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An agency of Industry Canada

CA 2273042 C 2006/02/14

(11)(21) 2 273 042

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 1999/05/27

(41) Mise à la disp. pub./Open to Public Insp.: 2000/11/27

(45) Date de délivrance/Issue Date: 2006/02/14

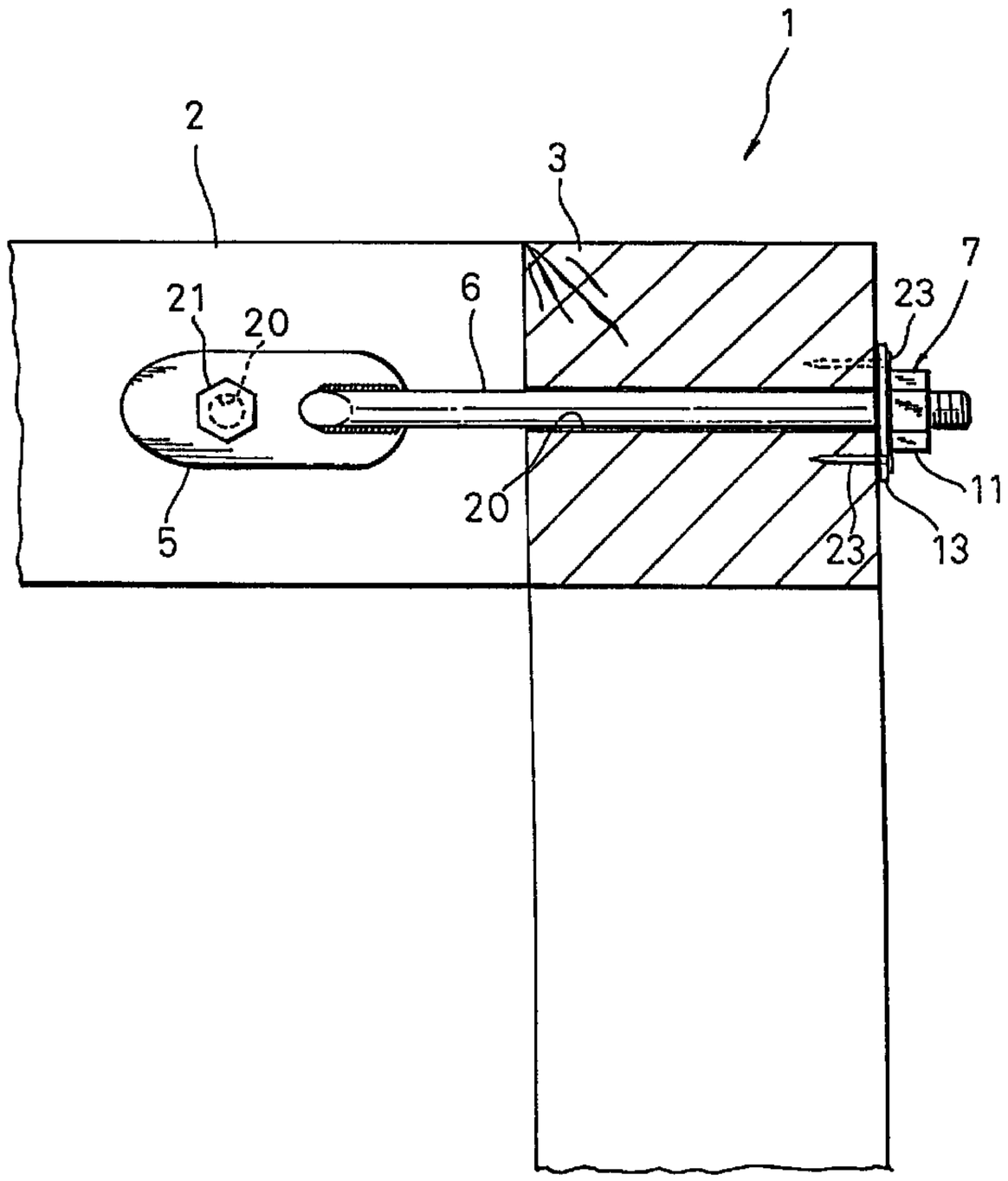
(51) Cl.Int./Int.Cl. *F16B 39/36* (2006.01), *F16B 37/08* (2006.01), *F16B 31/04* (2006.01), *E04B 1/38* (2006.01)

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(54) Titre : ECROU ET PIECE DE RACCORDEMENT
(54) Title: NUT AND CONNECTOR



(57) Abrégé/Abstract:
The present invention, a nut and connection, is used for a reinforcement tool or the like, of the connection between one beam and other beam in a wooden house, the nut of the present invention capable of locating to a tightening portion with a push-in condition; capable of tightening with a little working; and capable of maintaining the tightening condition even if the size of the tightening portion become small one.

ABSTRACT:

The present invention, a nut and connection, is used for a reinforcement tool or the like, of the connection between one beam and other beam in a wooden house, the nut of the present invention capable of locating to a tightening portion with a push-in condition; capable of tightening with a little working; and capable of maintaining the tightening condition even if the size of the tightening portion become small one.

NUT AND CONNECTOR

BACKGROUND OF THE INVENTION

The present invention relates to a nut which is screwed into a battledore-shaped bolt used in case that the connection between a beam and other beam in the wooden house is reinforced, or a nut and connect or which are used for the reinforcement of the connection between the beam and the other beam.

When the connection between the beam and other beam in the wooden house is reinforced in the conventional method, the head of the battledore-shaped bolt is fixed to one beam, the top end portion of the battledore-shaped bolt is inserted into a bolt insertion hole which is formed at the other beam, and a nut is fixed to screwed into the bolt through a washer.

In the above-mentioned structure, the nut screwed into the bolt is released from and does not function when timber material is dried and contracts.

Additionally, it is troublesome to fit the battledore-shaped bolt to the nut because the nut is screwed into the bolt to a predetemined fixed position while the nut is screwed into the end of the bolt.

SUMMARY OF THE INVENTION

In view of the foregoing, it is an object of the present invention to provide a nut and connector which can push in a thread

portion of the bolt and be positioned its portion and which requires a little work to screw into the bolt.

It is another object of the present invention to provide a nut and connector which can maintain a condition which the nut can be screwed into a bolt enough if the size of a thread portion become small.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawings. It is to be understood that these are for the purpose of illustra tion only and are not intended to be a definition of the limits of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an explanation view showing a first embodiment of the present invention in use;

Fig. 2 is a front view showing a first embodiment of the present invention;

Fig. 3 is a top view showing a first embodiment of the present invention;

Fig. 4 is a front view of a nut showing a first embodiment of the present invention;

Fig. 5 is a top view of a nut showing a first embodiment of the present invention;

Fig. 6 is a side view of a nut showing a first embodiment of the present invention;

Fig. 7 is a bottom view of a nut showing a first embodiment of the present invention;

Fig. 8 is a cross-sectional view taken on line 8-8 of Fig. 4;

Fig. 9 is a cross-sectional view taken on line 9-9 of Fig. 4;

Fig. 10 is an explanation view showing the way in which a nut is mounted on;

Fig. 11 is an explanation view showing the way in which a nut is screwed;

Fig. 12 is an explanation view showing the way in which a tightening portion contracts;

Fig. 13 is a front view showing a second embodiment of the present invention;

Fig. 14 is a partly cut-way front view of a nut according to a second embodiment of the present invention;

Fig. 15 is a top view of a nut showing a second embodiment of the present invention;

Fig. 16 is a front view showing a third embodiment of the present invention;

Fig. 17 is a partly cut-way front view of a nut according to a third embodiment of the present invention;

Fig. 18 is a top view of a nut showing a third embodiment of the present invention;

Fig. 19 is a front view showing a fourth embodiment of the present invention;

Fig. 20 is a front view of a nut showing a third embodiment of the present invention;

Fig. 21 is a cross-sectional view taken on line 21-21 of Fig. 20;

Fig. 22 is an exploded view of a nut showing a fourth embodiment of the present invention;

Fig. 23 is a front view showing a fourth embodiment of the present invention;

Fig. 24 is a front view of a nut showing a fifth embodiment of the present invention;

Fig. 25 is a cross-sectional view taken on line 25-25 of Fig. 24;

Fig. 26 is an explanation view showing the way in which a nut is grappled according to a fifth embodiment of the present invention;

Fig. 27 is a front view showing a sixth embodiment of the present invention;

Fig. 28 is a front view of a nut showing a sixth embodiment of the present invention;

Fig. 29 is a cross-sectional view taken on line 29-29 of Fig. 28;

Fig. 30 is an explanation view showing the way in which a nut is grappled according to a sixth embodiment of the present invention;

Fig. 31 is a top view showing a sixth embodiment of the present invention;

Fig. 32 is a cross-sectional view taken on line 32-32 of Fig. 31;

Fig. 33 is a cross-sectional view taken on line 33-33 of Fig. 32;

Fig. 34 is an explanation view showing a seventh embodiment of the present invention;

Fig. 35 is a top view showing an eighth embodiment of the present invention;

Fig. 36 is a cross-sectional view taken on line 36-36 of Fig. 35;

Fig. 37 is an explanation view showing an eighth embodiment of the present invention;

Fig. 38 is a top view showing a ninth embodiment of the present invention;

Fig. 39 is a cross-sectional view taken on line 39-39 of Fig. 38;

Fig. 40 is a cross-sectional view taken on line 40-40 of Fig. 39;

Fig. 41 is an explanation view showing a ninth embodiment of the present invention;

Fig. 42 is a top view showing a tenth embodiment of the present invention;

Fig. 43 is a cross-sectional view taken on line 43-43 of Fig. 42;

Fig. 44 is an explanation view showing a tenth embodiment of the present invention;

Fig. 45 is a plan view showing an eleventh embodiment of the present invention;

Fig. 46 is a cross-sectional view taken on line 46-46 of Fig. 45;

Fig. 47 is a plan view showing an twelfth embodiment of the present invention;

Fig. 48 is a cross-sectional view taken on line 49-49 of Fig. 48; and

Fig. 49 is an explanation view showing the way in which a nut is grappled according to an twelfth embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Preferred embodiment of the present invention will now be described in more detail below referring to the accompanying drawings.

Figs. 1 to 12 illustrate a first embodiment of the present invention wherein a connector 1, for example shown in Fig. 1, is used for the reinforcing in connection between a beam 2 and other beam 3 of a wooden house of the present invention. The connector 1, shown in Figs. 2 and 3, comprises a fitting plate 5, a bolt 6, and a nut 7 of the present invention. The fitting plate 5 is formed in the shape of an oval and has an insertion hole 4 for inserting a stopper like a bolt, nail, or the like, in the portion adjacent one side portion thereof. The bolt 6 is fixed to a portion adjacent other end portion of the fitting plate 5, one side portion of the bolt 6 being fixed to the portion by welding, other end portion of the bolt 6 projecting outwardly. The nut 7 of the present invedtion can be screwed in the bolt 6 after it is pushed in the bolt 6 to a fixed position.

The nut 7 as illustrated in Figs. 4 to 9 has an outer wall 8 formed in the shape of a polygon, for example, a hexagonal shape in each embodiment of the present invention and an inner wall 9. Also the nut 7 comprises a nut body 11 with a hole of inclination which shortens in to the diameter of the inner wall 9; a stopper 13 formed in an end portion on a long diameter side of the nut body 11 having a bolt insertion hole 12; at least three or more guideposts, for example three guideposts 14, 14, 14 in this embodiment, which is formed coaxially at an inner wall of the nut body 11; three nut cegments 16, 16, 16 which are attached and movably among the guideposts 14, 14, 14 in a coaxial direction and which are formed screw threads 15 on the

inner wall thereof, the screw threads 15 screwed into the bolt 6; a fitting piece 18 in the shape of a flange which is fixed to the end portion of small diameter side of the nut body 11 by welding and formed a plurality of screw insertion holes 17, 17 which project outwardly rather than the outer circumferential portion of the nut body 11, the fitting piece 18 preventing to come off; and a spring 19 which is located between the stopper 13 into the nut body 11 and the three nut cegments 16, 16, 16 andwhich pushes always the nut cegments 16, 16, 16 on the short diameter side of the nut body 11 through a washer 19a in accordance in response to be necessary.

In the above-mentioned connector 1, as illustrated in Fig. 1, the bolt insertion holes 20, 20 are formed at the portion that is reinforced the beams 2 and 3. After the bolt 6 is inserted into the bolt insertion hole 20 of the beam 3, the fitting plate 5 is fixed to the beam 2 due to the bolt 21 and nut 7.

After that, as illustrated in Fig. 10, the nut 7 is pushed into the bolt 6 to the tightened position such that the fitting piece 18 of the nut 7 allows it locate in formed direction.

Then, the nut segments 16, 16, 16 move slidely on the large diameter side of the hole of inclination due to press of the spring 19 and make it possible to incert bolt 6.

After that, with tighteming the nut 7 by a tool like a wrench, or the like, as illustrated in Fig. 11, the screw threads 15, 15, 15 of the nut segments 16, 16, 16 are screwed into the thread portion 6a of the bolt 6, the beam 2 is fixed with tightening to the beam 3. After the tightening work finishes, the nail or screws 23, 23 are driven in

the insertion holes 17, 17 of the fitting piece 18, and the fitting piece 18 and beam 3 are fixed.

In this case, the fitiing piece 18 may be fixed to an outer circumferential portion thereof by pins in the shape of a hook.

In the above-mentioned connector 1, as illustrated in Fig.12, the nut body 11 fixed to the beam 3 by nails or screws 23,23 move slidely due to the spring power of the spring 19 and prevent to loosen the tightening power when the beams 2 and 3 dry and contract.

DIFFERENT PREFERRED EMBODIMENT OF THE INVENTION

Other embodiments of the present invention will now be described referring to Figs. 13 to 49. Through the drawings of the embodiments, like components are denoted by like numarals as of the first embodiment and will be explained in no more detail.

A second embodiment of the present invention is shown in Figs. 13 to 15. It is distinguished from the first embodiment by the fact that the nut 7 is replaced with another similar nut 7A. The nut 7A includes fitting plate 18A formed in the shape of a disc and fixed to the nut body 11. A connector 1A with the nut 7A according to the second embodiment will have similar advantages to that according to the first embodiment.

A third embodiment of the present invention is shown in Figs. 16 to 18. It is distinguished from the first embodiment by the fact that the nut 7 is replaced with another similar nut 7B. The nut 7B includes a fitting piece 18B formed screw insertion grooves 24, 24 at an outer

circumferential portion thereof in molding. A connector 1B with the nut 7B according to the third embodiment will have similar advantages to that according to the first embodiment.

A fourth embodiment of the present invention is shown in Figs. 19 to 22. It is distinguished from the first embodiment by the fact that a thread portion 25 is formed at inner wall surface on the short diameter side of the nut body 11A and a screw tubular 26 screwed into the screw portion 25 is formed in the fitting piece 18C. A connector 1C with the nut 7C that the fitting piece 18C is screwed into the nut body 11A according to the third embodiment will have similar advantages to that according to the first embodiment.

A fifth embodiment of the present invention is shown in Figs. 23 to 26. It is distinguished from the first embodiment by the fact that the nut 7 is replaced with another similar nut 7D and the nut body 11 is replaced with another similar nut body 11B. The nut 7D includes a fitting piece 18D having integrally an inclination tubu 27 with a thread portion 27a in outer circumferential portion of the lower end thereof which support three pieces of nut cegments 16, 16, 16. The nut body 11B has a thread portion 28 which is formed in the inner wall surface of the end portion thereof and screwed into the thread portion 27a of the inclination tubu 27. A connector 1D with the nut 7D according to the fifth embodiment will have similar advantages to that according to the first embodiment and the mounting of the nut 7D can be done easily.

Additionally, when the user feels anxious about the way in which the nut body 11B is screwed into and fixed to the fitting piece 18D,

the screwing portion between the nut body 11B and fitting piece 18D may be fixed by an adhesive, welding, or the like.

A sixth embodiment of the present invention is shown in Figs. 27 to 30. It is distinguished from the fifth embodiment by the fact that the fitting piece 18D is replaced with another similar fitting piece 18E. The fitting piece 18E is formed in a T-shape with cross-section and has the thread portion 27a in outer circumferential portion of the lower end thereof which support three nut cegments 16, 16, 16. A connector 1E having the nut 7E with the fitting piece 18E according to the sixth embodiment will have similar advantages to that according to the fifth embodiment and it can be reduced its weight.

A seventh embodiment of the present invention is shown in Figs. 31 to 34. It is distinguished from the first embodiment by the fact that the fitting piece 18 is replaced with another similar fitting piece 18F. The fitting piece 18F includs an inner tubular member 29 which is made of synthetic resin; an outer tubular body 30 which is formed in the shape of a hexagon, having the bolt insertion hole 12 covers the outer circumferential portion of the inner tubular member 29; and fitting pieces 32, 32 which are fitted and fixed into a flange 31 provided at the portion adjacent the end portion of the outer tubular body 30. The outer wall of the inner tubular member 29 is formed in the shape of a hexagon and has at least three or more guideposts 14, 14, 14. A nut 7F according to the seventh embodiment will have similar advantages to that accordingto the fifth embodiment.

An eighth embodiment of the present invention is shown in Figs. 35 to 37. It is distinguished from the seventh embodiment by the fact

that the outer tubular body 30 is replaced with another similar tubular body 30A. The outer tubular body 30A has a flange 31A in the shape of a disc which projects outwardly at end portion thereof. In addition, the flange 31A of the outer tubular body 30A is fitted rotatably by the fitting pieces 32, 32 of the fitting piece 18F. A nut 7G according to the eighth embodiment will have similar advantages to that according to the seventh embodiment and the outer tubular body 30A allows it rotate and can be screwed into the bolt.

A ninth embodiment of the present invention is shown in Figs. 38 to 41. It is distinguished from the eighth embodiment by the fact that the outer tubular body 30A is replaced with another similar tubular body 30B that the outer circumferential portion of the outer tubular body 30B is formed in the shape of a disc. A nut 7H with the outer tubular body 30B according to the ninth embodiment will have similar advantages to that according to the eighth embodiment.

A tenth embodiment of the present invention is shown in Figs. 42 to 44. It is distinguished from the seventh embodiment by the fact that the outer tubular body 30 is replaced with another similar tubular body 30C that the outer circumferential portion of the outer tubular body 30C is formed in the shape of a disc. A nut 7I with the outer tubular body 30C according to the tenth embodiment will have similar advantages to that according to the seventh embodiment.

An eleventh embodiment of the present invention is shown in Figs. 45 and 46. It is distinguished from the first embodiment by the fact that a nut body 11A is formed integrally with a frange-shaped fitting plate 18A formed in the shape of a circle having insertion holes 17,

17, 17 and 17, and a washer 33 as a stopper, which supports to a spring 19, is fit into an end portion of the side of large diameter at the nut body 11A and fixed thereto. The nut 7J according to the eleventh embodiment will have similar advantages to that according to the first embodiment.

A twelfth embodiment of the present invention is shown in Figs. 47 to 49. It is distinguished from the eleventh embodiment by the fact that a fitting plate 18B is fit rotatably into a nut body 11B. The nut 7K according to the twelfth embodiment may allow the nut body 11B rotate even if the fitting plate 18B is fixed to the beam or the like.

Moreover, in each of the above mentioned embodiments of the present invention, the connector is explained, however, the nut 7, 7A, 7B, 7C, 7D, 7E, 7F, 7G, 7H, 7I, 7J and 7K may be used instead of the nut which screws into the anchor bolt laid it underground or other bolts.

Additionally, the nut cegments which are stored within the nut body may be stored more than three of the nut cegments, without three nut cegments within it.

ADVANTAGE OF THE INVENTION

As set forth above, the advantages of the present invention are as follows:

(1)A nut comprises a nut body formed in the shape of a polygon at an outer wall thereof, having a hole of an incliation which shortens diameter in to angle; a stopper formed at an end portion on a large

diameter side of the nut body, having a bolt insetion hole; at least three or more guideposts formed coaxially at an inner wall of the nut body; at least three or more nut segments attached movably in a coaxial direction among the guideposts, the nut segments having a screw thread which is screwed into a bolt at the inner wall thereof; a fitting piece, which is formed in the shape of a flange, projects outwardlly rather than an outer circumferential portion of the nut body and can prevent to come out at least three or more nut segments which are fixed to the end portion on a small diameter side of said nut body; and a spring provided into the nut body such that at least three or more nut segments are always push in on the small diameter side of the nut body so that the nut allows it be located at the tightening portion of bolt by pushing, and three or more nut segments allow it be screwed into the thread portion of the bolt.

Therefore, it is easy to screw the nut, it takes a short time to work.

(2) As discussed in the above paragraph, the fitting piece can be fixed to the grappling member by screws or the like.

Therefore, even if the grappling member contracts in use, because the nut body pushes the movement and moves itself, and nut segments inside nut body moves slidely, the nut can be prevented to change the pushes power in efficiency.

(3) As discussed in the above paragraph, because the nut segments are always pushed in on the small diameter side due to the spring, the nut segments can be screwed certainly into the bolt.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A nut comprising:

a nut body formed in the shape of a polygon at an outer wall thereof, the nut body having a tapered hole therethrough, the tapered hole extending from a first end of the nut body where the tapered hole has a larger diameter to a second end of the nut body where the tapered hole has a smaller diameter;

a stopper formed as a stop flange extending radially inward at the first end, the stopper having a bolt insertion hole therein;

at least three guideposts formed coaxially at an inner wall of the nut body;

at least three nut segments having inclined outer surfaces complementing an angle of taper of the tapered hole and screw threaded inner surfaces for threaded engagement with a bolt, the at least three nut segments being moveably disposed between the guideposts so as to permit sliding movement in an axial direction and radial displacement urged by sliding engagement of said inclined outer surfaces with the tapered hole;

a fitting piece provided at the second end of the nut body, the fitting piece being formed in the shape of a flange, the fitting piece projecting outwardly rather than an outer circumferential portion of the nut body to retain the at least three nut segments within the nut body; and

a spring provided in the nut body for biasing the at least three nut segments toward the second end of the nut body.

2. A nut according to claim 1, wherein the fitting piece is fixed to the first end of the nut body by an adhesive or a welding.

3. A nut according to claim 1, wherein the fitting piece is screwed to the first end of the nut body.

4. A nut according to claim 1, wherein the fitting piece is formed integrally at the first end of the nut body.

5. A nut according to claim 1, wherein the fitting piece is attached to the first end of the nut body.

6. A nut comprising:

a tubular nut body formed in the shape of a polygon at an outer wall thereof;

a stopper formed as a stop flange at an end portion of an outside of the nut body, having a bolt insertion hole;

a fitting piece formed in the shape of a flange which is fixed at the end portion inside the nut body and projects outwardly rather than an outer circumferential portion of said nut body;

an inclination tube having at least three guideposts which are formed coaxially at an inner wall surface thereof;

at least three nut segments having inclined outer surfaces complementing an angle of taper of the inclination tube and screw threaded inner surfaces for threaded engagement with a bolt, the at least three nut segments located between the fitting piece and the stopper, the at least three nut segments being moveably disposed between the guideposts so as to permit sliding movement in an axial direction and radial displacement urged by sliding engagement of said inclined outer surfaces with the inclination tube; and

a spring provided in the nut body such that the at least three nut segments are always located between the fitting pieces.

