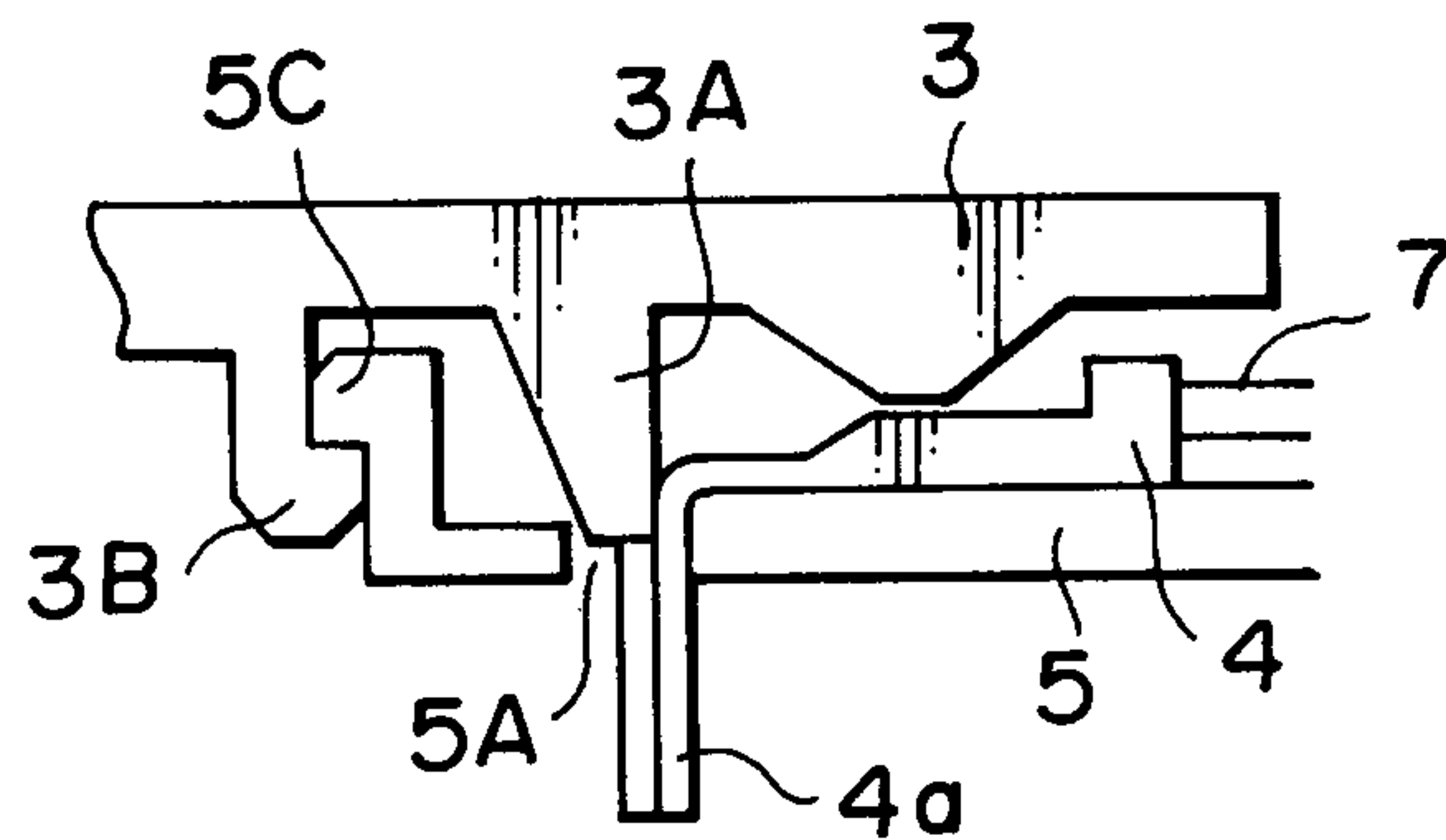


FIG. 24