7. A nut according to claim 6, wherein the fitting piece is fixed to the nut body by threaded attachment.

8. A nut comprising:

an inner tubular body which is made of synthetic resin material, having an inclined hole such that are inner diameter narrows at an angle;

at least three guideposts which are coaxially provided on an inner wall surface of the inner tubular body;

at least three nut segments having inclined outer surfaces complementing an angle of inclination of the inclined hole and screw threaded inner surfaces for threaded engagement with a bolt, the at least three nut segments being moveably disposed between the guideposts so as to permit sliding movement in an axial direction and radial displacement urged by sliding engagement of said inclined outer surfaces with the inclined hole;

an outer tubular body which has a bolt insertion hole which is formed at a back end portion thereof and covers an outer circumferential portion corresponding to a part except the end portion of a small diameter side of the inner tubular body;

a spring provided in the outer tubular body such that the spring biases the at least three nut segments inside the inner tubular body to a small diameter side of said inner tubular body; and

a fitting piece, which is formed in the shape of a flange, attached to the end portion of the small diameter side of the inner tubular body and is mounted to the outer tubular body

and which projects outwardly rather than an outer circumferential part of the outer tubular body and having a bolt insertion hole.

9. A nut according to claim 8, wherein the outer tubular body covers fixedly an outer circumferential part corresponding to a part except the end portion of small diameter side of the inner tubular body and mounted rotatably to the outer tubular body.

10. A nut comprising:

a fitting plate having an insertion hole of a bolt or the like;

a bolt has two ends, one end portion fixed to the fitting plate and other end portion projects outwardly;

a nut further comprises a nut body formed in the shape of a polygon at an outer wall thereof, having a hole that tapers on an angle from a large diameter end to a small diameter end; a stopper formed at the large diameter end and having a bolt insertion hole; at least three guideposts formed coaxially at an inner wall of the nut body; at least three nut segments having inclined outer surfaces complementing an angle of inclination of the tapered hole and screw threaded inner surfaces for threaded engagement with a bolt, the at least three nut segments being moveably disposed between the guideposts so as to permit sliding movement in an axial direction and radial displacement urged by sliding engagement of said inclined outer surfaces with the inclined hole; a fitting piece, which is formed in the shape of a flange, that projects outwardly rather than an outer circumferential portion of the nut body and prevents the at least three nut segments from leaving the nut body; and a spring stored in the nut body for biasing the at least three nut segments to the small diameter end.

11. A nut for slidable application to a bolt, comprising:

a nut body having a first end, a second end, and a through hole;

said nut body having an outer wall formed in the shape of a polygon and an inner wall defining said through hole including at least a portion thereof being an inclined wall hole having a diameter decreasing from a first diameter to a second diameter proximate said second end that is less than said first diameter;

a stopper formed as a stop flange extending radially inward into said through hole at said first end of the nut body, the stopper including said stop flange defining a bolt exit aperture of said through hole;

at least three guideposts formed coaxially on said inner wall of the nut body at said inclined wall hole and extending in a direction parallel to an axis of said through hole;

at least three nut segments having inclined outer surfaces complementing an inclination angle of said inner wall at said inclined wall hole;

said at least three nut segments being movably disposed between the guideposts so as to permit sliding movement in an axial direction and radial displacement urged by sliding engagement of said inclined outer surfaces with said inner wall at said inclined wall hole;

said at least three nut segments each having an inner surface facing said axis of said through hole, said inner surface having a screw thread for engaging a thread of said bolt;

a fitting piece, which is formed in the shape of a flange, disposed at said second end of said nut body, said fitting piece projecting outwardly of said outer wall of the nut body and extending inward of said second diameter to define a bolt insertion aperture, through which said bolt passes during application of said nut body to said bolt; and

a spring disposed in the nut body between said stop flange and said at least three nut segments to bias said at least three nut segments toward said second end of said nut body.

12. The nut according to claim 11, wherein the fitting piece is fixed to said second end by one of adhesive and welding.

13. The nut according to claim 12, wherein the fitting piece has a threaded portion and said nut body has a threaded portion engaging said threaded portion of said fitting piece to secure said fitting piece at said second end of the nut body.

14. A nut for slidable application to a bolt comprising:

a tubular nut body having an outer wall formed shaped as a polygon, a first end, and a second end, said tubular nut body defining a tube cavity extending therethrough;

said tubular nut body having a stopper flange formed at said first end and defining a bolt exit aperture through which said bolt passes when said nut is slid onto said bolt;

a fitting piece, formed in the shape of a flange, fixed to said tubular nut body at said second end and extending radially inward of a perimeter of said tube cavity of the tubular nut body and extending radially outward of said outer wall of said tube body, said fitting piece defining a bolt insertion aperture through which said bolt passes when said nut is slid onto said bolt;

a sleeve disposed within said tube cavity and defining an inclined wall hole having a diameter decreasing from a first diameter to a second diameter proximate said second end that is less than said first diameter, said inclined wall hole being coaxially aligned with said bolt exit aperture and said bolt insertion aperture;

at least three guideposts formed coaxially on an inner wall of said inclined wall hole and extending in a direction parallel to an axis of said inclined wall hole;

at least three nut segments having inclined outer surfaces complementing an inclination angle of said inner wall of said inclined wall hole;

said at least three nut segments being movably disposed between the guideposts so as to permit sliding movement in an axial direction and radial displacement urged by sliding engagement of said inclined outer surfaces with said inner wall of said inclined wall hole;

said at least three nut segments having an inner surface facing said axis of said inclined wall hole, said inner surface having a screw thread for engaging a thread of said bolt; and

a spring disposed in said tube cavity of the tubular nut body and between said at least three nut segments and said stop flange to bias said at least three nut segments in said axial direction toward said second end.

15. A nut for slidable application to a bolt, comprising:

a nut body having a first end, a second end, and a through hole;

said nut body having an outer wall and an inner wall defining said through hole including at least a portion thereof being an inclined wall hole having a diameter decreasing from a first diameter to a second diameter proximate said second end;

at least three guideposts formed coaxially on said inner wall of the nut body at said inclined wall hole and extending in a direction parallel to an axis of said through hole, said at least three guideposts each having a pair of side faces extending in a radial direction of said inclined wall hole;

at least three nut segments being movably disposed between opposing pairs of said side faces of said at least three guideposts;

said opposing pairs of said side faces being inclined with respect to each other along said radial direction such that a distance between said opposing pairs of side faces decreases along said radial direction toward said axis of said through hole to define an opposing face inclination angle;

said at least three nut segments having pairs of nut segment side faces inclined with respect to each other at said opposing face inclination angle such that a width of said at least three nut segments decreases radially toward said axis of said through hole so that said opposing pairs of said side faces limit movement of said at least three nut segments toward said axis in said radial direction;

said at least three nut segments having inclined outer surfaces complementing an inclination angle of said inclined wall hole such that said at least three nut segments are movably disposed between the guideposts so as to permit sliding movement in an axial direction and radial displacement urged by sliding engagement of said inclined outer surfaces with said inner wall at said inclined wall hole;

said at least three nut segments each having an inner surface facing said axis of said through hole, said inner surface having a portion of a screw thread for engaging a thread of said bolt;

a stop flange extending radially inward into said through hole at said first end of said nut body; and

a bias device disposed in the nut body between said stop flange and said at least three nut segments to bias said at least three nut segments toward said second end of said nut body and thereby urge said at least three nut segments radial inward by sliding engagement of said inclined outer surfaces with said inner wall at said inclined wall hole.

16. The nut according to claim 15, further comprising a fitting piece fixed to said second end by one of adhesive and welding, said fitting piece projecting outwardly of said outer wall of the nut body and extending inward of said second diameter to define a bolt insertion aperture, through which said bolt passes during application of said nut body to said bolt.

17. The nut according to claim 15, further comprising:

a fitting piece having a threaded portion and said nut body having a threaded portion engaging said threaded portion of said fitting piece to secure said fitting piece at said second end of the nut body; and

said fitting piece projecting outwardly of said outer wall of the nut body and extending inward of said second diameter to define a bolt insertion aperture, through which said bolt passes during application of said nut body to said bolt.

18. The nut according to claim 15, wherein said stop flange defines a bolt exit aperture through which said bolt passes during application of said nut body to said bolt.

19. A nut for slidable application to a bolt comprising:

a tubular nut body having an outer wall, a first end, and a second end, said tubular nut body defining a tube cavity extending therethrough;

said tubular nut body having a stopper flange formed at said first end and extending radially inwardly into said tube cavity;

a fitting piece, formed in the shape of a flange, mounted to said tubular nut body at said second end and extending radially inward of a perimeter of said tube cavity of the tubular nut body, said fitting piece defining a bolt insertion aperture through which said bolt passes when said nut is slid onto said bolt;

a sleeve disposed within said tube cavity and defining an inclined wall hole having a diameter decreasing from a first diameter to a second diameter proximate said second end that is less than said first diameter, said inclined wall hole being coaxially aligned with an axis of said tube cavity;

at least three guideposts formed coaxially on said inclined wall hole and extending in a direction parallel to an axis of said tube cavity, said at least three guideposts each having a pair of side faces extending in a radial direction of said inclined wall hole;

at least three nut segments being movably disposed between opposing pairs of said side faces of said at least three guideposts;

said opposing pairs of said side faces being inclined with respect to each other along said radial direction such that a distance between said opposing pairs of side faces decreases along said radial direction toward said axis of said through hole to define an opposing face inclination angle;

said at least three nut segments having pairs of nut segment side faces inclined with respect to each other at said opposing face inclination angle such that a width of said at least three nut segments decreases radially toward said axis of said tube cavity so that said opposing pairs of said side faces limit movement of said at least three nut segments toward said axis in said radial direction;

said at least three nut segments having inclined outer surfaces complementing an inclination angle of said inclined wall hole such that said at least three nut segments are movably disposed between the guideposts so as to permit sliding movement in an axial direction and radial displacement urged by sliding engagement of said inclined outer surfaces with said inner wall at said inclined wall hole;

said at least three nut segments each having an inner surface facing said axis of said tube cavity, said inner surface having a portion of a screw thread for engaging a thread of said bolt; and

a bias device disposed in said tube cavity of the tubular nut body and between said at least three nut segments and said stop flange to bias said at least three nut segments in said

axial direction toward said second end to effect said radial displacement urged by sliding engagement of said inclined outer surfaces with said inner wall at said inclined wall hole.

20. The nut according to claim 19 wherein said fitting piece extends radially outward of a perimeter of said tube cavity of the tubular nut body to form a fitting flange.

21. The nut according to claim 20 wherein said fitting flange has at least one aperture for accepting a fastener therethrough.

22. The nut according to claim 19 wherein:

said tubular nut body has a disc shaped annular flange extending radially outward therefrom at said second end;

said fitting piece having said tubular nut body rotatably mounted thereon so as to permit rotation about said axis; and

said fitting piece extends radially outward of a perimeter of said tube cavity of the tubular nut body to form a fitting flange.

23. The nut according to claim 22 wherein said fitting flange has at least one aperture for accepting a fastener therethrough.

24. A connector kit for connecting a first beam to a second beam with an end of said first beam facing a first side of said second beam, wherein a first fastener is to be inserted into a side of said first beam, at least one second fastener is to be inserted into a second side of said second beam opposite said first side of said second beam, and a bolt hole is to

be provided in said second beam extending through said first side and said second side, the connector kit comprising:

a bolt having a threaded portion at a first end and a flange at a second end wherein said bolt is for passing through said bolt hole from said first side of said second beam to extend said threaded portion from said second side of said second beam;

said flange having an aperture for accepting said first fastener to hold said flange against said first side of said first beam; and

a nut device for slidable application to said bolt onto said threaded portion to a position abutting said second side of said second beam, said nut device including:

a nut body having a first end, a second end, and a through hole;

said nut body having an outer wall and an inner wall defining said through hole including at least a portion thereof being an inclined wall hole having a diameter decreasing from a first diameter to a second diameter proximate said second end;

at least three guideposts formed coaxially on said inner wall of the nut body at said inclined wall hole and extending in a direction parallel to an axis of said through hole, said at least three guideposts each having a pair of side faces extending in a radial direction of said inclined wall hole;

at least three nut segments being movably disposed between opposing pairs of said side faces of said at least three guideposts;

said opposing pairs of said side faces being inclined with respect to each other along said radial direction such that a distance between said opposing pairs of side faces decreases along said radial direction toward said axis of said through hole to define an opposing face inclination angle;

said at least three nut segments having pairs of nut segment side faces inclined with respect to each other at said opposing face inclination angle such that a width

of said at least three nut segments decreases radially toward said axis of said through hole so that said opposing pairs of said side faces limit movement of said at least three nut segments toward said axis in said radial direction;

said at least three nut segments having inclined outer surfaces complementing an inclination angle of said inclined wall hole such that said at least three nut segments are movably disposed between the guideposts so as to permit sliding movement in an axial direction and radial displacement urged by sliding engagement of said inclined outer surfaces with said inner wall at said inclined wall hole;

said at least three nut segments each having an inner surface facing said axis of said through hole, said inner surface having a portion of a screw thread for engaging said threaded portion of said bolt;

a stop flange extending radially inward into said through hole at said first end of said nut body;

a bias device disposed in the nut body between said stop flange and said at least three nut segments to bias said at least three nut segments toward said second end of said nut body and thereby urge said at least three nut segments radial inward by sliding engagement of said inclined outer surfaces with said inner wall at said inclined wall hole to effect engagement of said portions of said screw thread with said threaded portion of said bolt, and to permit outward radial displacement of said at least three nut segments by action of said threaded portion against said bias device thereby allowing slidable application of said nut device to said threaded portion of said bolt when said nut device is slid onto said bolt with said second end of said nut body leading;

a fitting piece mounted to said second end of said nut body, said fitting piece projecting outwardly of said outer wall of the nut body to form a fitting flange and extending inward of said second diameter to define a bolt insertion aperture, through which said bolt passes during application of said nut body to said bolt; and

said fitting flange having at least one fastener aperture for accepting said at least one second fastener therethrough to fasten said fitting flange to said second side of said second beam.

25. The kit according to claim 24, wherein said stop flange defines a bolt exit aperture through which said bolt passes during application of said nut device to said bolt.

26. A connector kit for connecting a first beam to a second beam with an end of said first beam facing a first side of said second beam, wherein a first fastener is to be inserted into a side of said first beam, at least one second fastener is to be inserted into a second side of said second beam opposite said first side of said second beam, and a bolt hole is to be provided in said second beam extending through said first side and said second side, the connector kit comprising:

a bolt having a threaded portion at a first end and a flange at a second end wherein said bolt is for passing through said bolt hole from said first side of said second beam to extend said threaded portion from said second side of said second beam;

said flange having an aperture for accepting said first fastener to hold said flange against said first side of said first beam; and

a nut device for slidable application to said bolt onto said threaded portion to a position abutting said second side of said second beam, said nut device including:

a tubular nut body having an outer wall, a first end, and a second end, said tubular nut body defining a tube cavity extending therethrough;

said tubular nut body having a stopper flange formed at said first end and extending radially inwardly into said tube cavity;

a fitting piece, formed in the shape of a flange, mounted to said tubular nut body at said second end and extending radially inward of a perimeter of said tube cavity of the tubular nut body, said fitting piece defining a bolt insertion aperture through which said bolt passes when said nut is slid onto said bolt;

a sleeve disposed within said tube cavity and defining an inclined wall hole having a diameter decreasing from a first diameter to a second diameter proximate said second end that is less than said first diameter, said inclined wall hole being coaxially aligned with an axis of said tube cavity;

at least three guideposts formed coaxially on said inclined wall hole and extending in a direction parallel to an axis of said tube cavity, said at least three guideposts each having a pair of side faces extending in a radial direction of said inclined wall hole;

at least three nut segments being movably disposed between opposing pairs of said side faces of said at least three guideposts;

said opposing pairs of said side faces being inclined with respect to each other along said radial direction such that a distance between said opposing pairs of side faces decreases along said radial direction toward said axis of said through hole to define an opposing face inclination angle;

said at least three nut segments having pairs of nut segment side faces inclined with respect to each other at said opposing face inclination angle such that a width of said at least three nut segments decreases radially toward said axis of said tube

cavity so that said opposing pairs of said side faces limit movement of said at least three nut segments toward said axis in said radial direction;

said at least three nut segments having inclined outer surfaces complementing an inclination angle of said inclined wall hole such that said at least three nut segments are movably disposed between the guideposts so as to permit sliding movement in an axial direction and radial displacement urged by sliding engagement of said inclined outer surfaces with said inner wall at said inclined wall hole;

said at least three nut segments each having an inner surface facing said axis of said tube cavity, said inner surface having a portion of a screw thread for engaging said threaded portion of said bolt when said nut device is slid onto said threaded portion with said second end of said tubular nut body leading;

a bias device disposed in said tube cavity of the tubular nut body and between said at least three nut segments and said stop flange to bias said at least three nut segments in said axial direction toward said second end to effect said radial displacement urged by sliding engagement of said inclined outer surfaces with said inner wall at said inclined wall hole, and to permit outward radial displacement to permit said nut device to slide over said threaded portion when said nut device is slid onto said threaded portion with said second end of said tubular nut body leading; and

said fitting piece extending radially outward from said tubular nut body to form a fitting flange with at least one fastener aperture for accepting said at least one second fastener therethrough to permit securing said fitting flange to said second side of said second beam when said nut device is slid onto said threaded portion to abut said fitting flange against said second side.

27. The kit according to claim 26 wherein:

said tubular nut body has a disc shaped annular flange extending radially outward therefrom at said second end; and

said fitting piece having said tubular nut body rotatably mounted thereon so as to permit rotation about said axis thereby permitting tightening of said nut device on said threaded portion after said fitting flange is secured to said second side of said second beam.

FIG.1

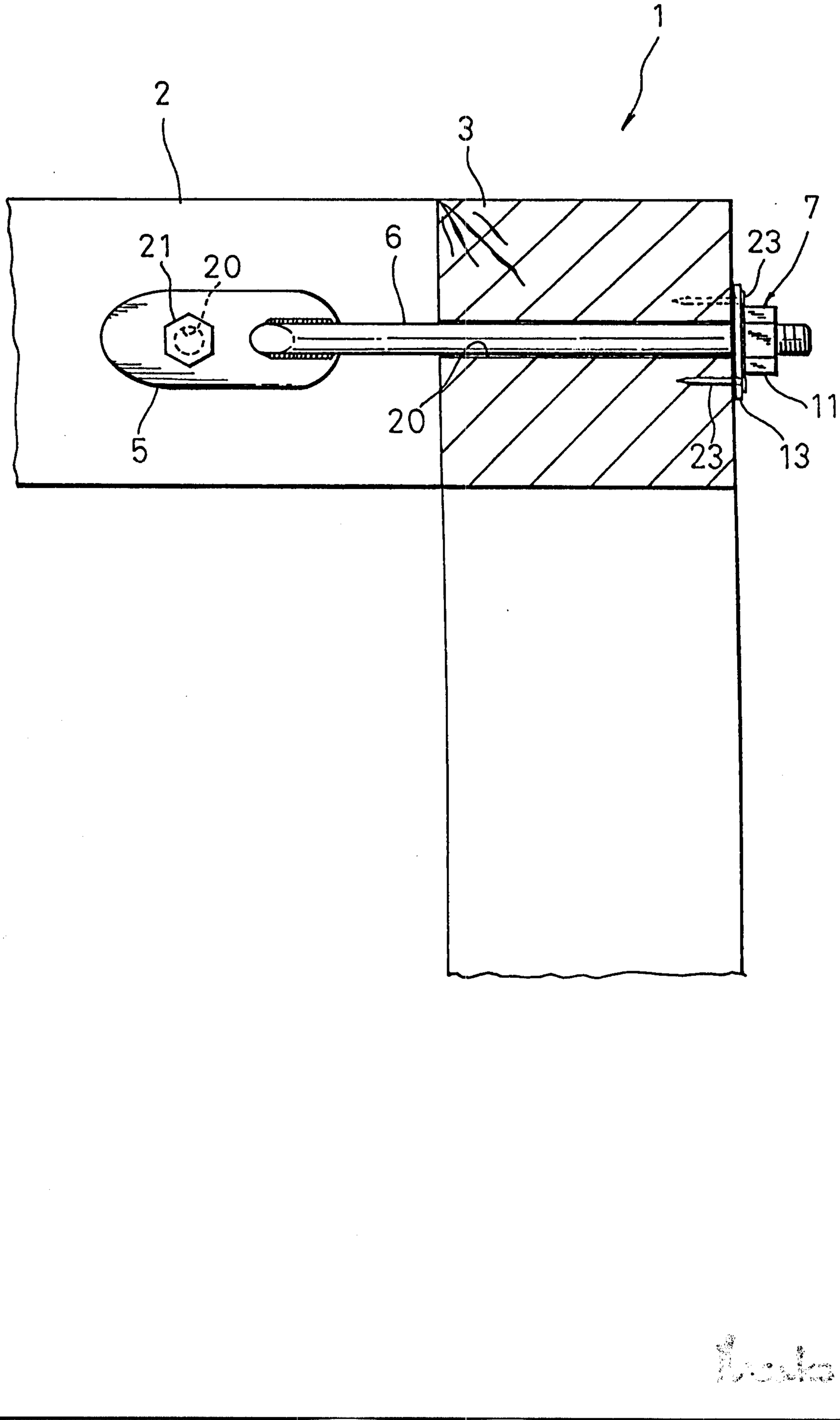


FIG.2

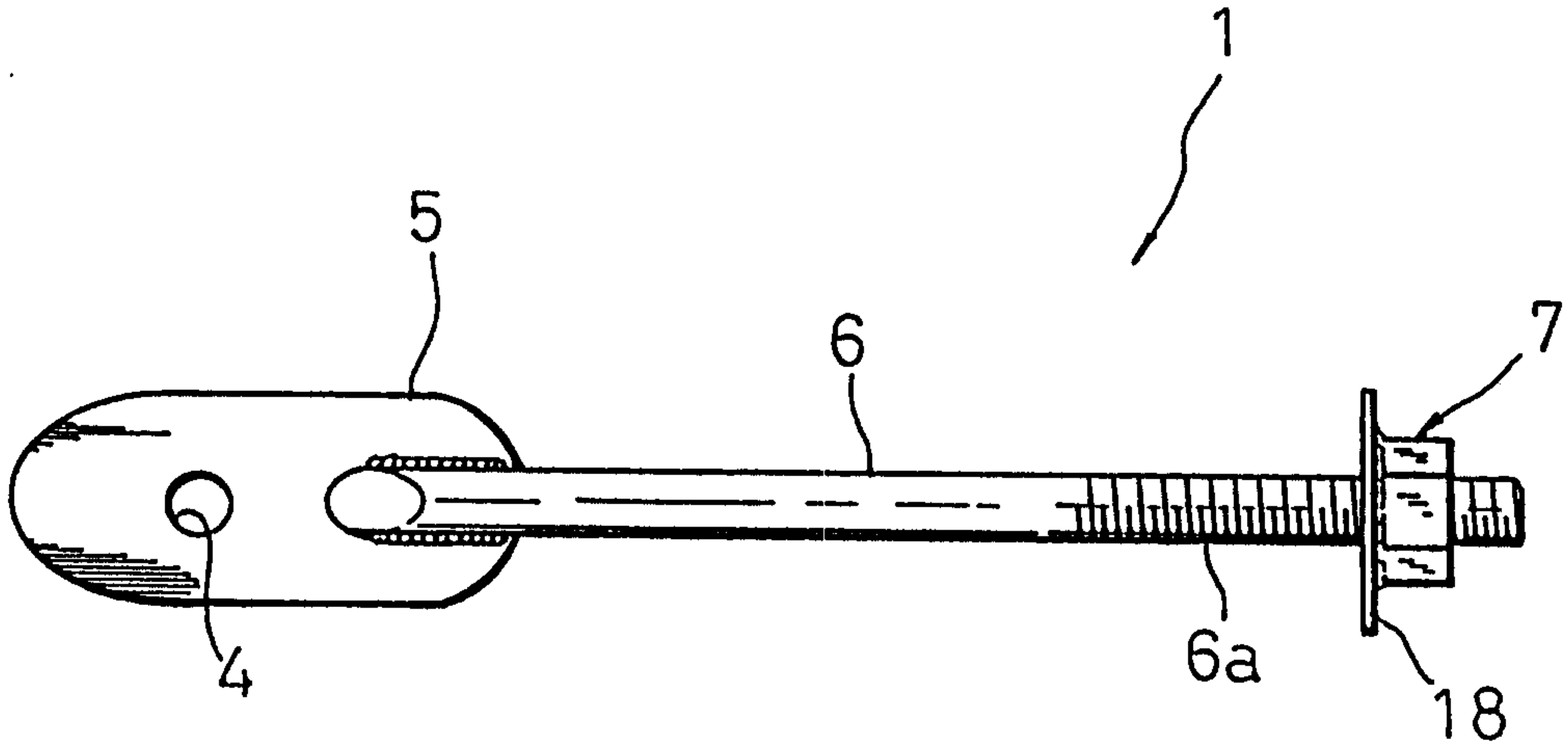


FIG.3

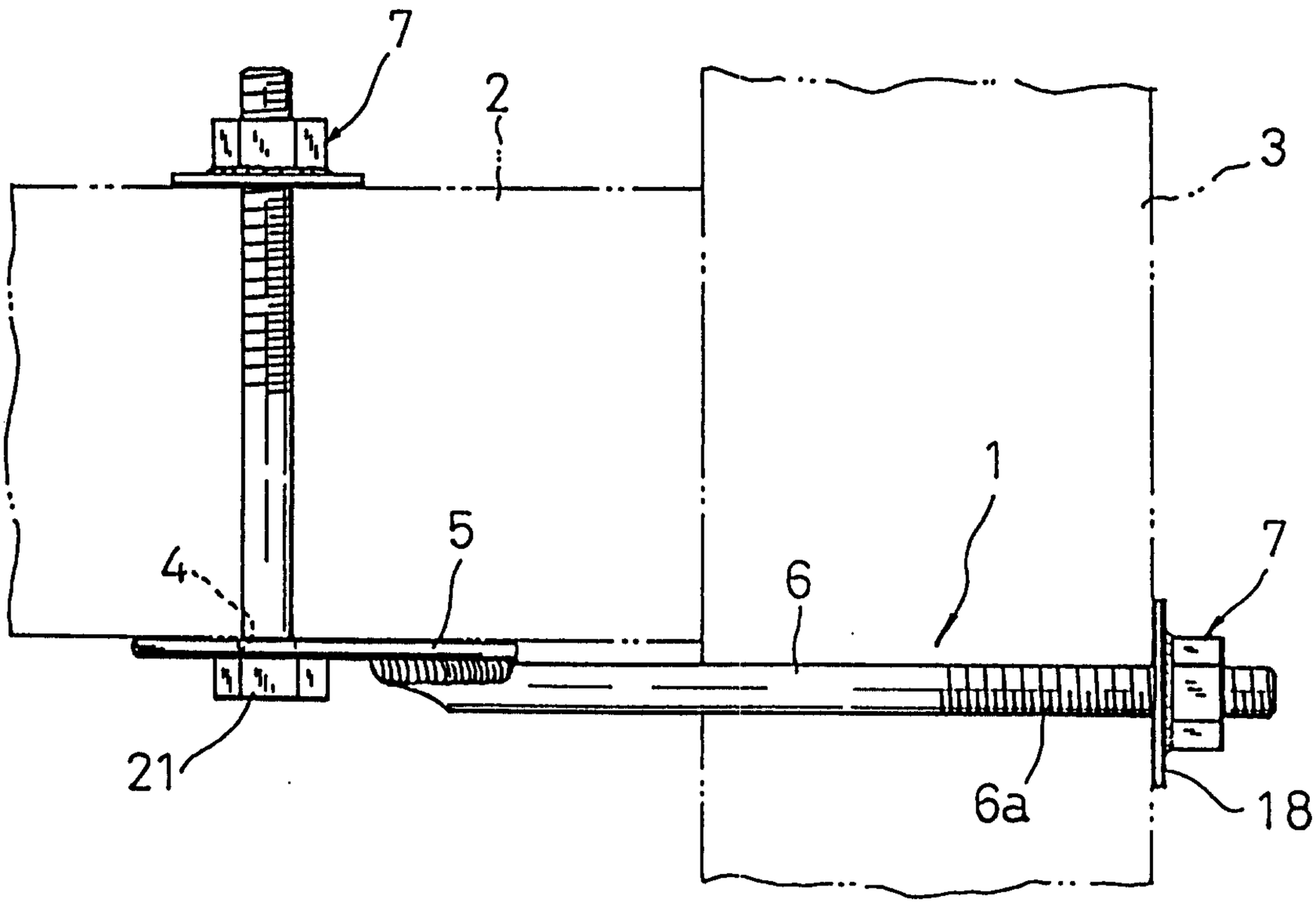


FIG.4

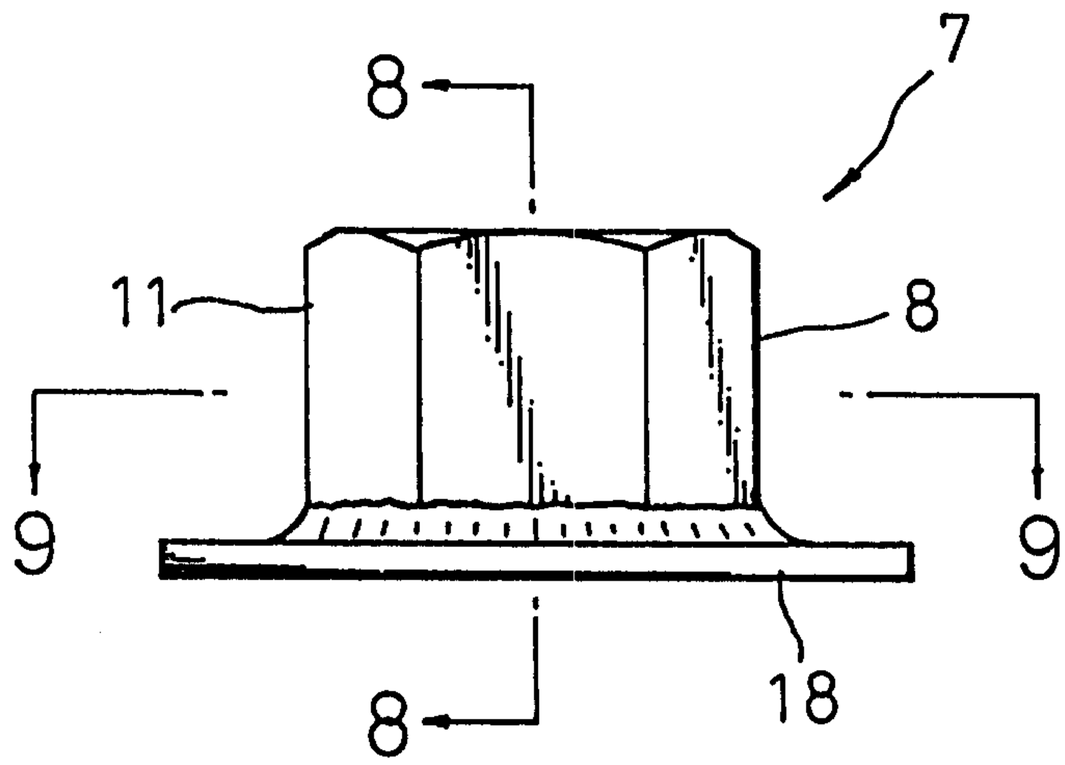


FIG.5

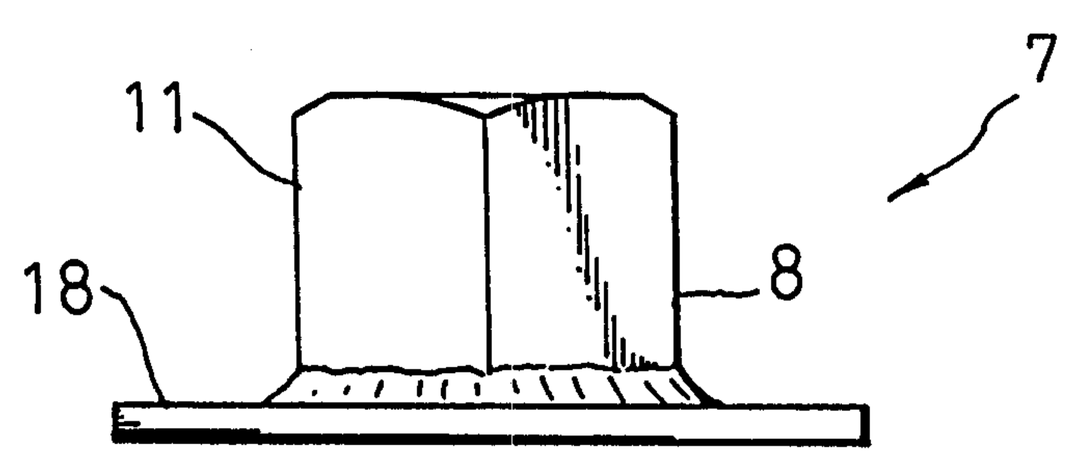


FIG.6

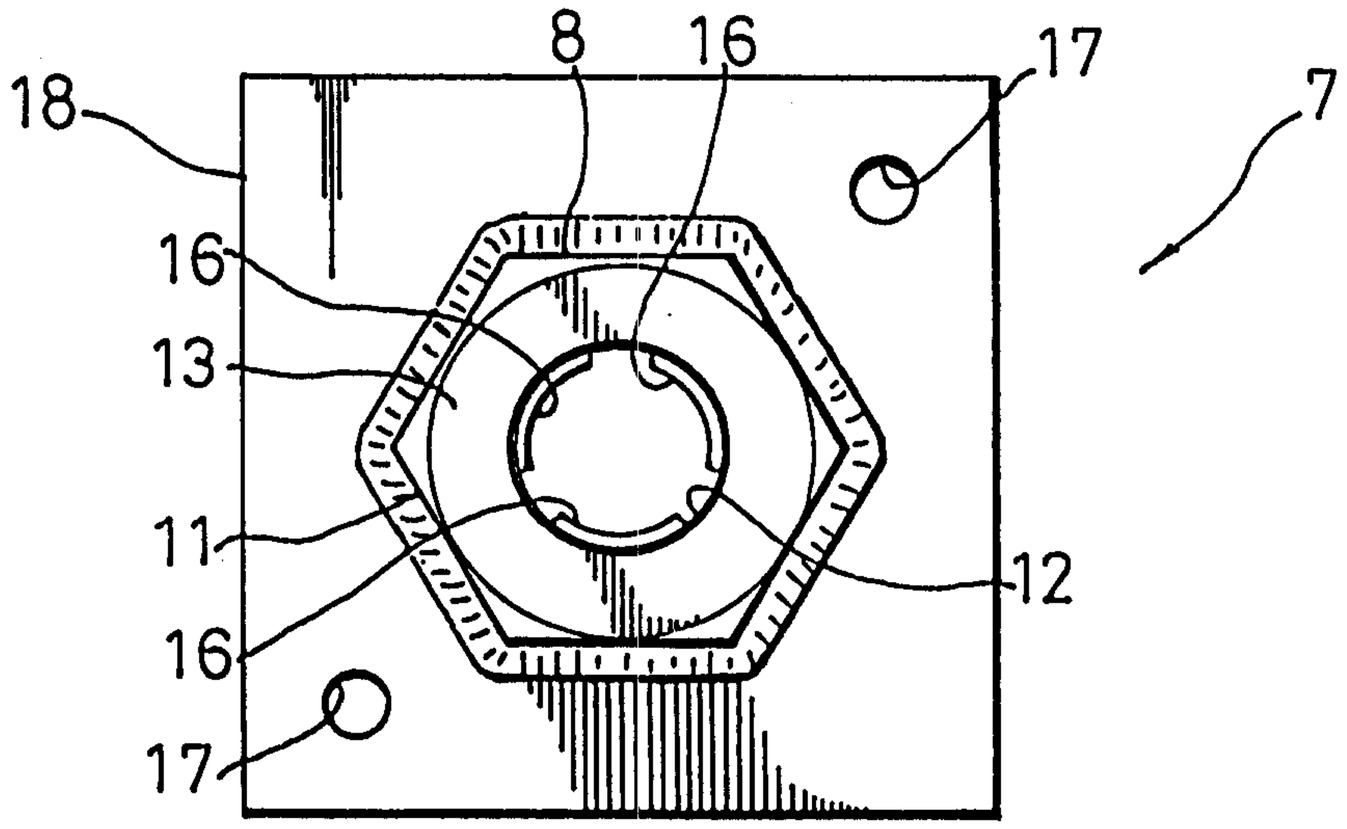


FIG.7

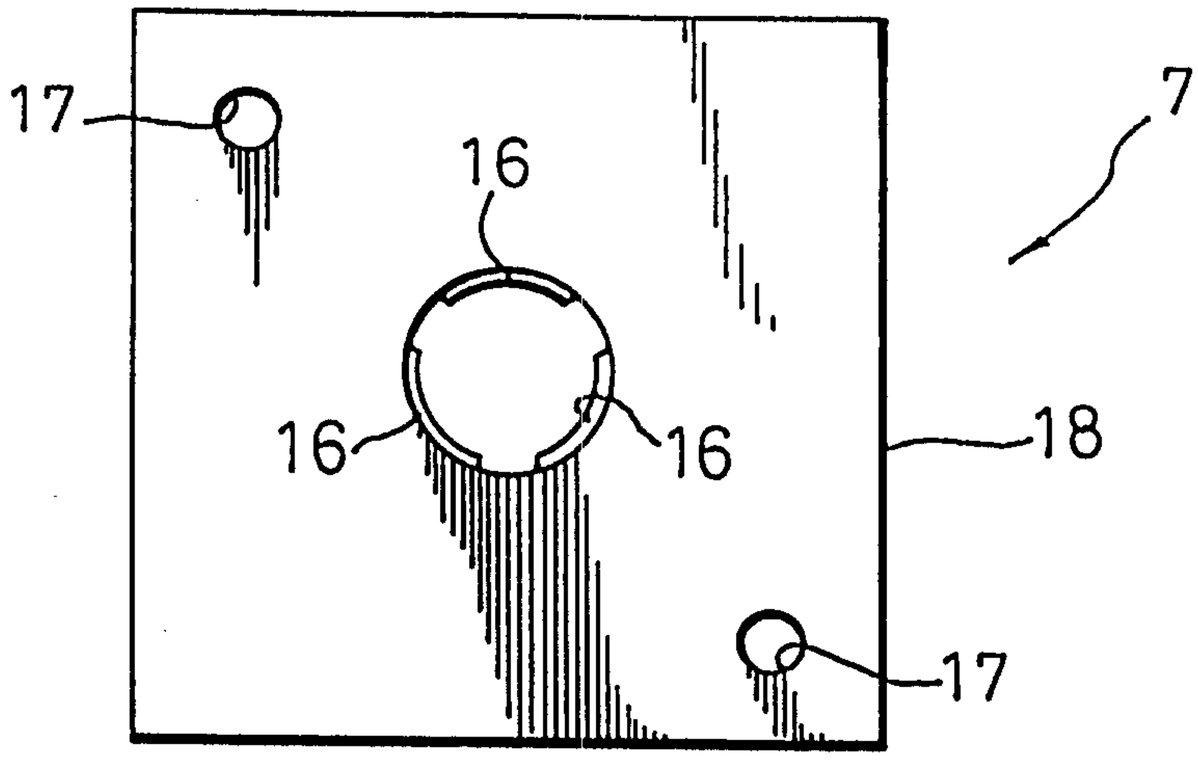


FIG.8

FIG.9

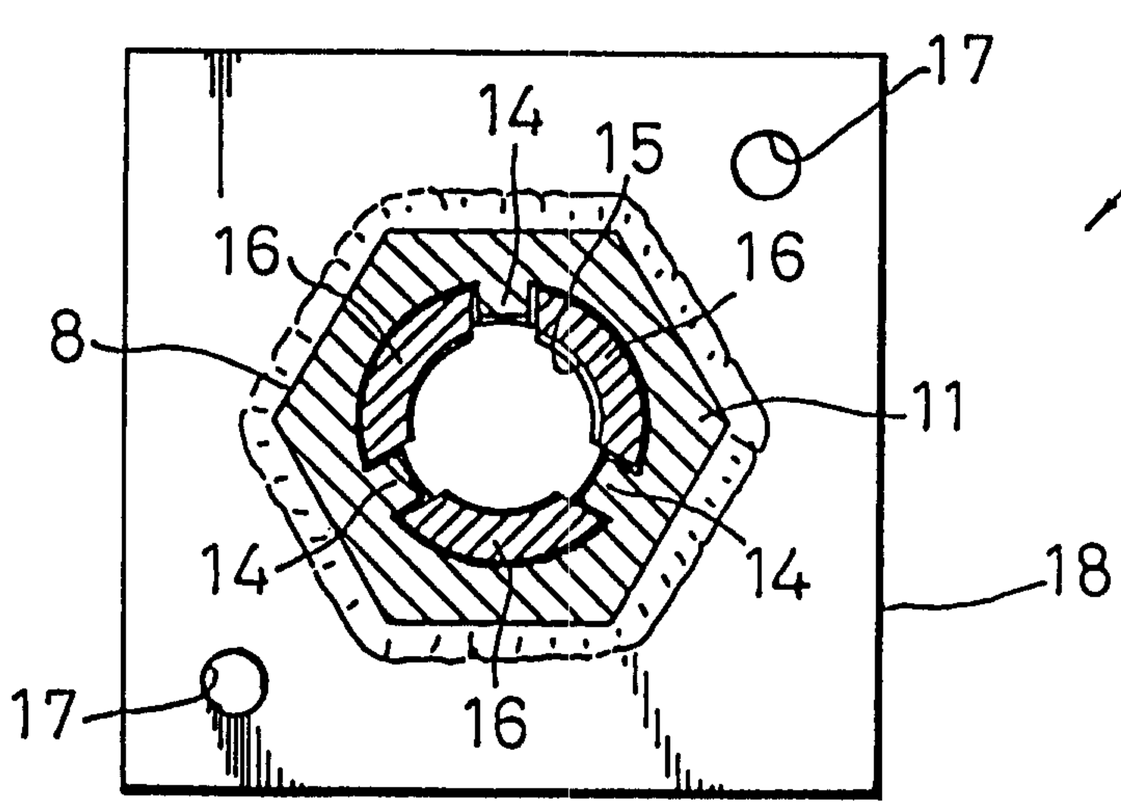


FIG.10