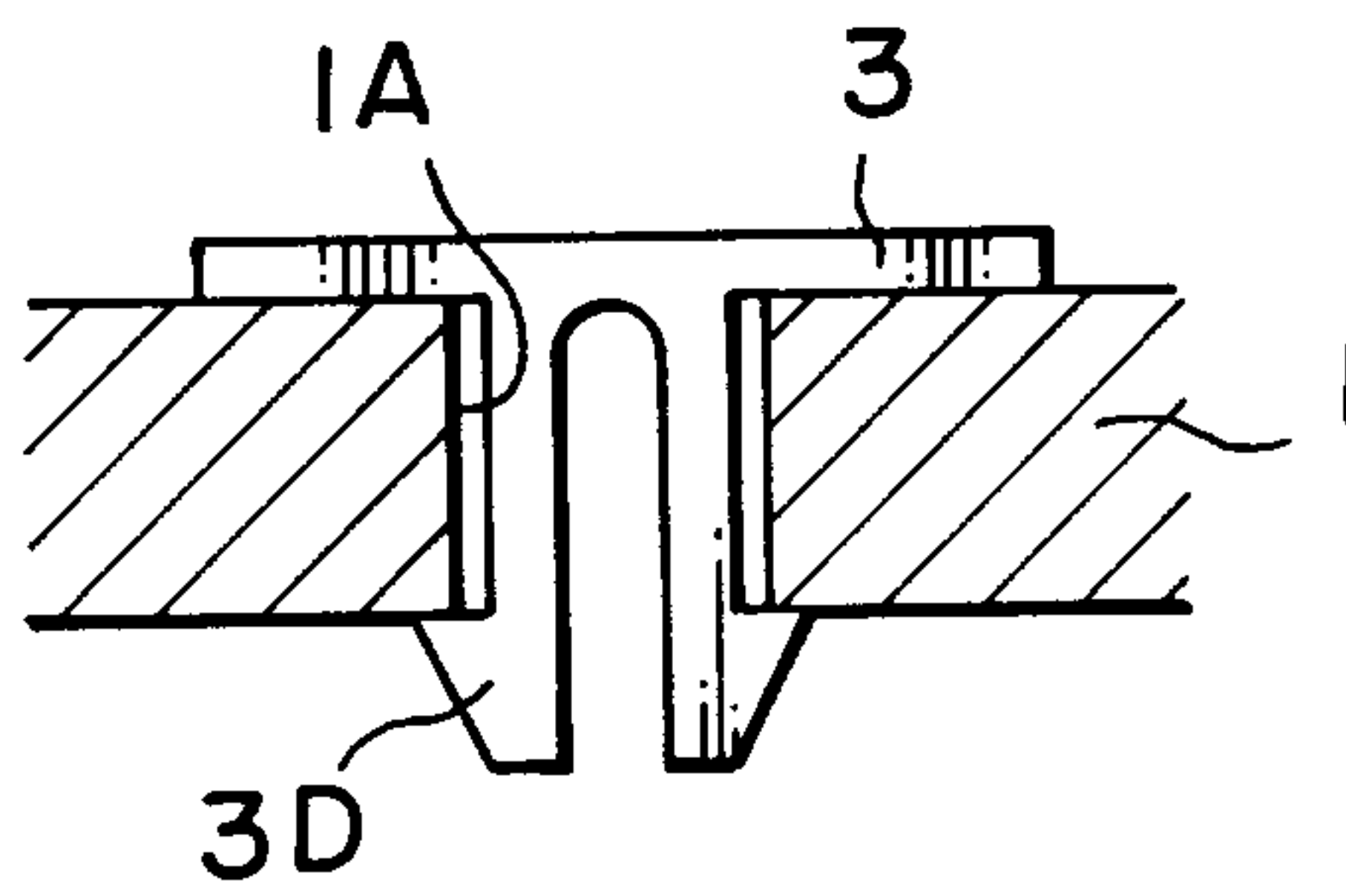


FIG. 25