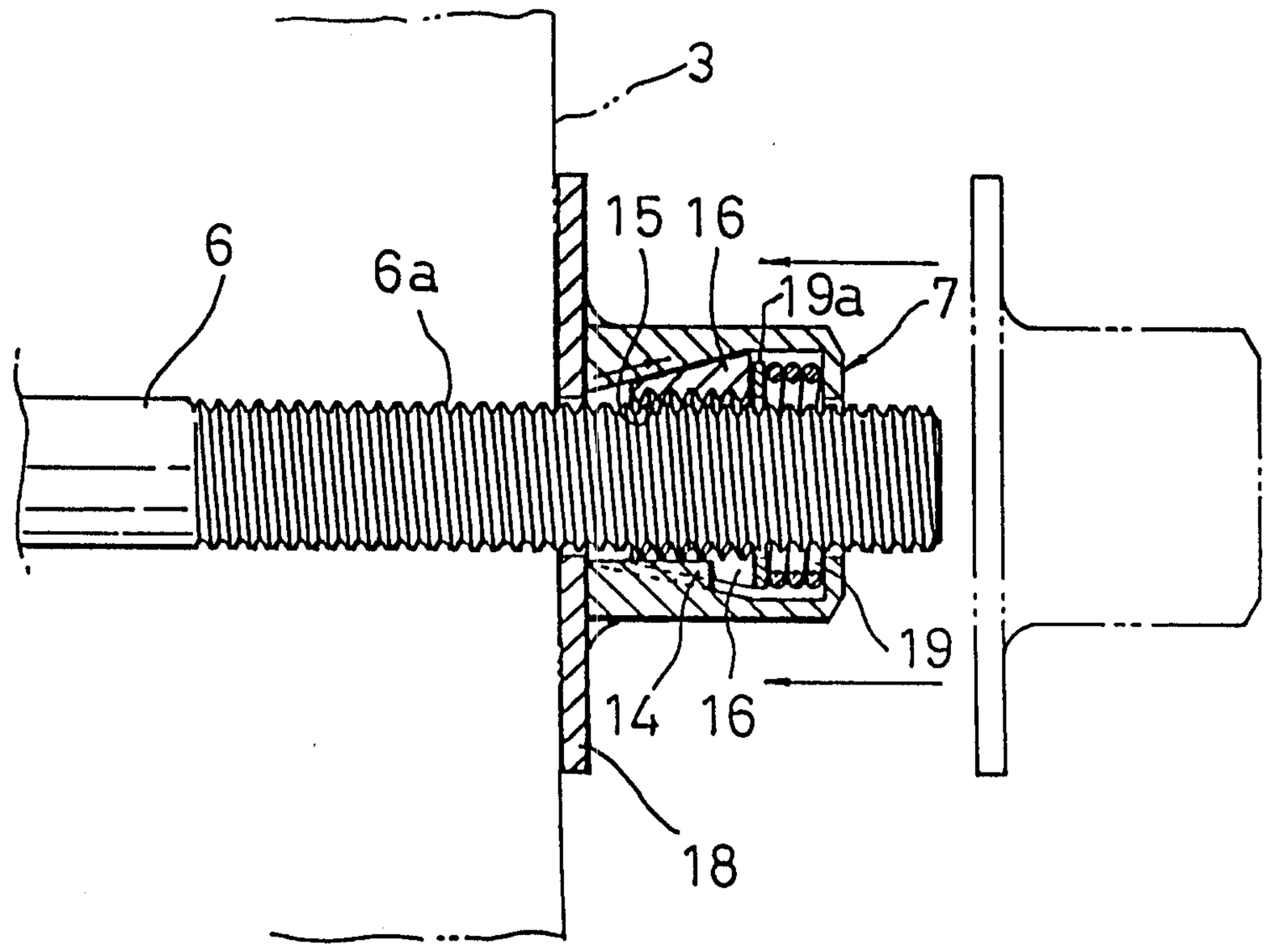


FIG.11

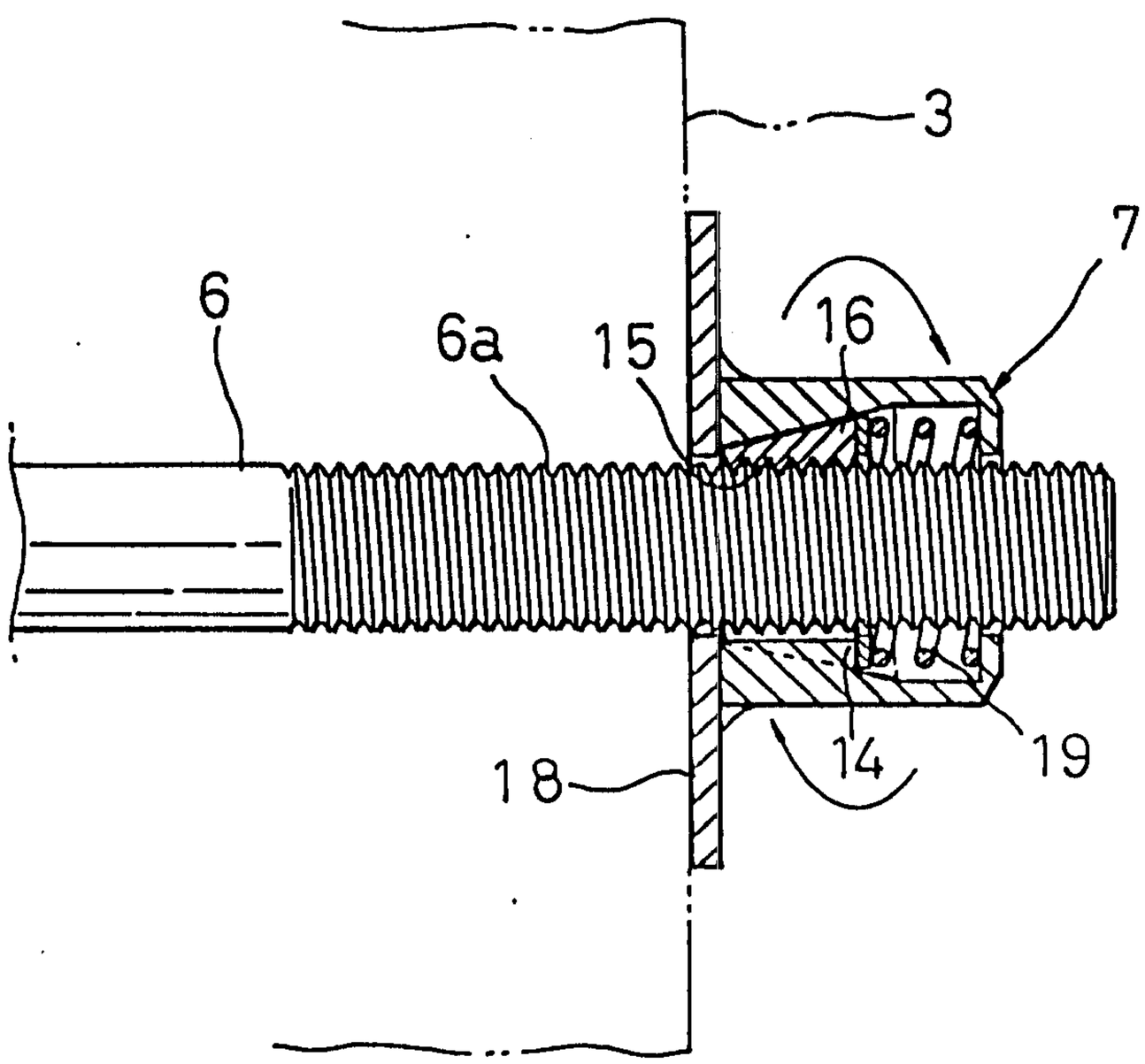
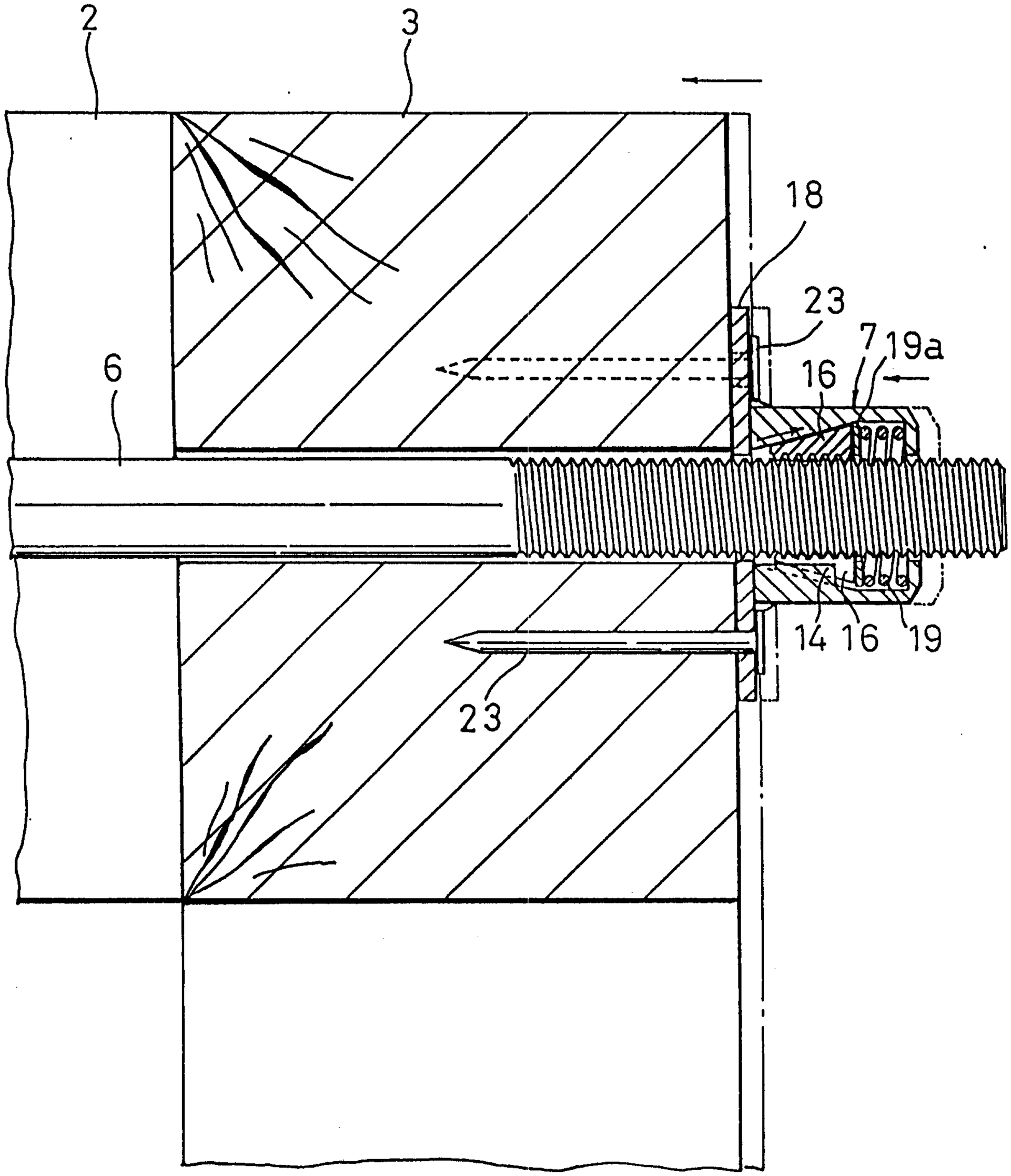


FIG.12



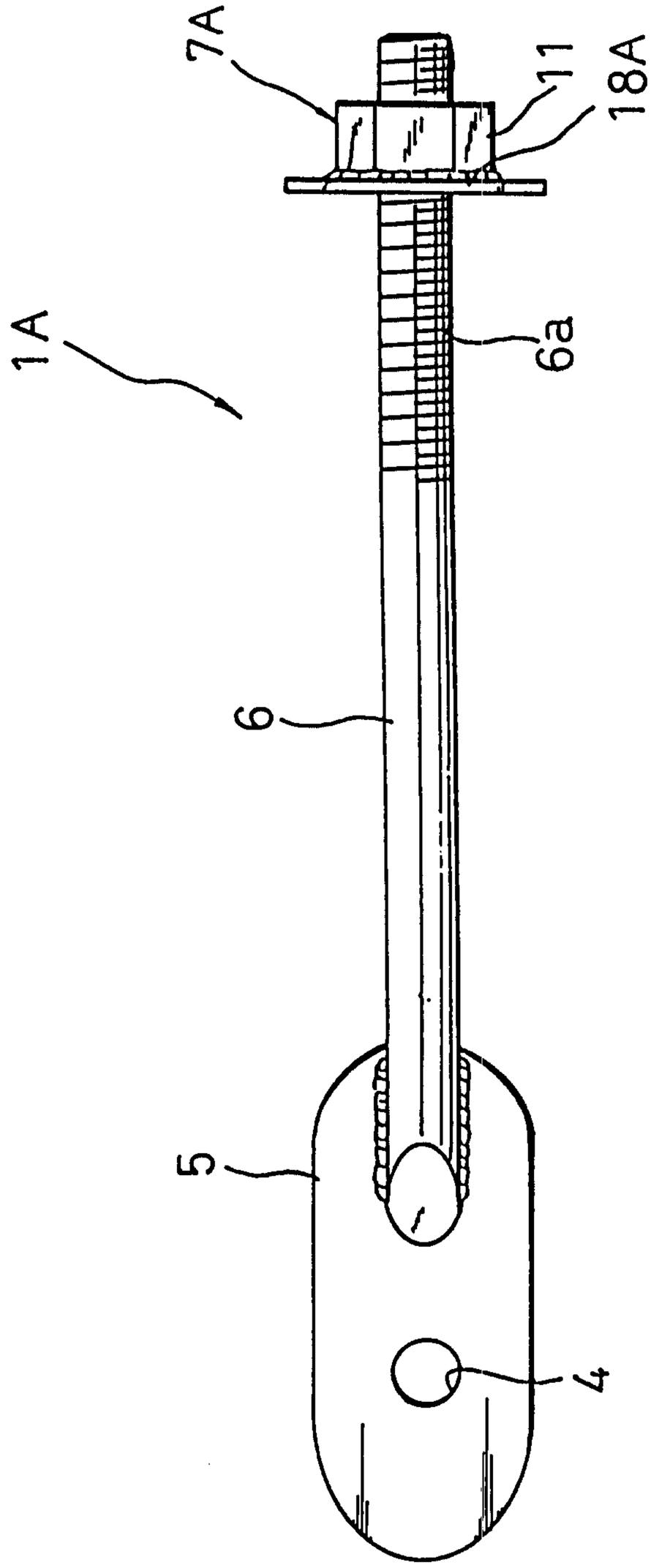


FIG. 13

FIG.14

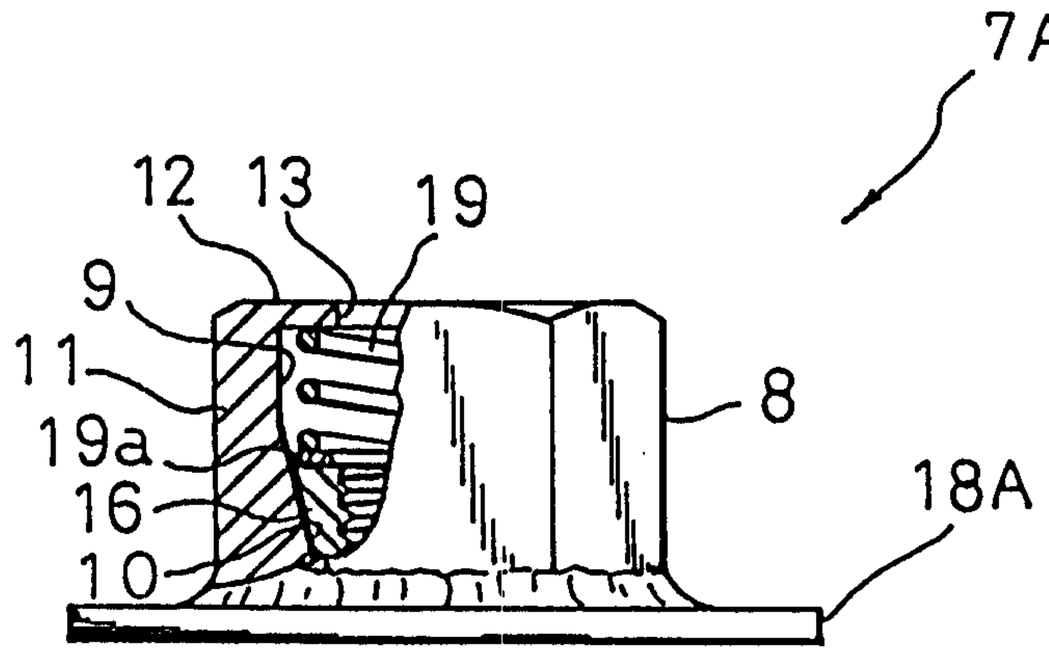
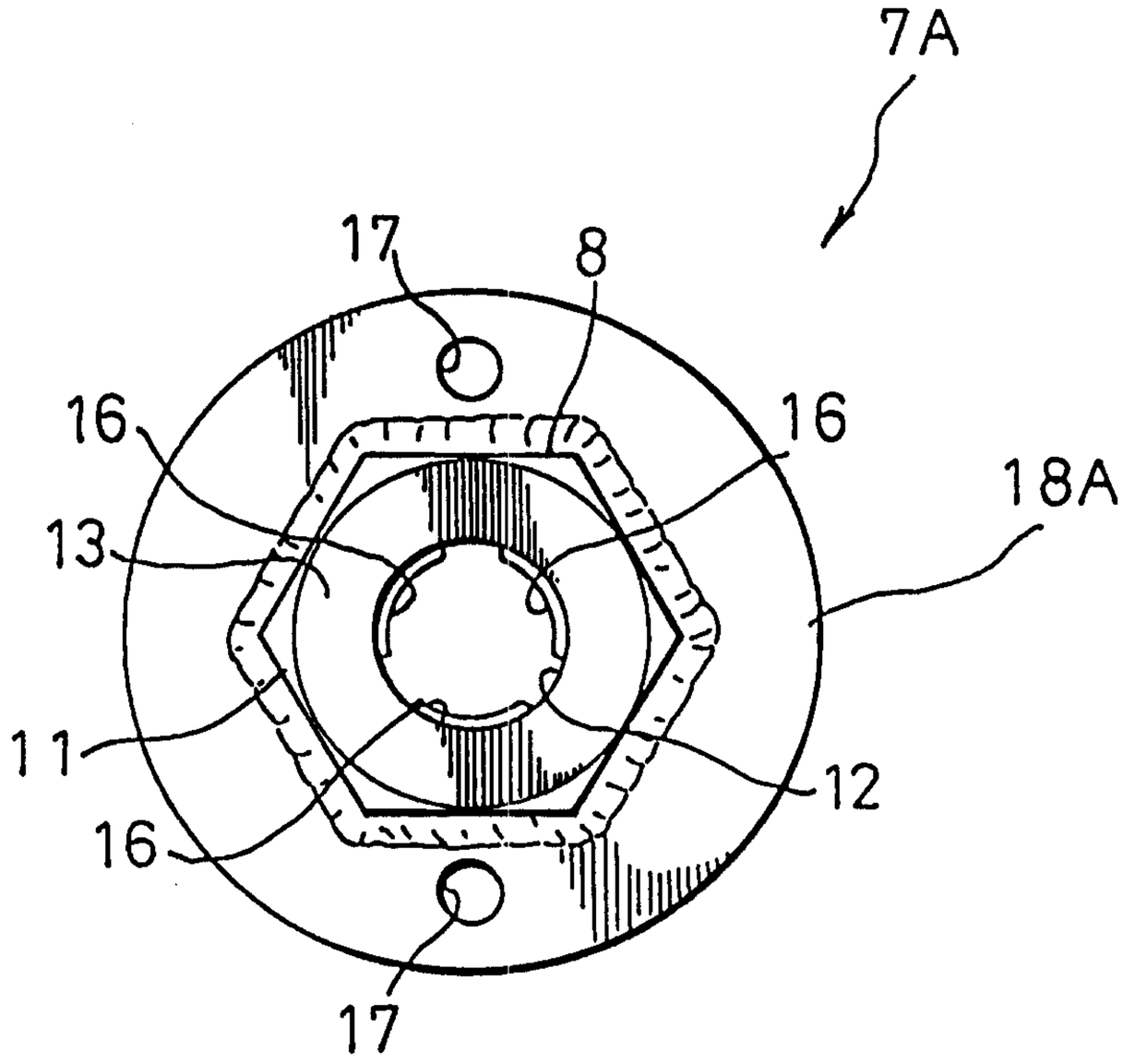


FIG.15



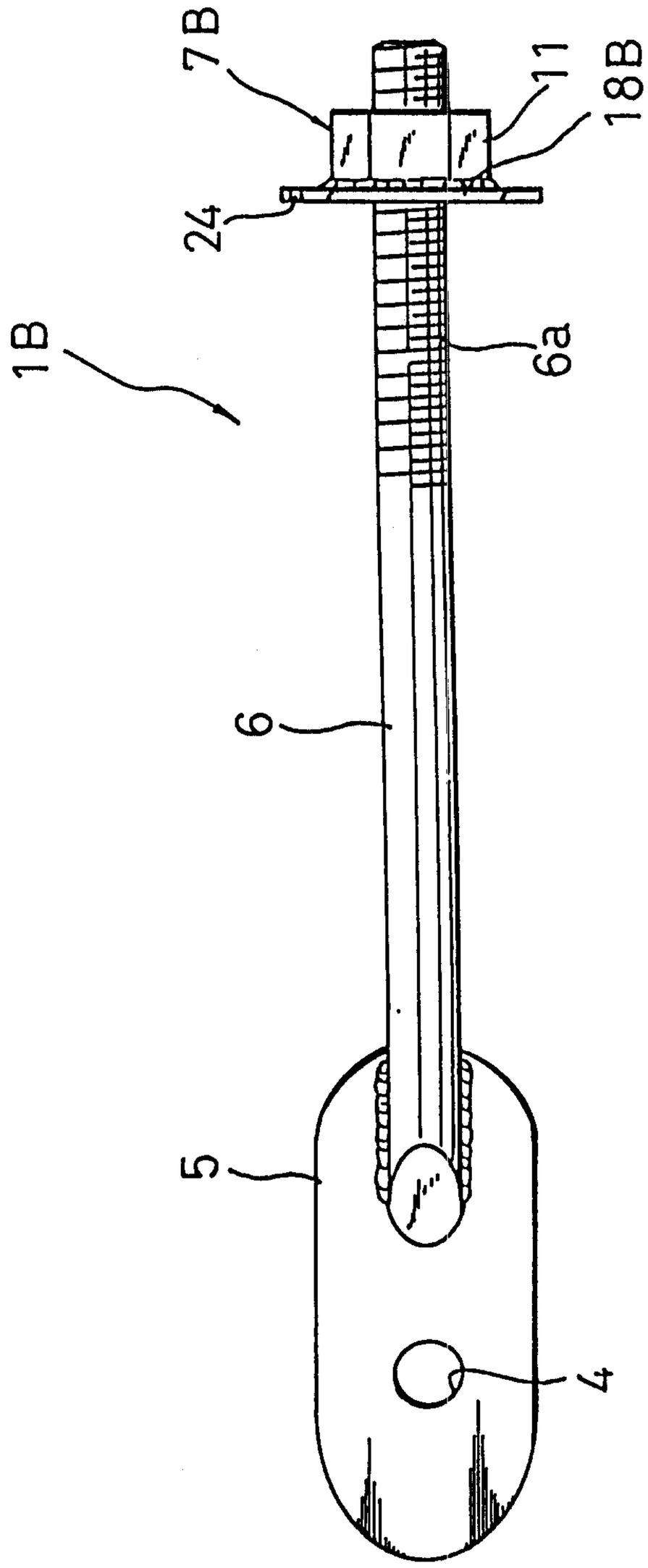


FIG. 16

FIG.17

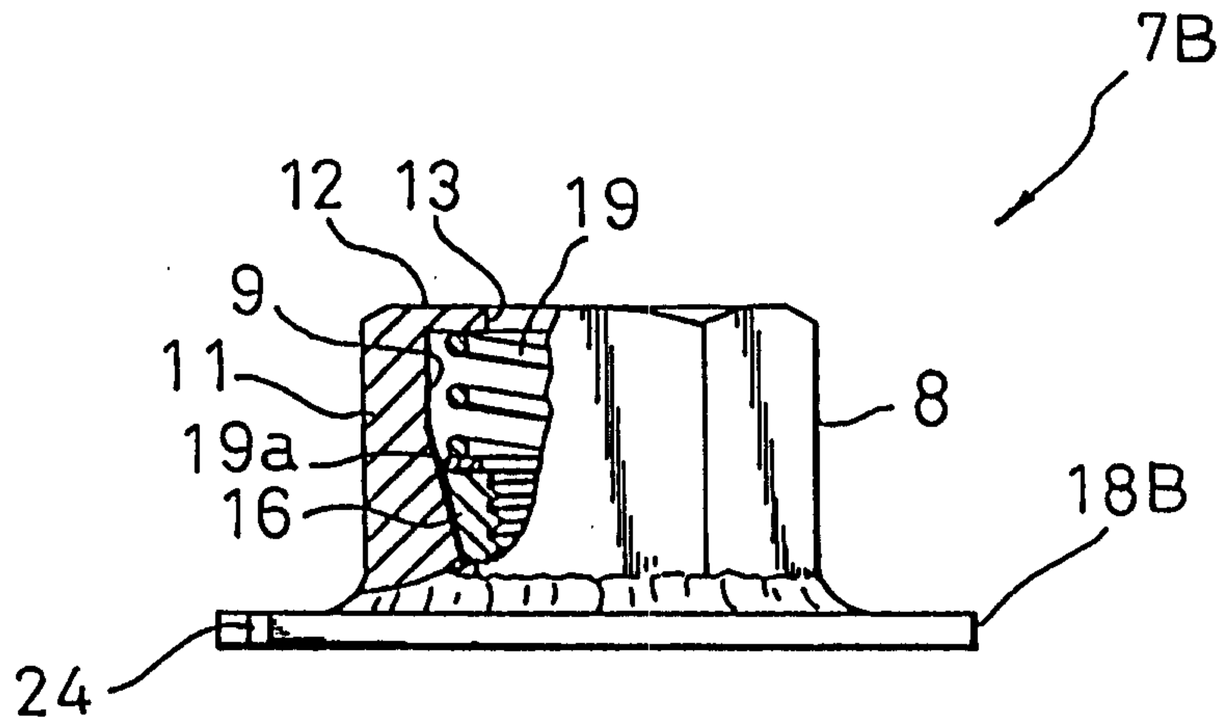
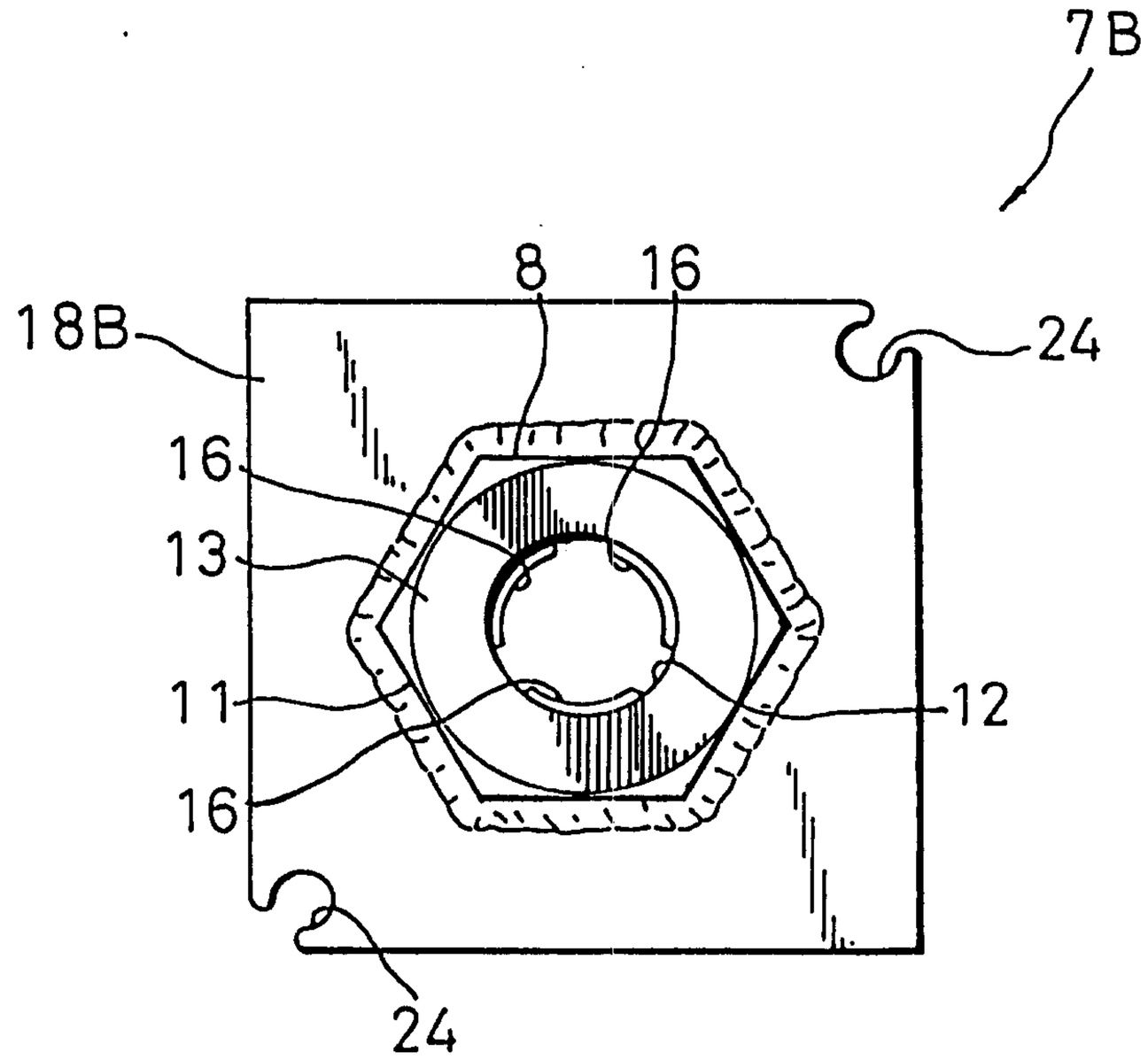


FIG.18



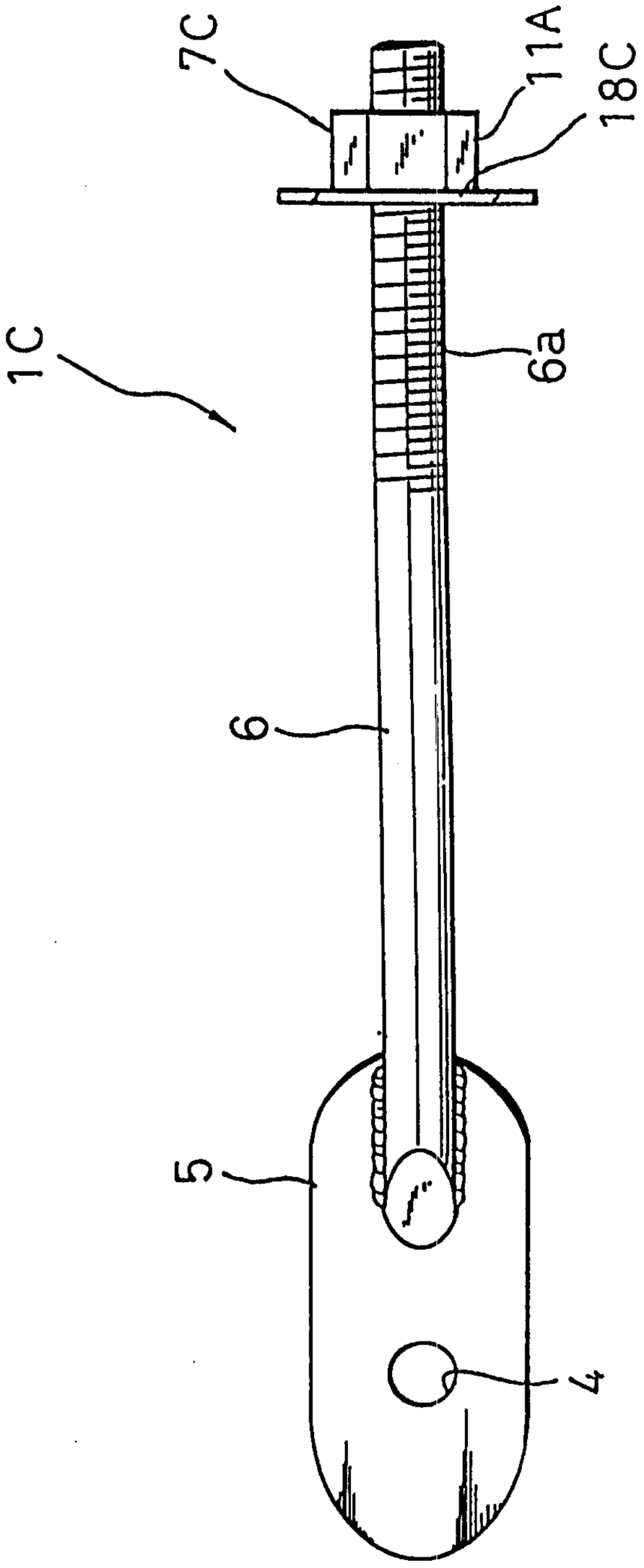


FIG. 19

FIG.20

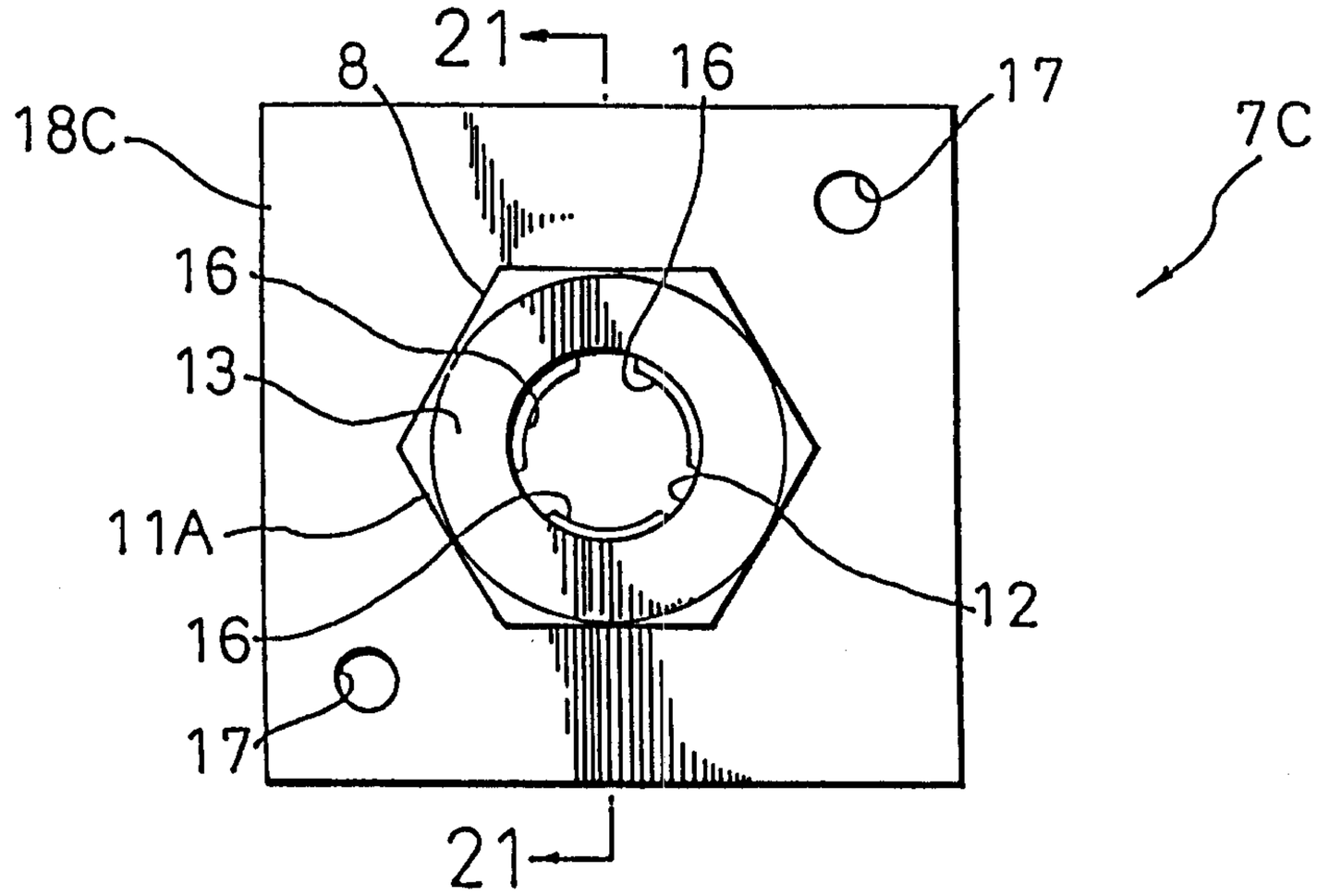


FIG.21

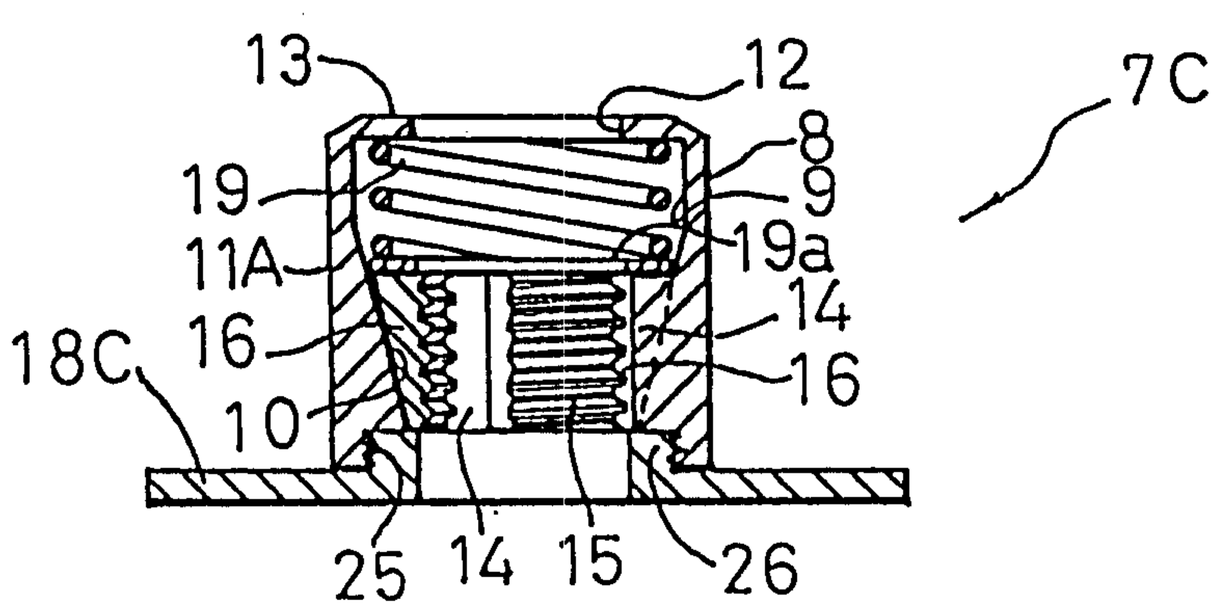
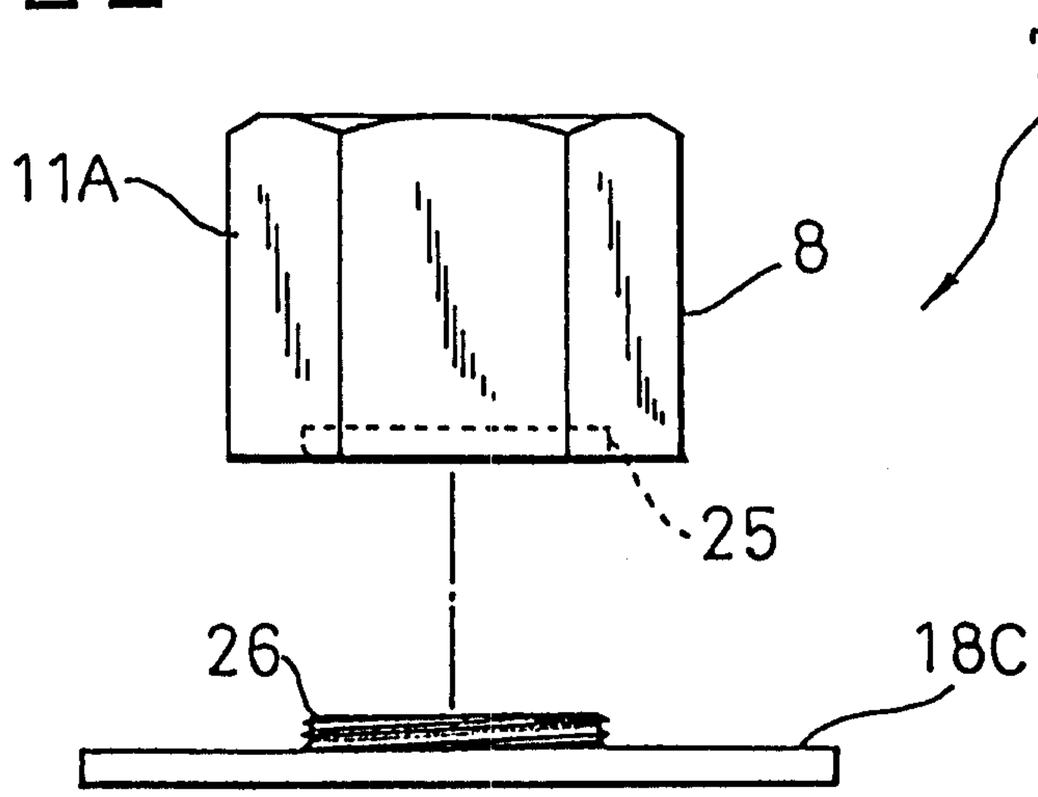


FIG.22



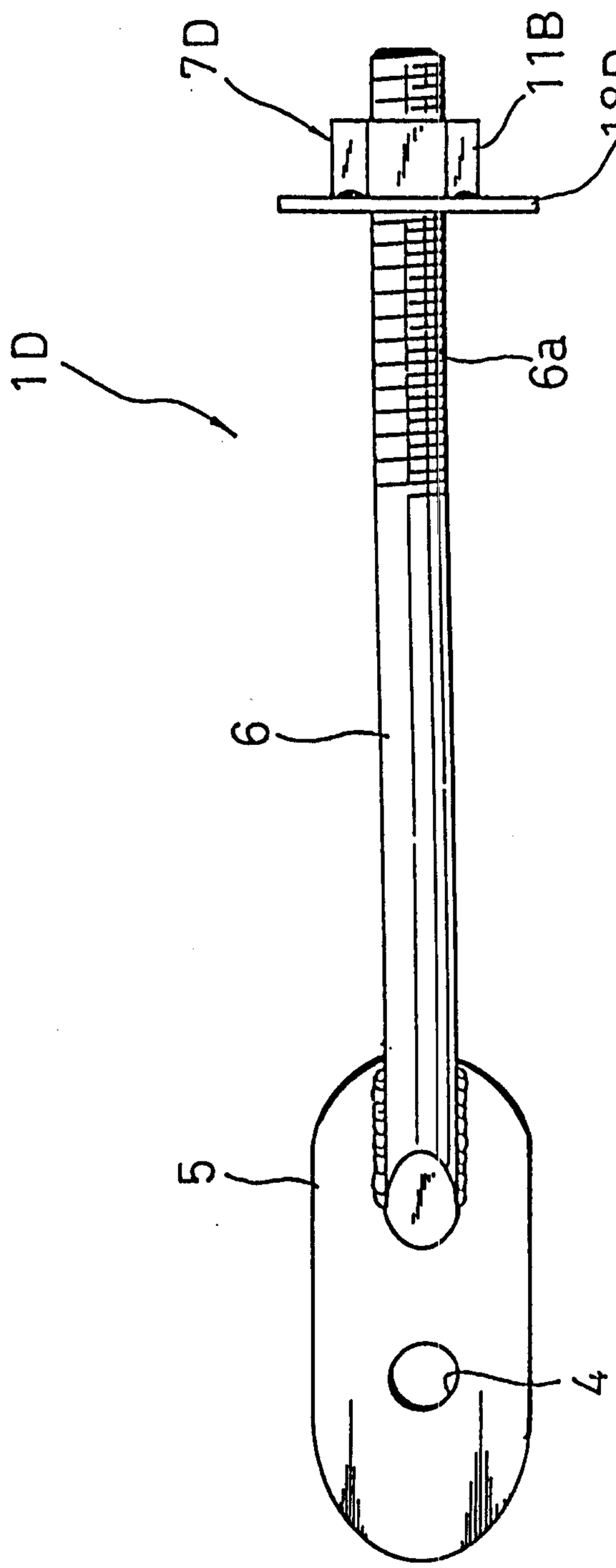


FIG. 23

FIG.24

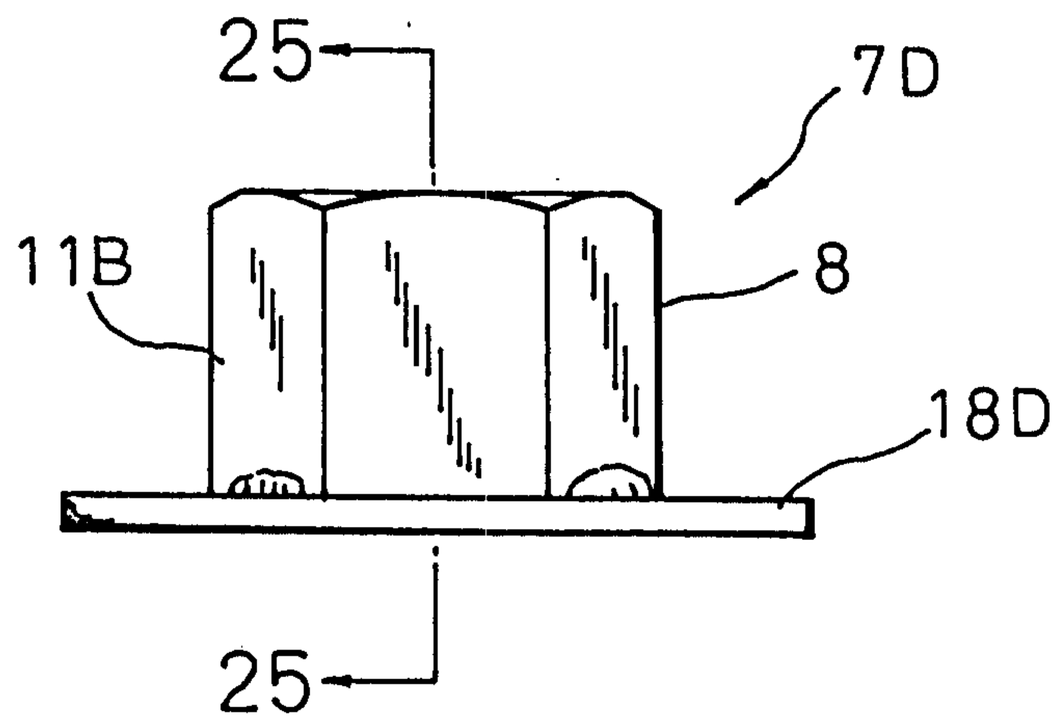


FIG.25

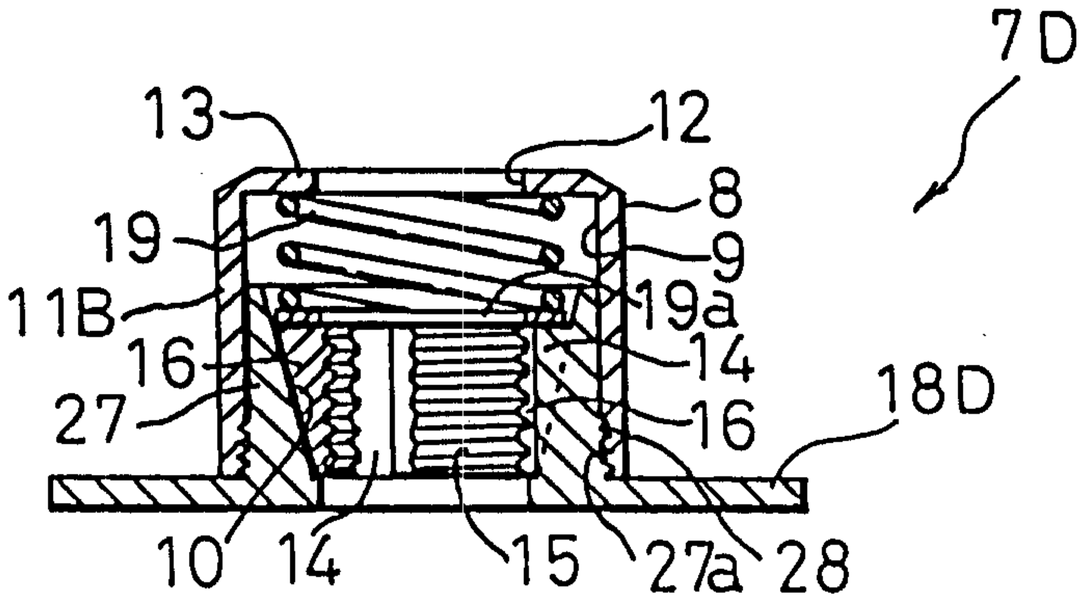
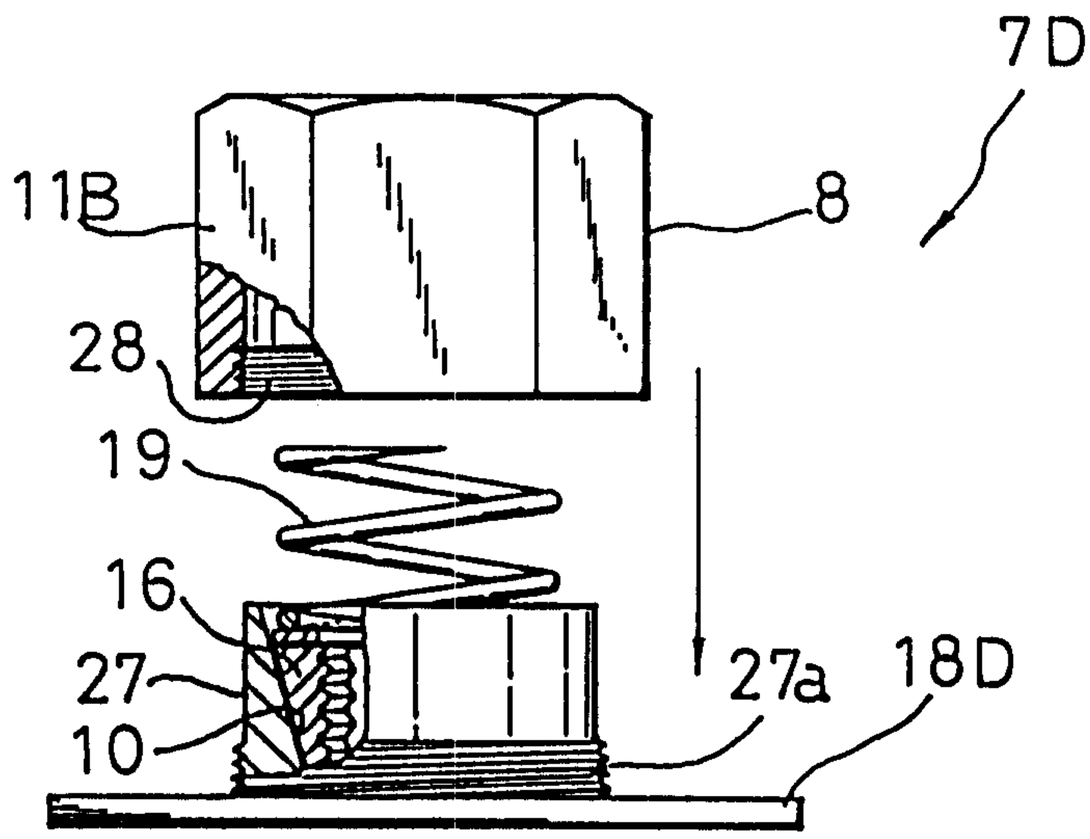