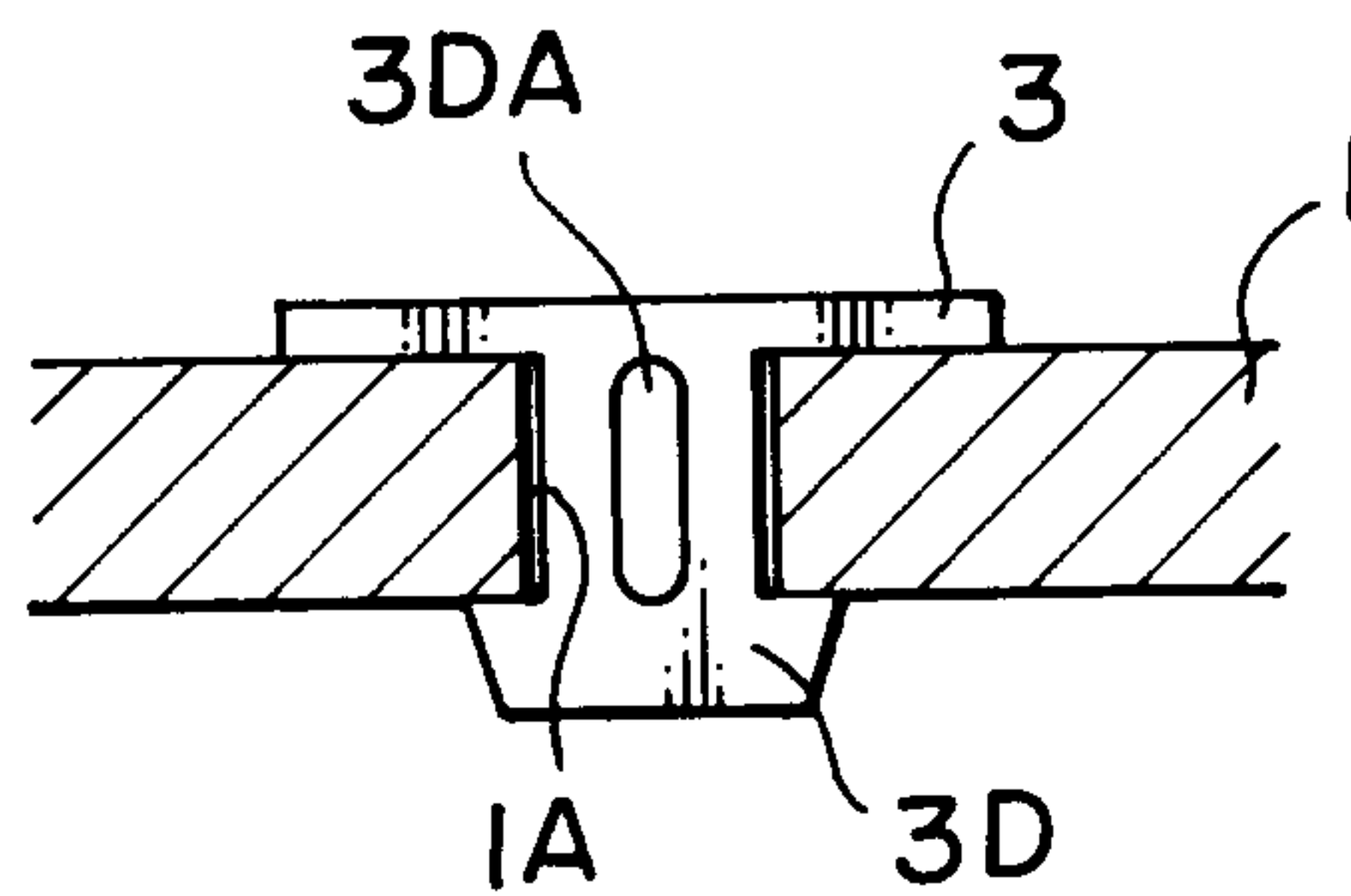


FIG. 26

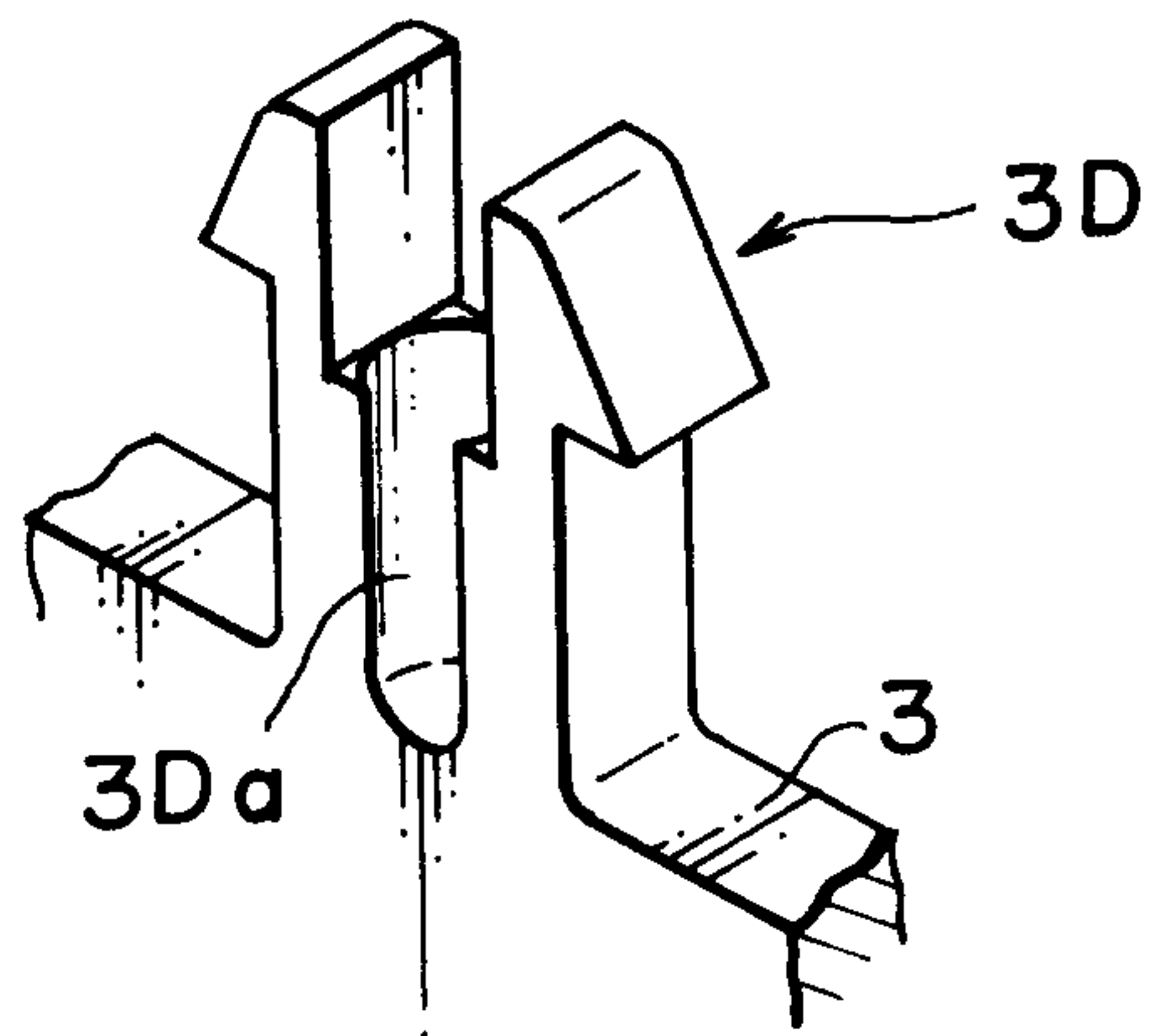


FIG. 27

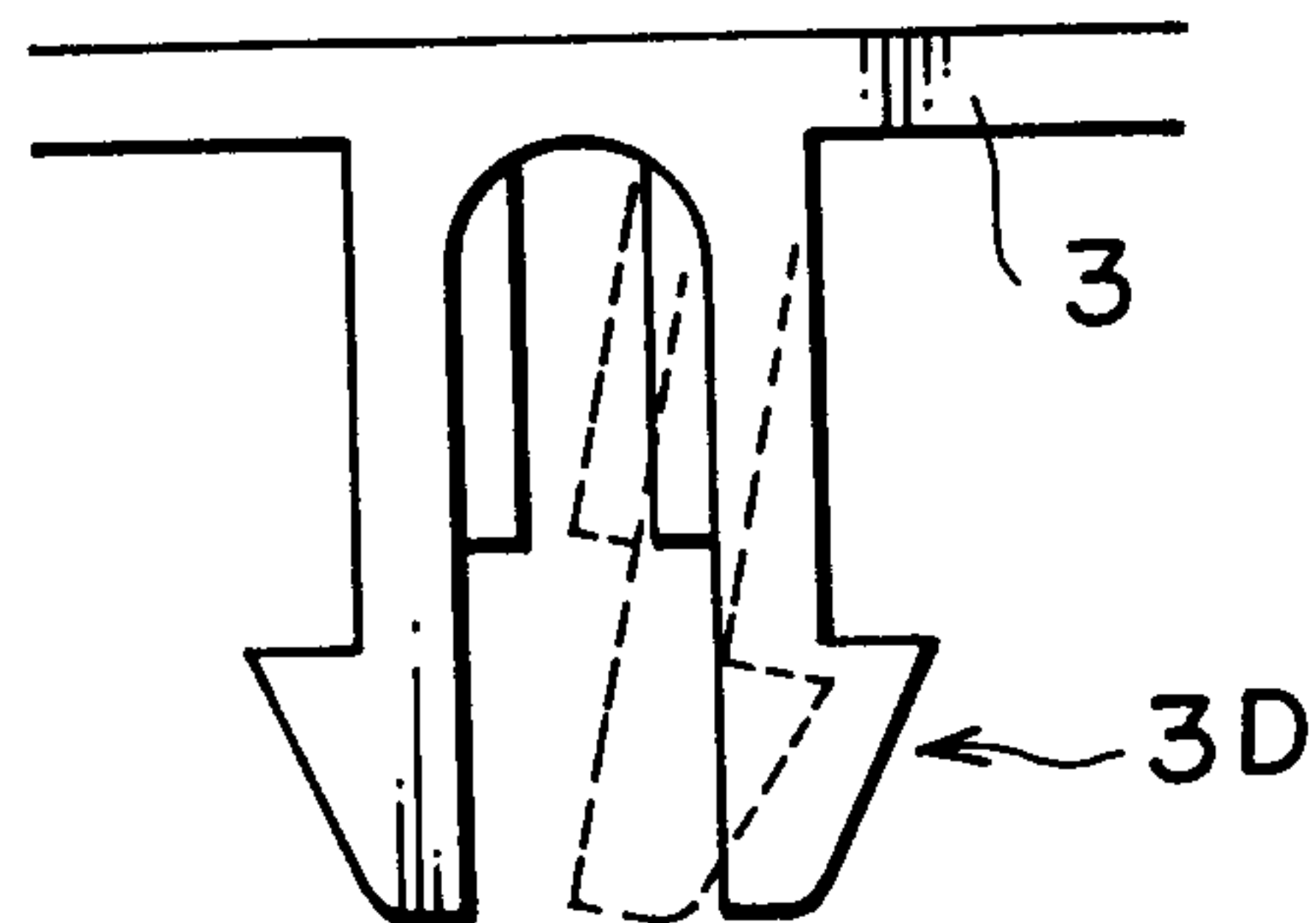