FIG.26



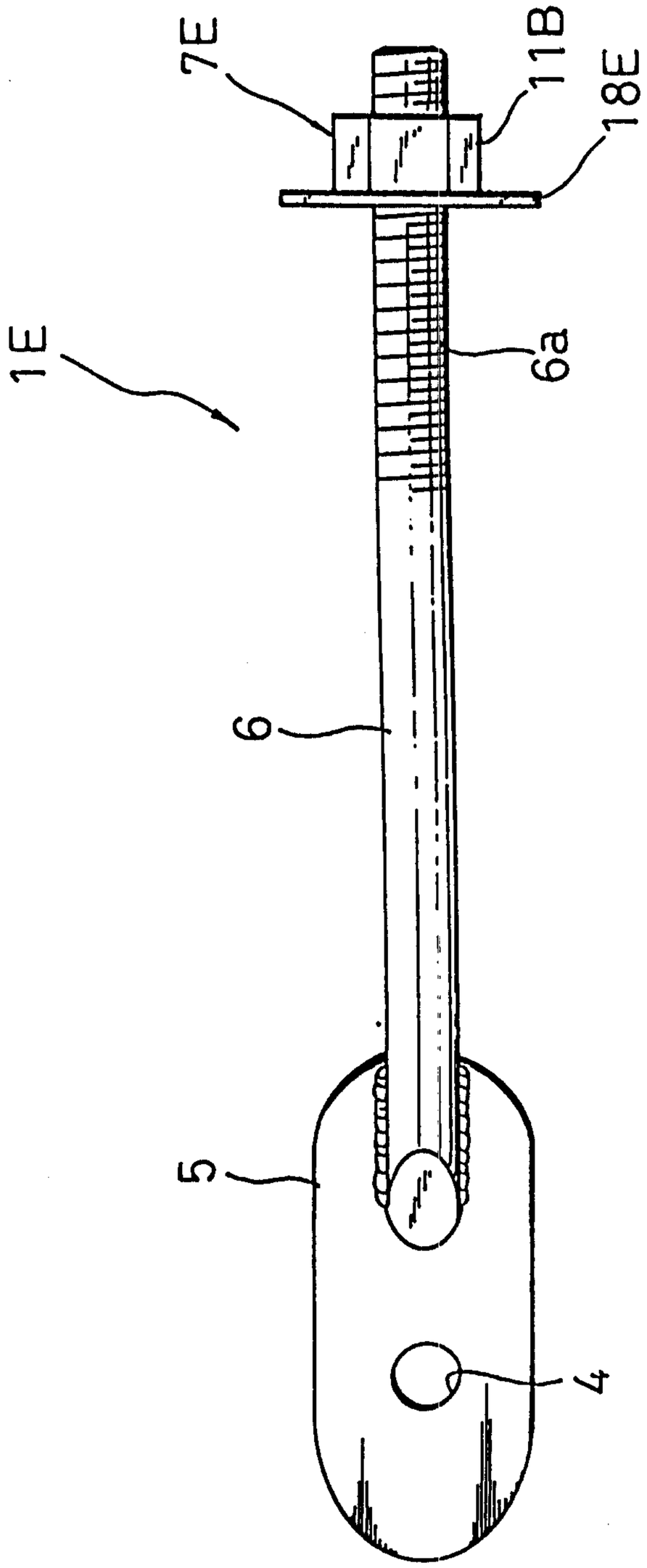


FIG. 27

FIG.28

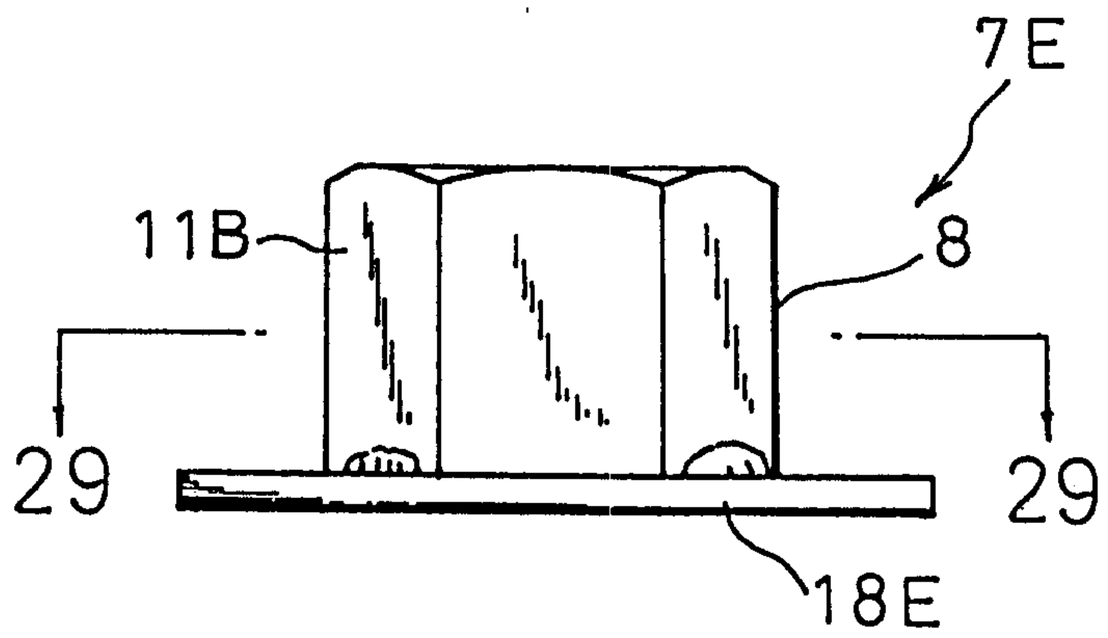


FIG.29

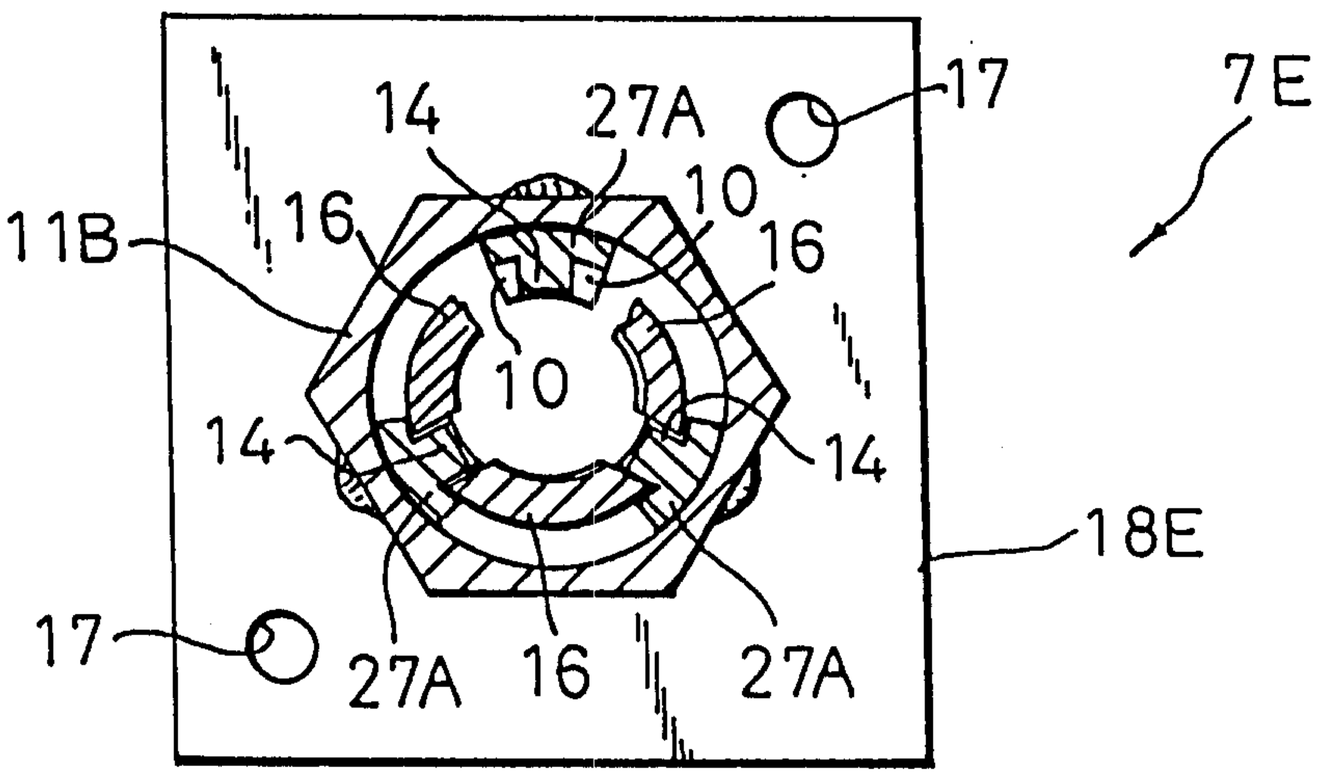


FIG.30

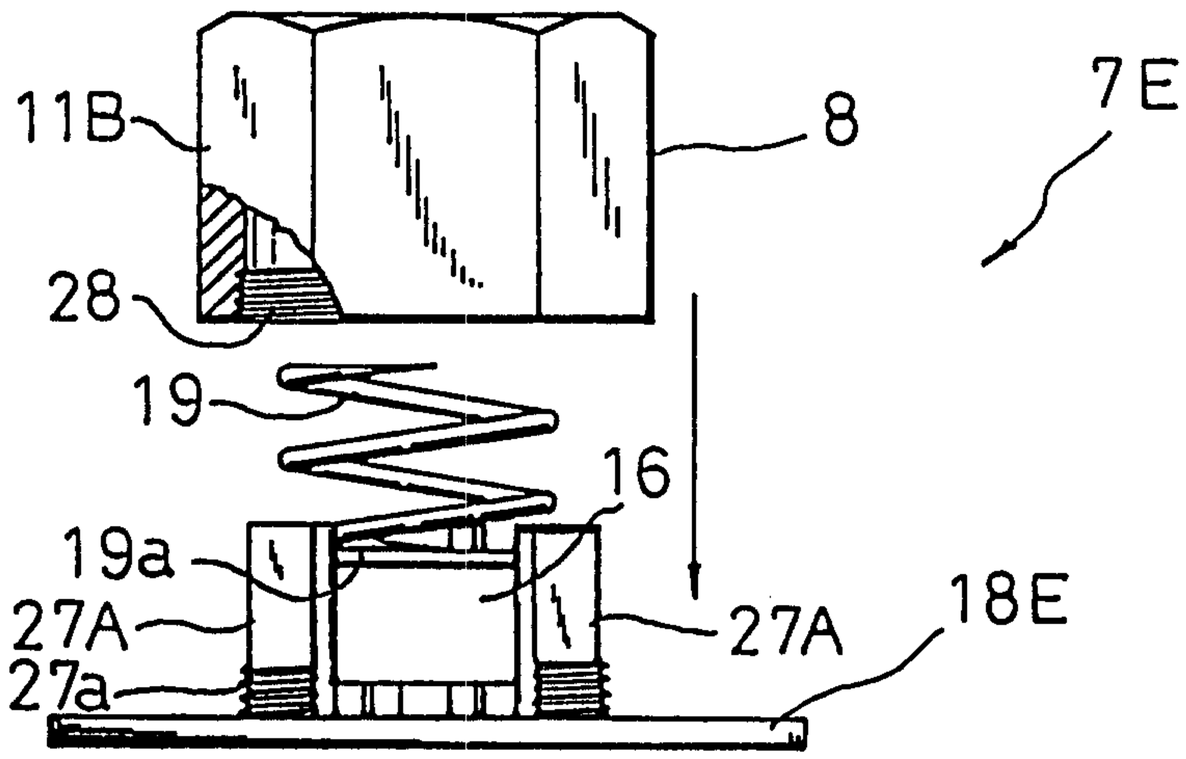


FIG.31

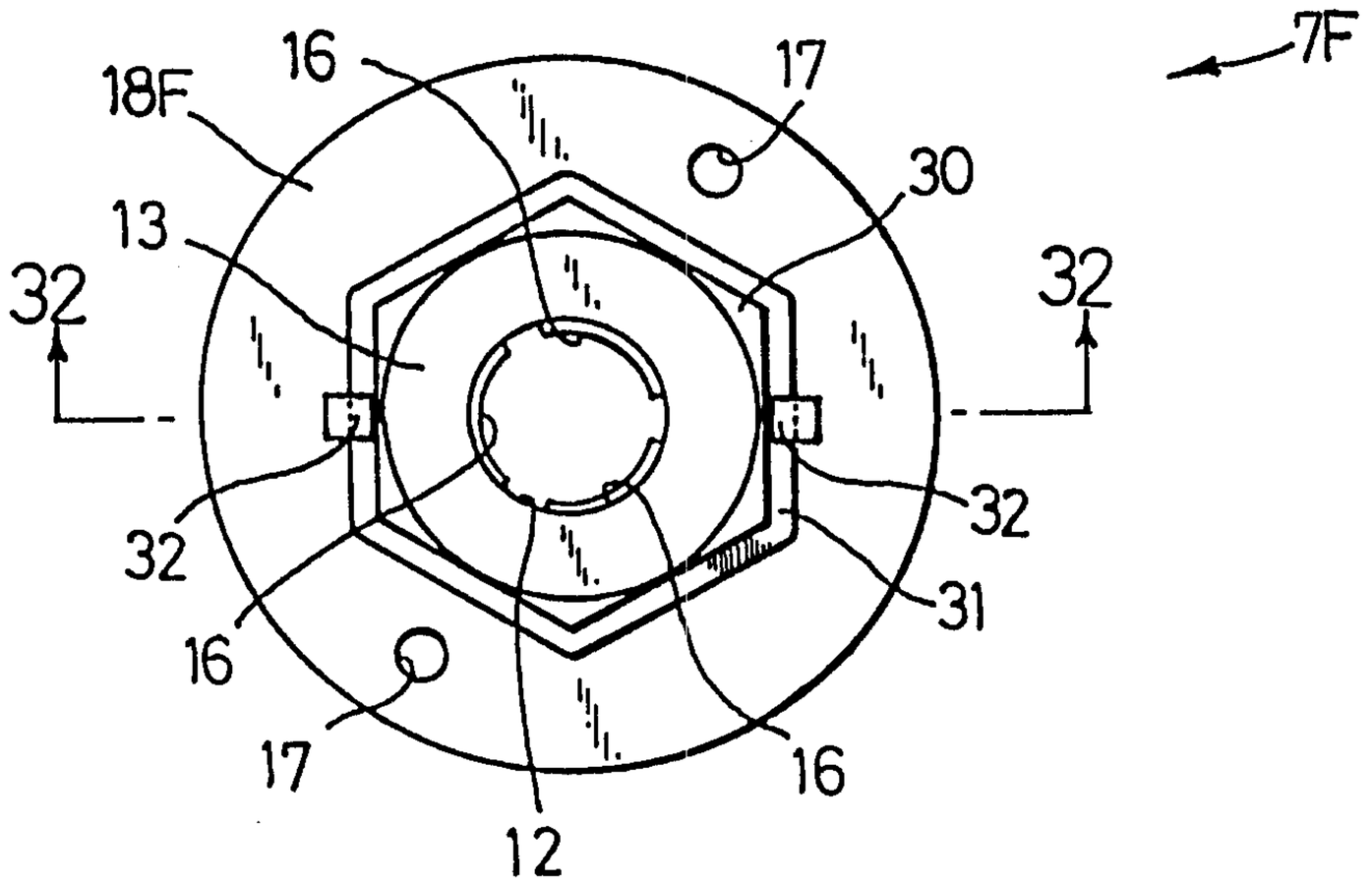


FIG.32

FIG.33

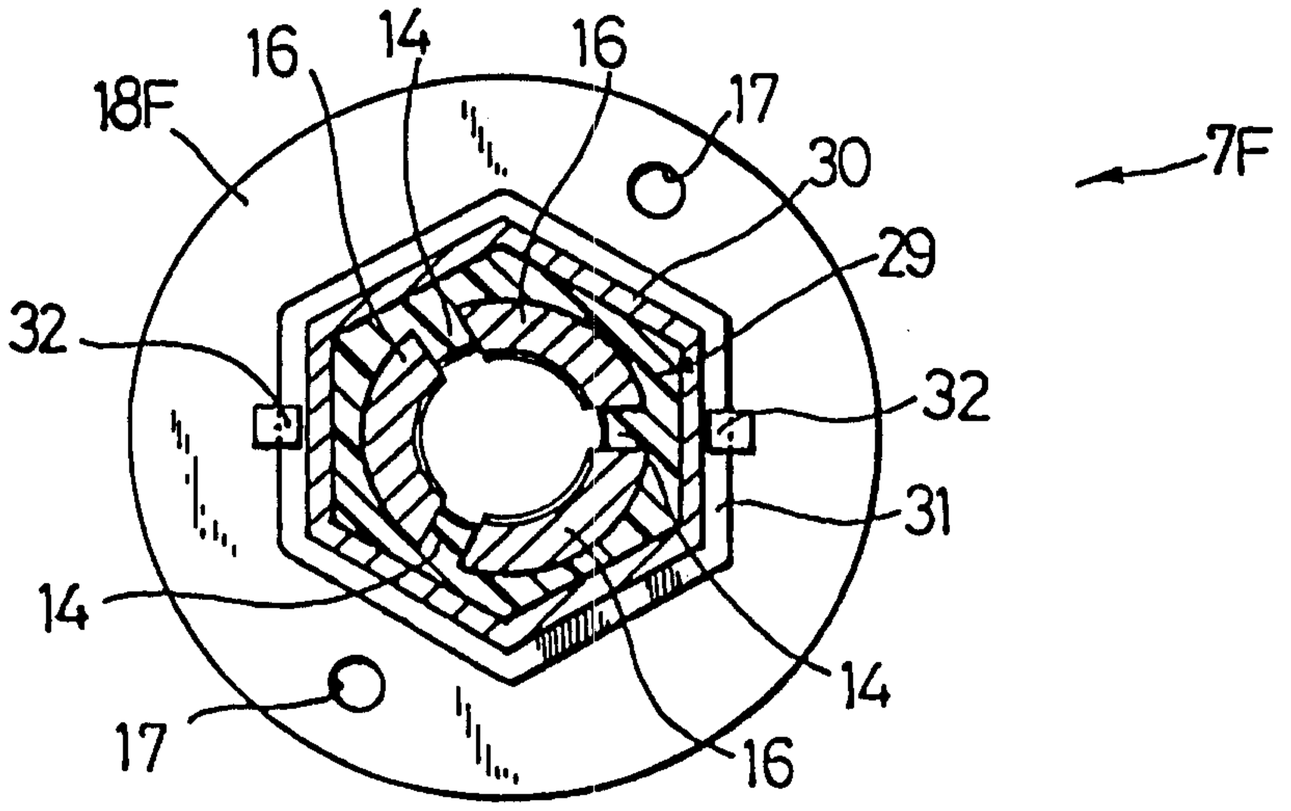


FIG.34

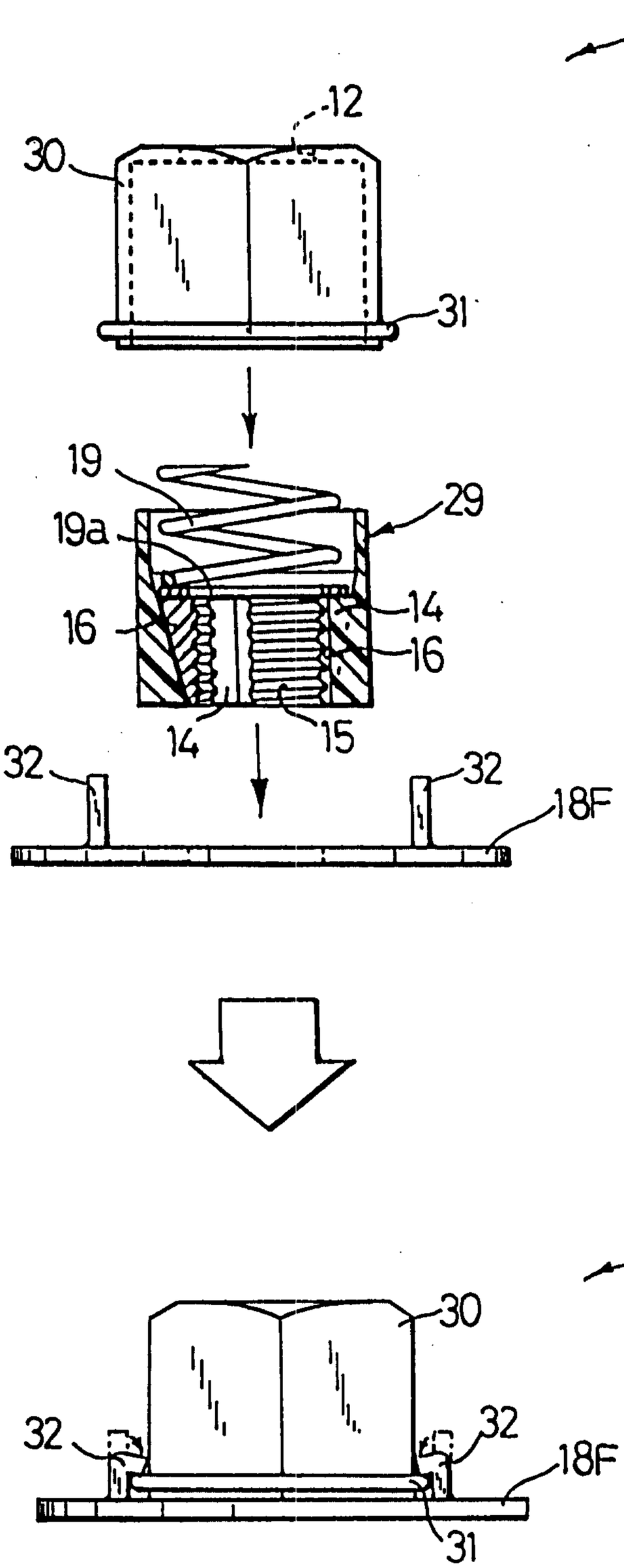