FIG. 28

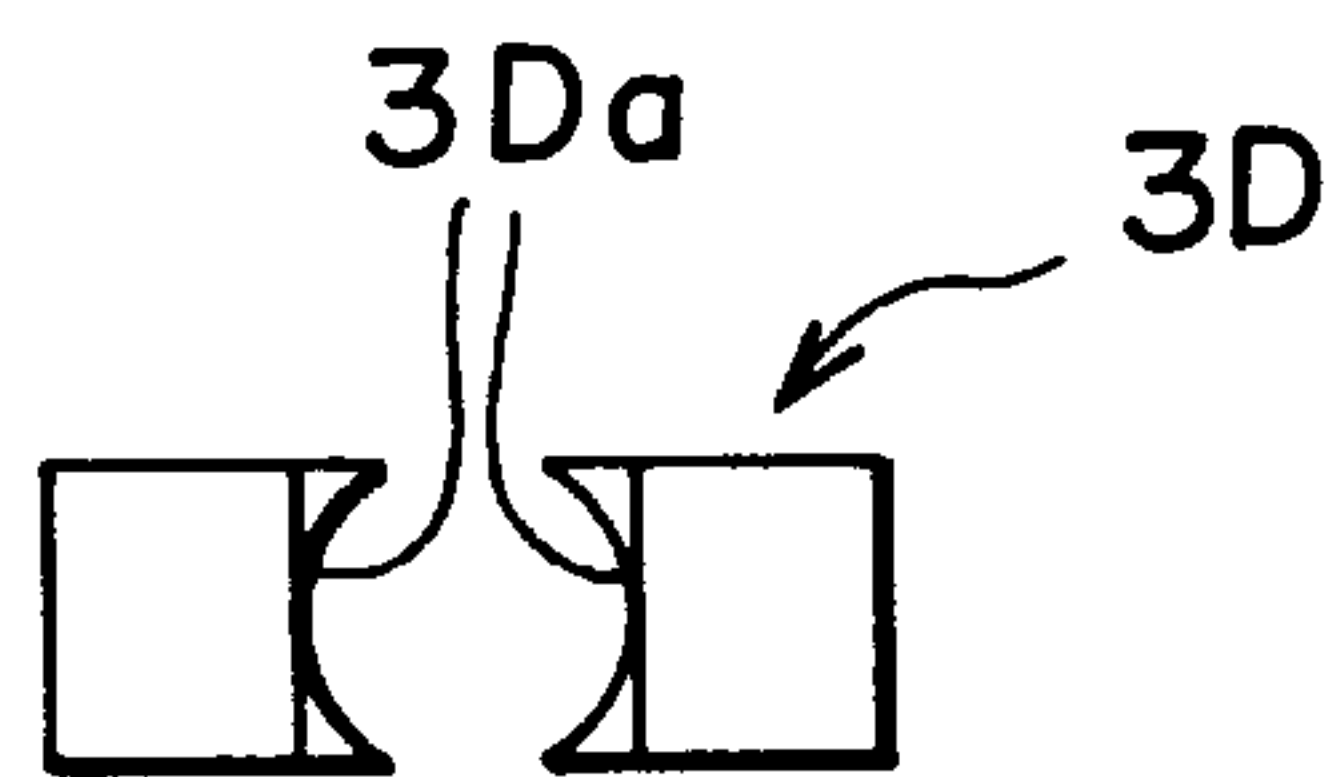


FIG. 29

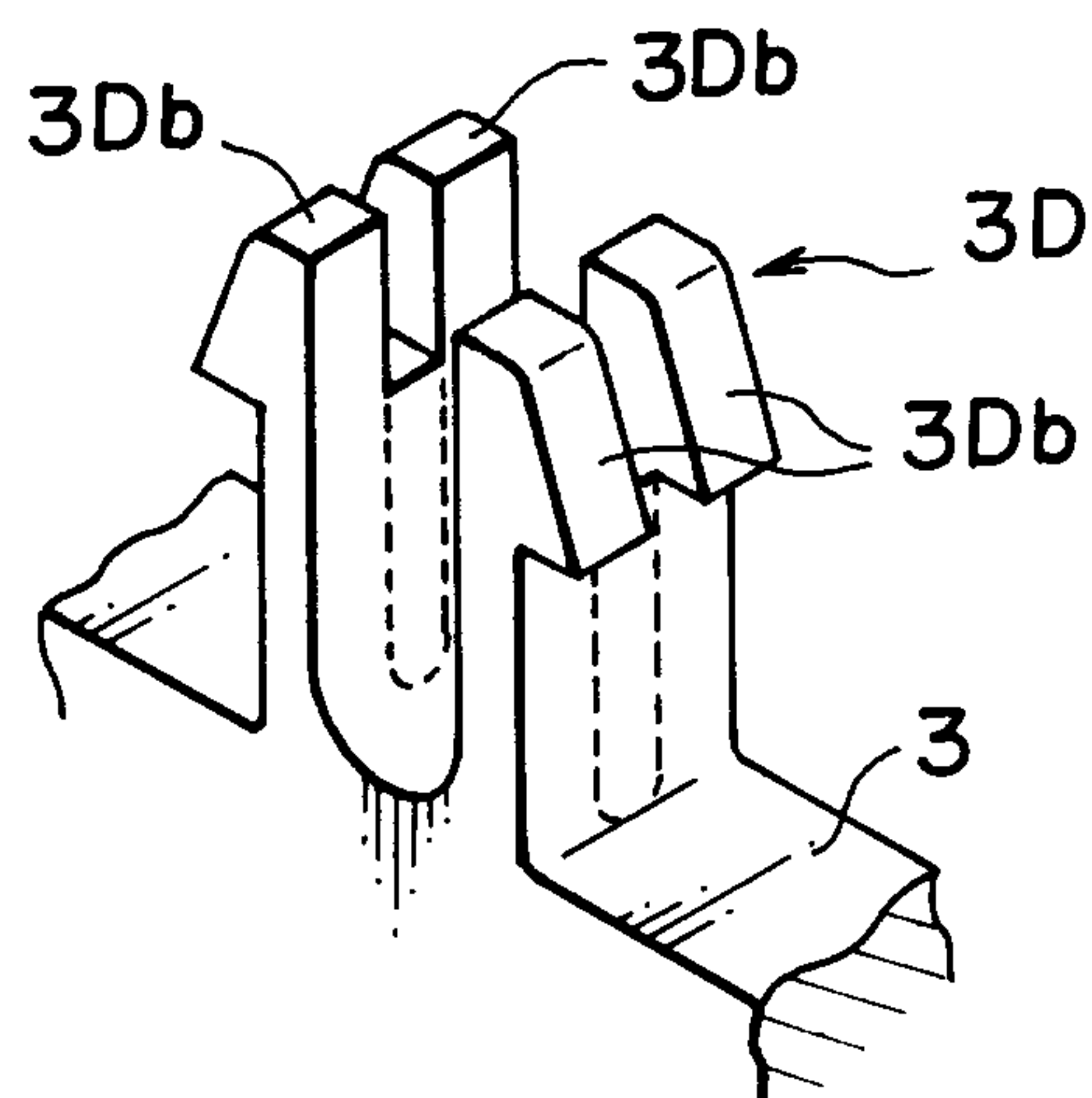