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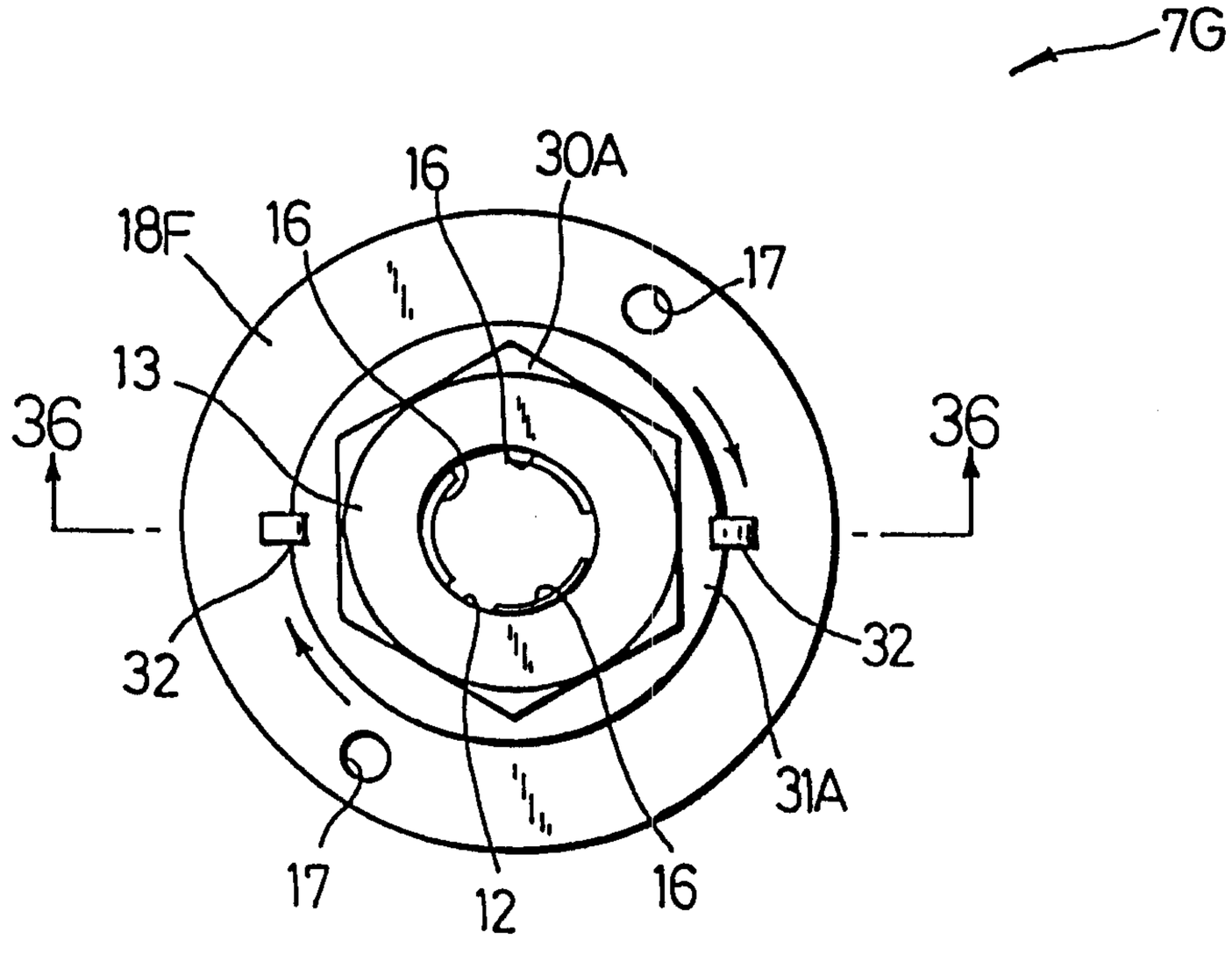

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FIG.36

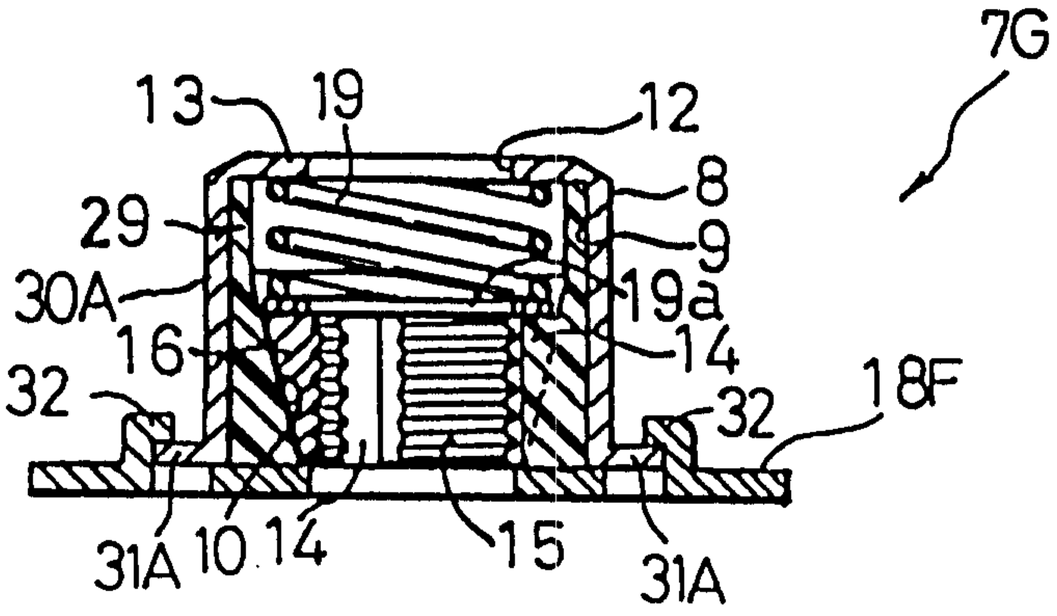

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FIG.37

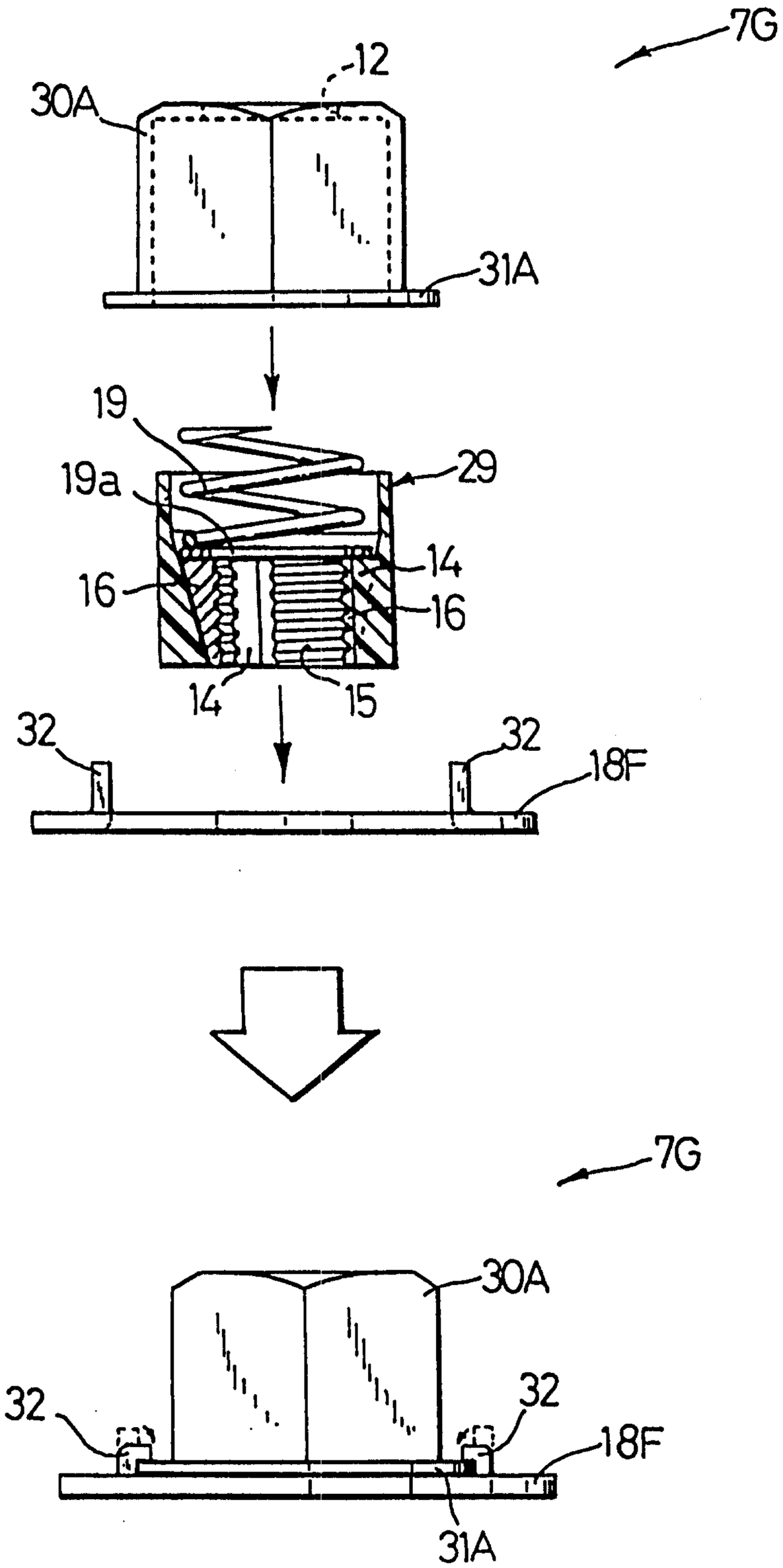


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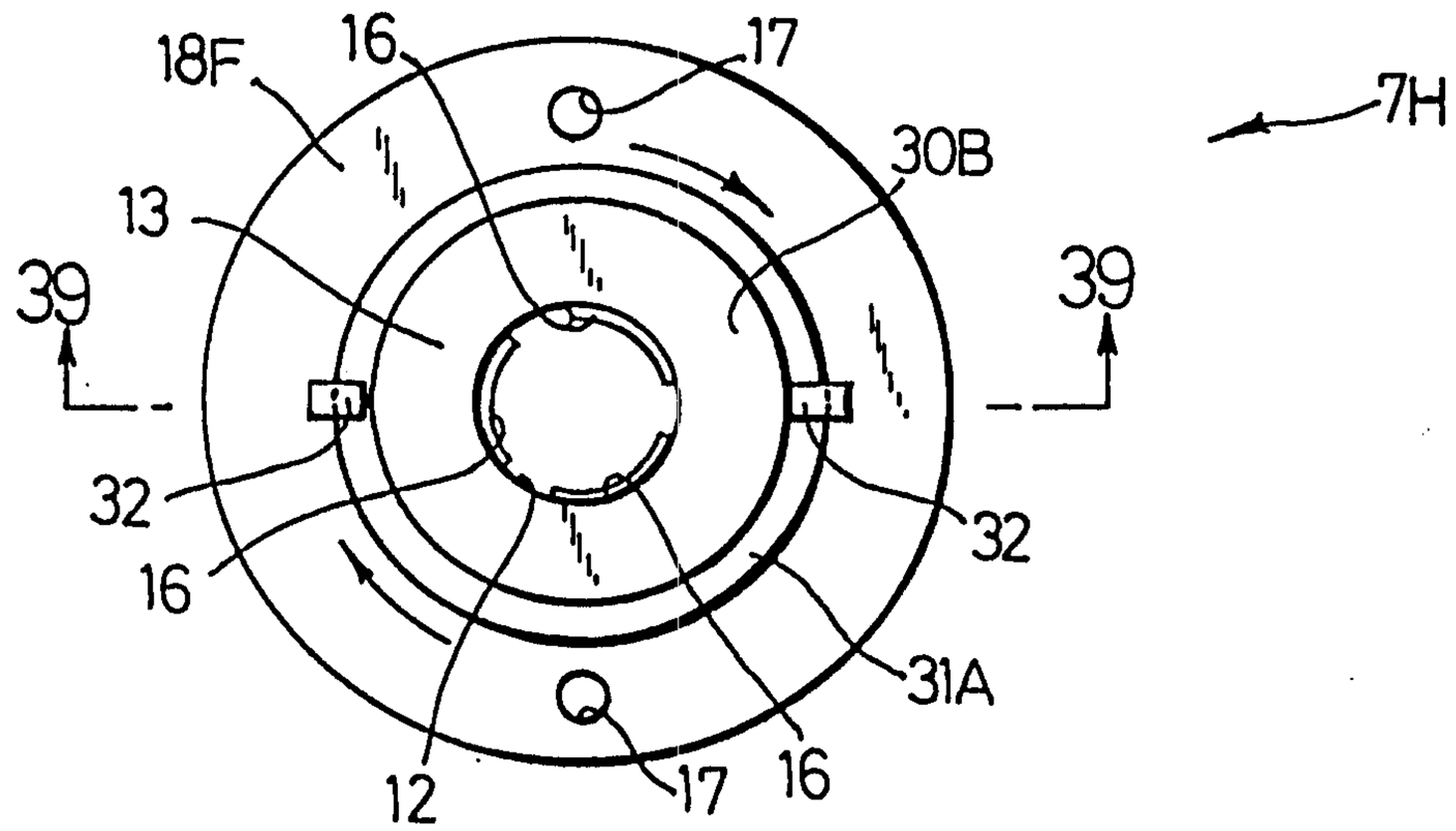