FIG. 30

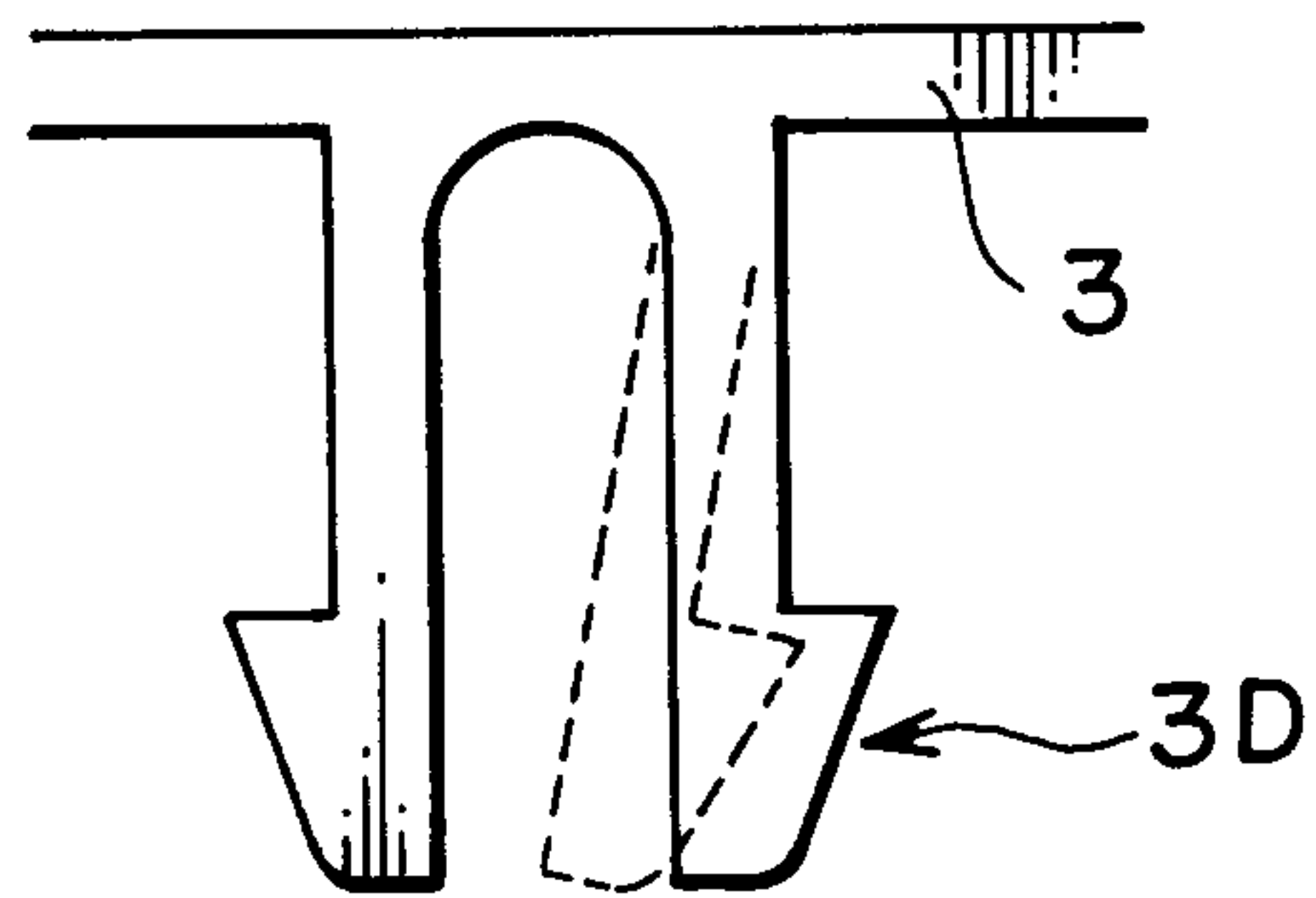
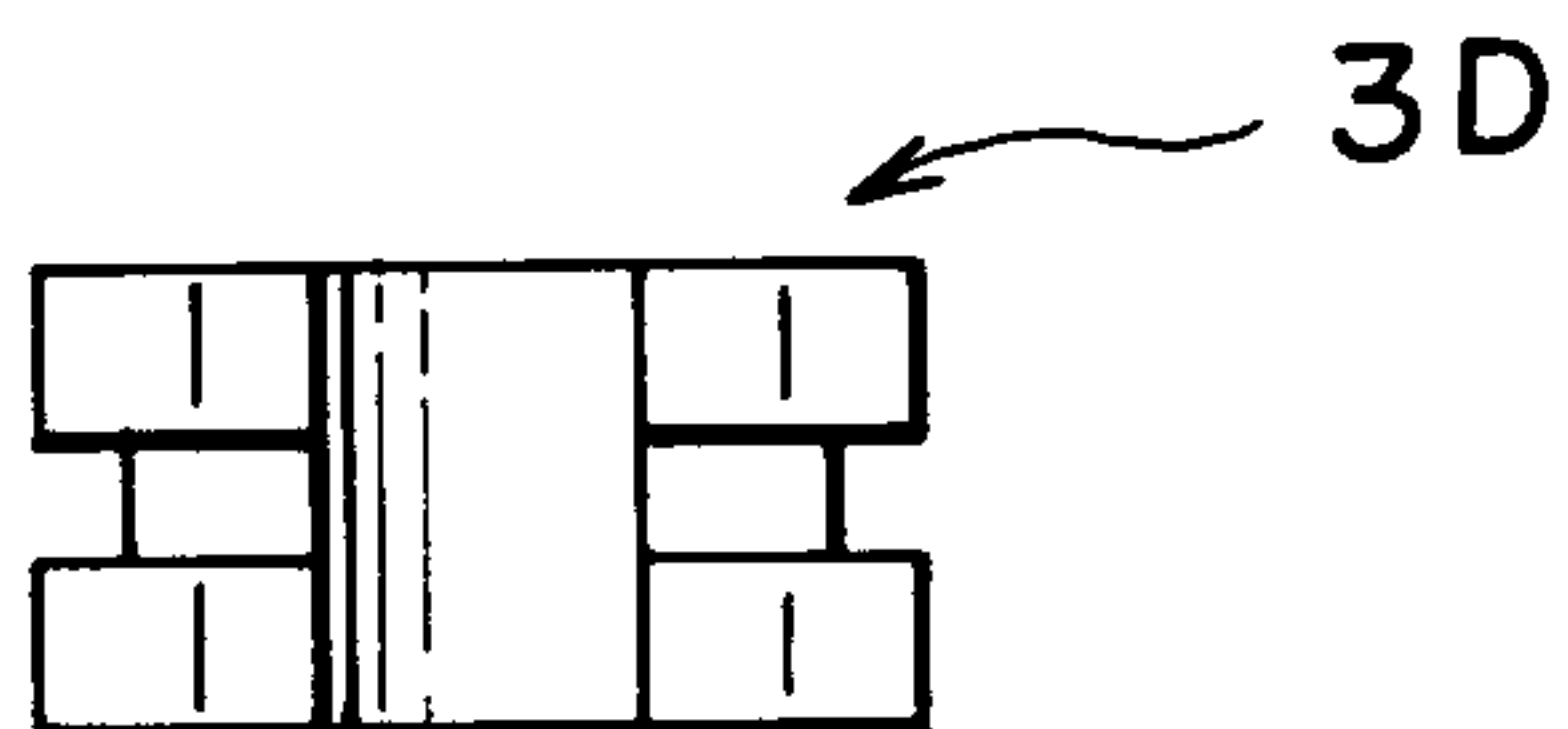


FIG. 31



Markus A. Clark