FIG.39

FIG.40

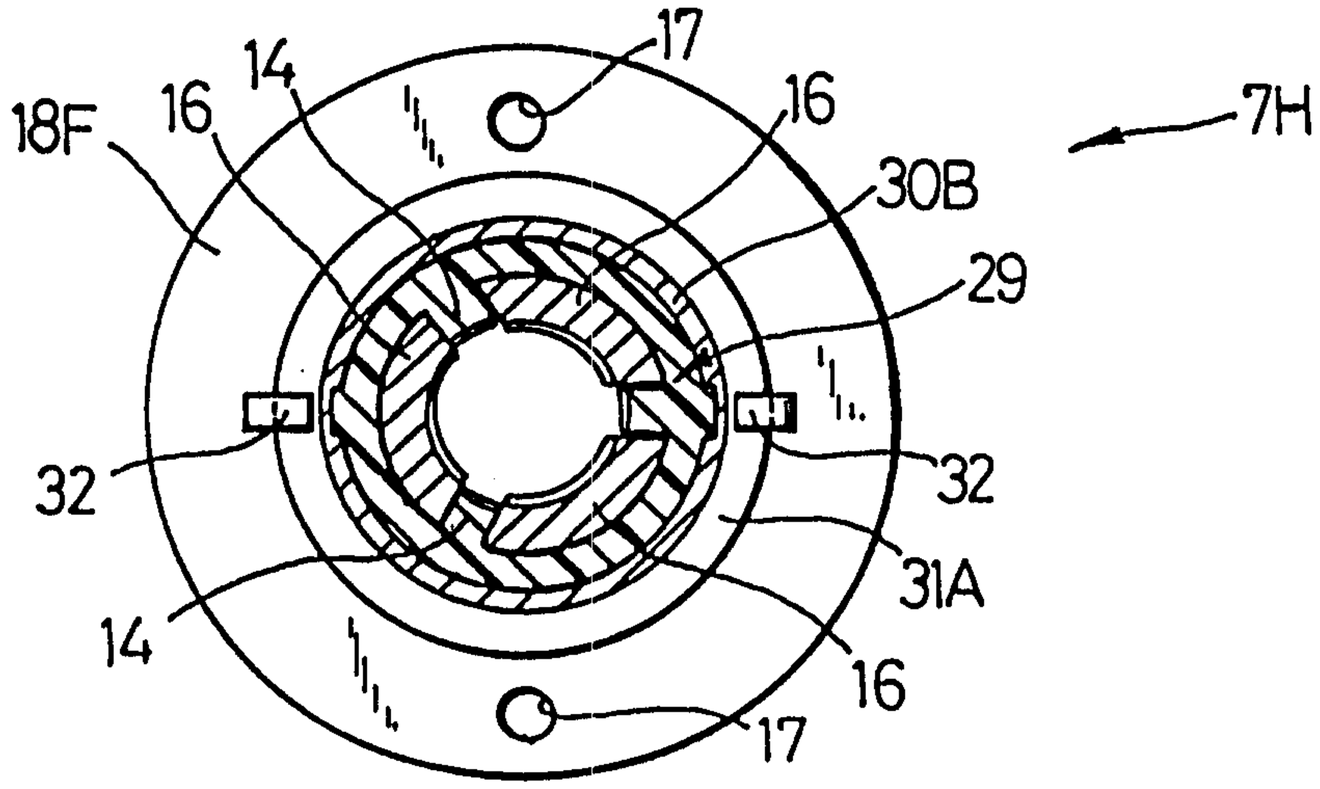


FIG.41

FIG.42

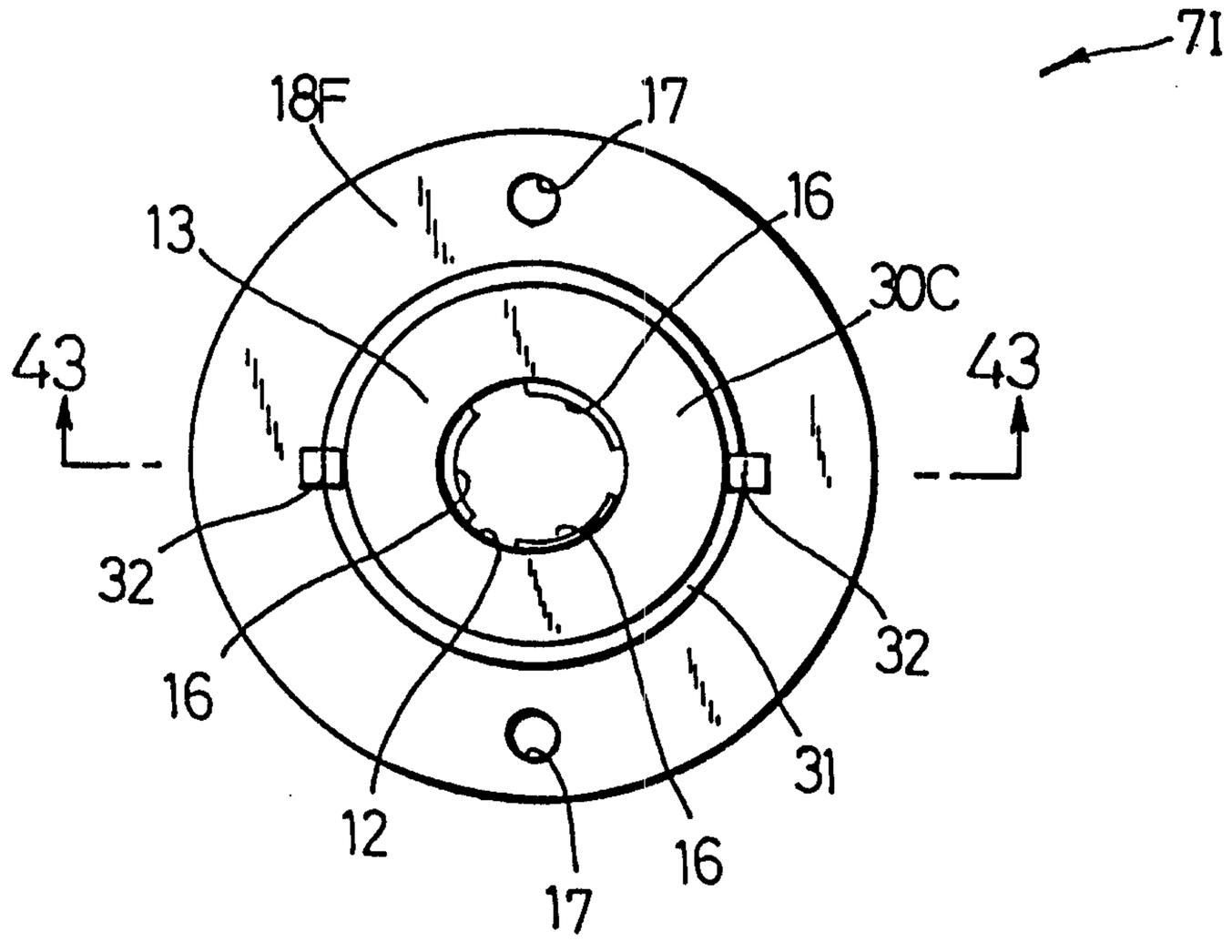

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FIG.43

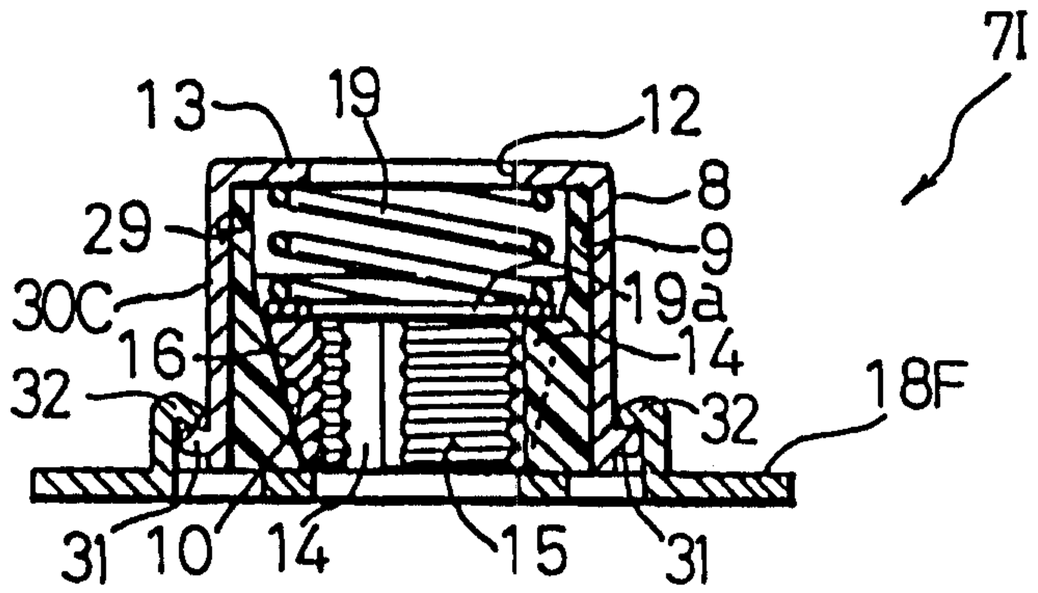

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FIG.44

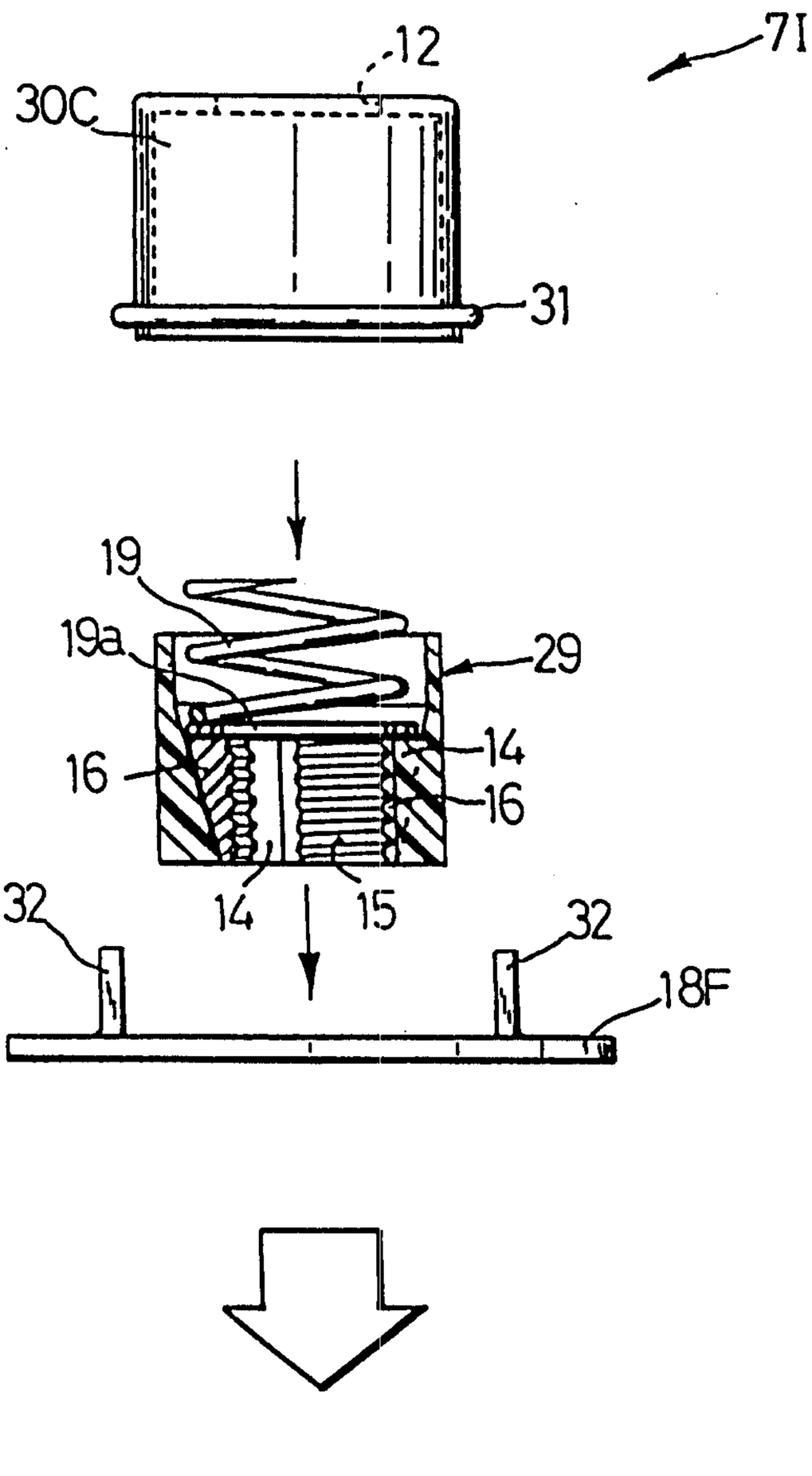


FIG.45

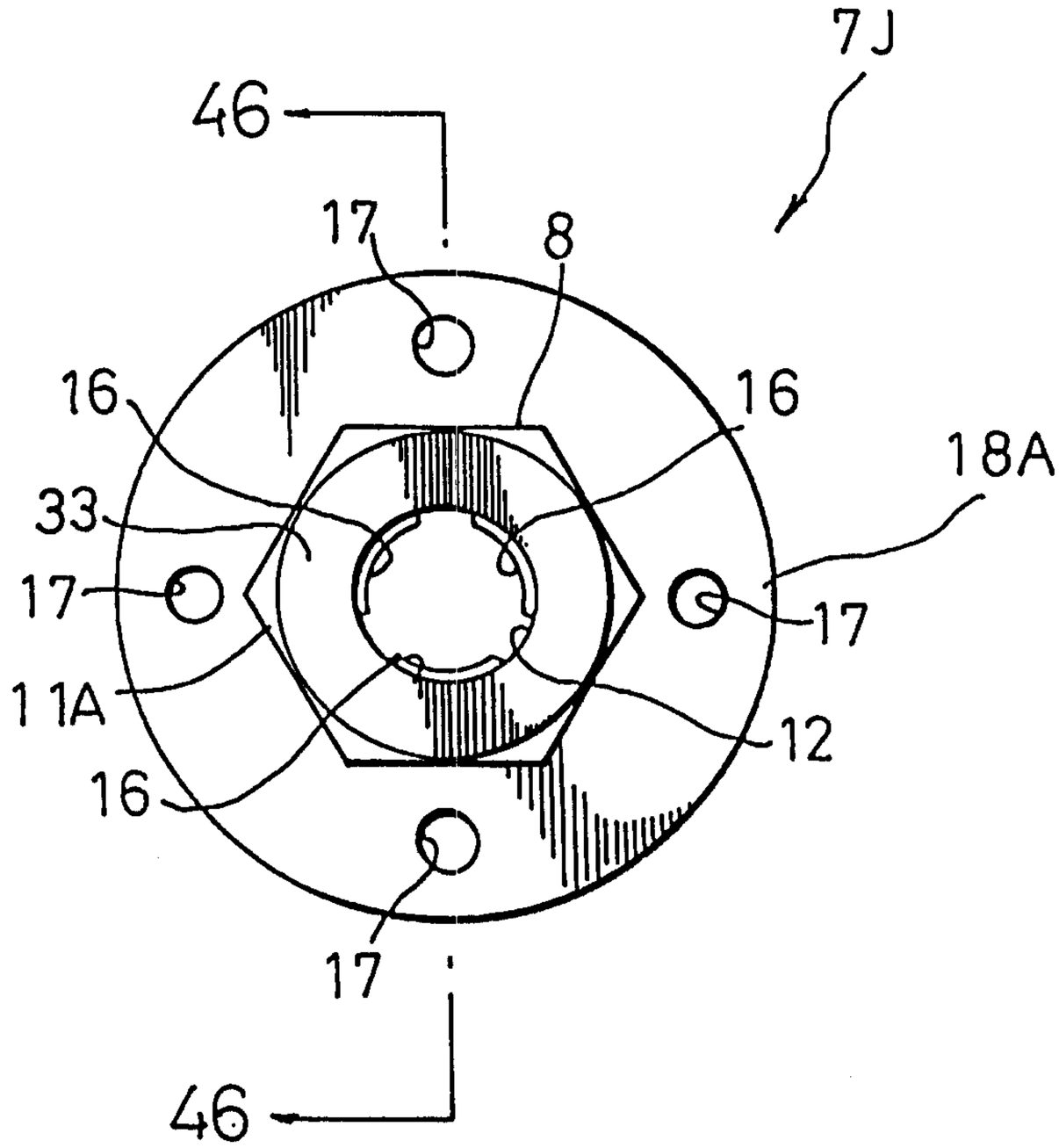

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17
46

FIG.46

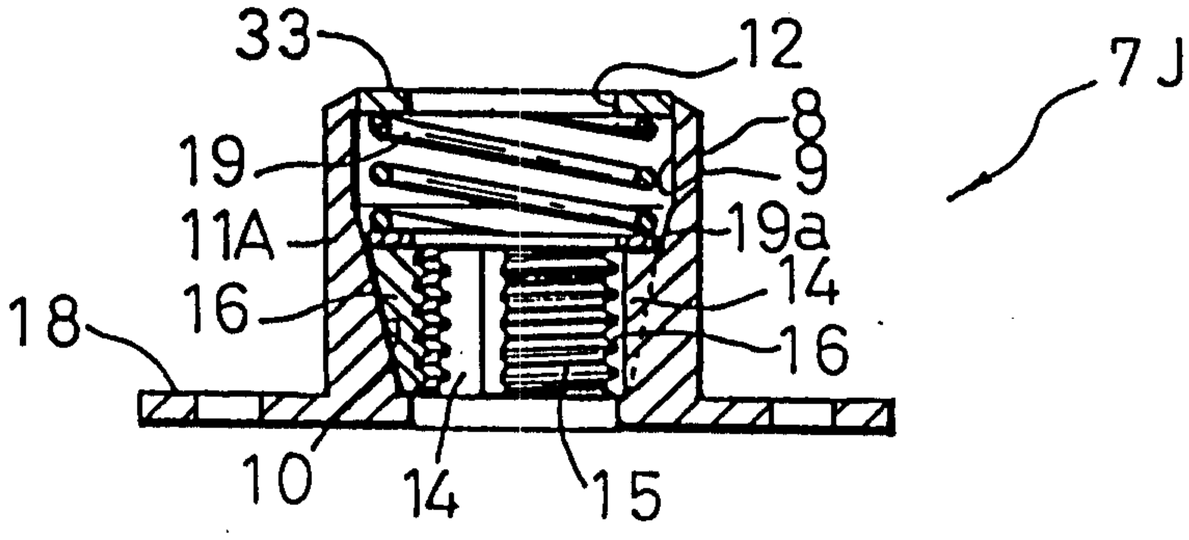

33
12
7J
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19
9
11A
19a
16
14
18
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14
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FIG.47

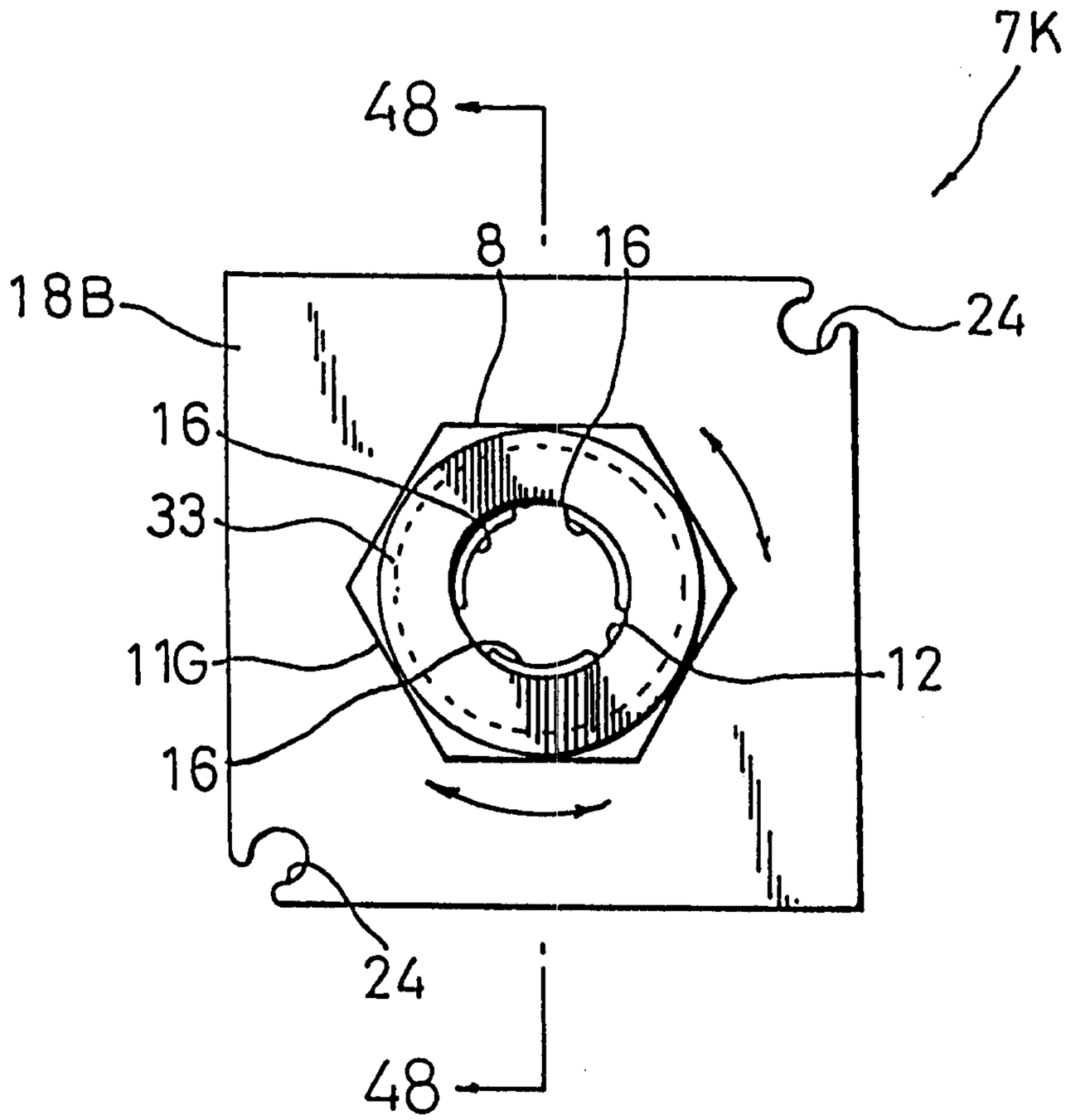

7K
48
8
16
18B
24
16
33
11G
12
16
24
48

FIG.48

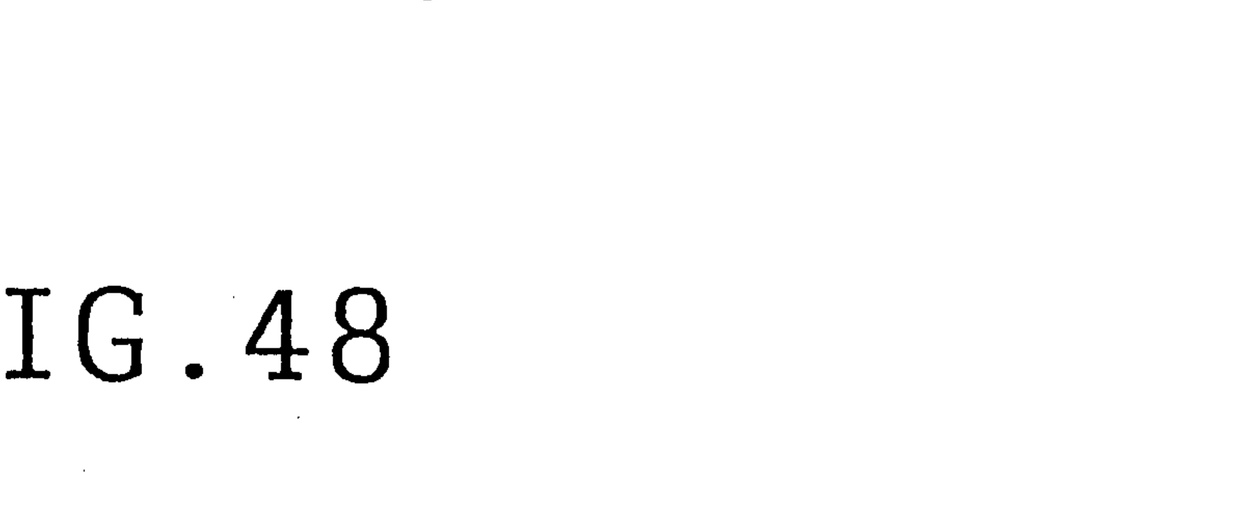
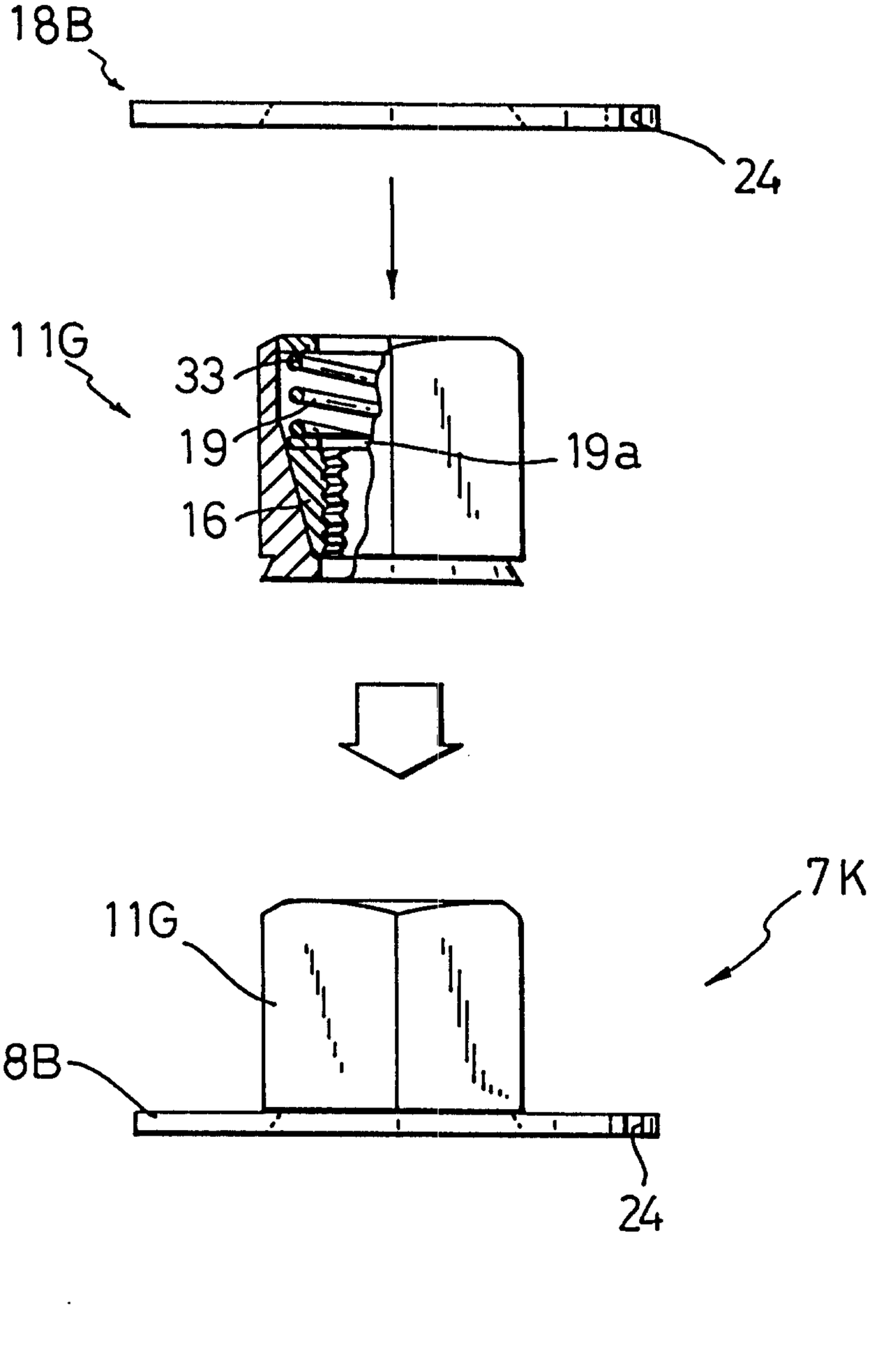
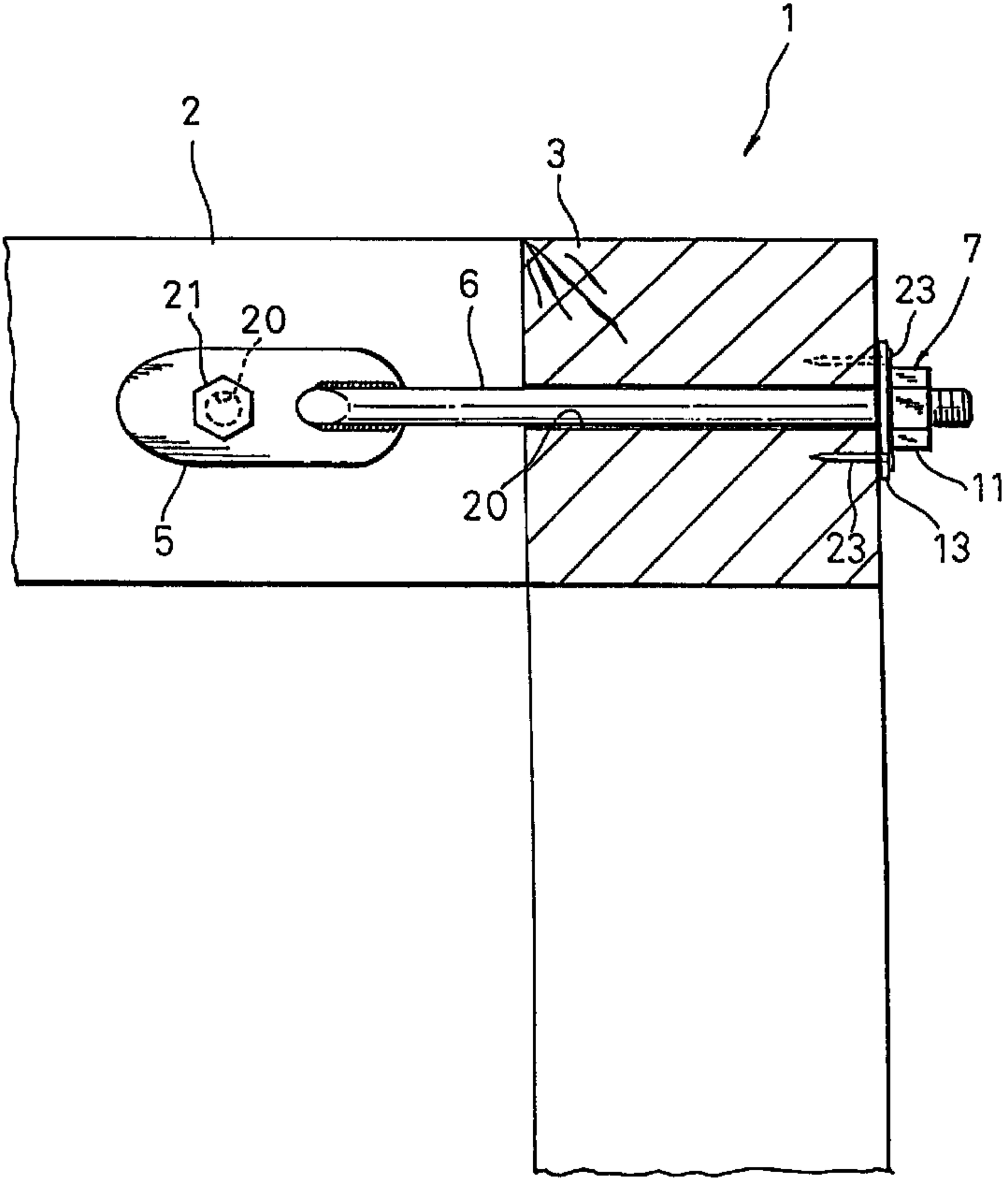

33
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7K
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19a
11G
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18B
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14
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FIG.49




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