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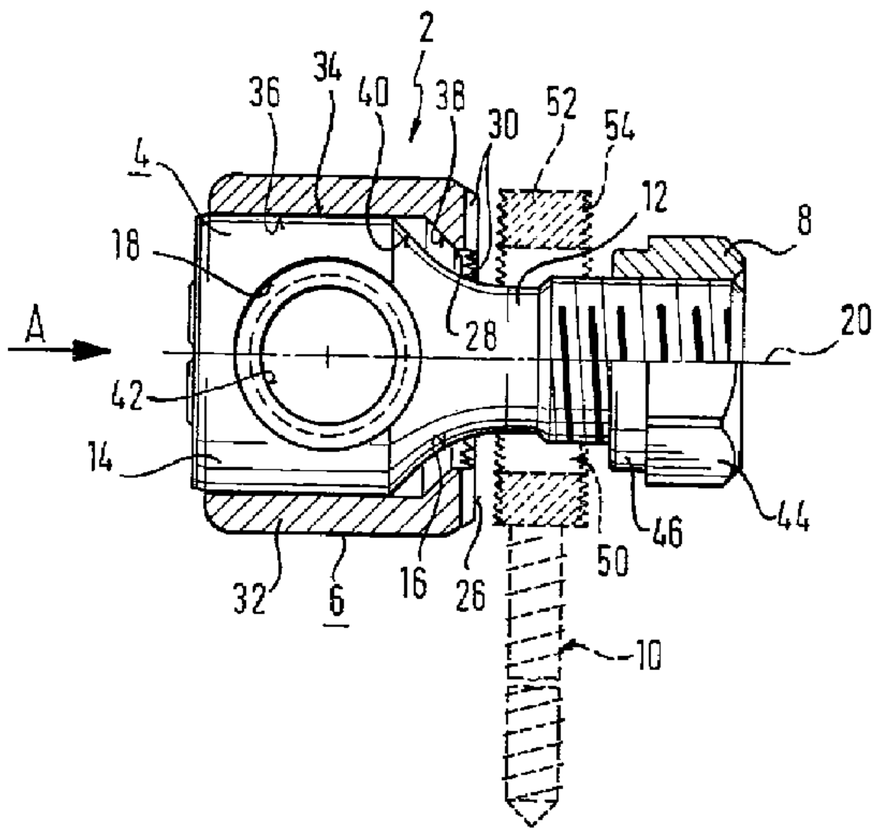
(54) **ELEMENT DE CONNEXION POUR SYSTEME DE STABILISATION DE COLONNE VERTEBRALE CHEZ L×HOMME**

(54) **CONNECTING ELEMENT FOR A STABILIZING SYSTEM FOR A HUMAN SPINE**



(57) Élément de connexion pour fixer une tige à une vis pédiculaire ou à un élément similaire pour un système de stabilisation de colonne vertébrale humaine, l'élément comportant une première section devant recevoir une vis pédiculaire et une deuxième section destinée à recevoir et à fixer par serrage la tige passée à travers, alors que la deuxième section est formée comme élément de tension comportant une tige filetée; de plus, une douille coulissante est disposés sur la deuxième section, la douille comportant une ouverture de part en part pour la tige ainsi que deux ouvertures, l'une vis à vis l'autre, dans la paroi ou les logements en retrait fermés vers la tige pour la barre, ainsi qu'un écrou pouvant être vissé sur la tige pour fixer la douille à la tête de la vis pédiculaire.

(57) Connecting element for fixing a rod at a pedicle screw or the like for a stabilizing system for a human spine, the element having a first section for receiving a pedicle screw and a second section for receiving and fixing by clamping the rod passed therethrough, wherein the second section is formed at a tension member having a thread shank, further a sleeve is slidingly arranged on the second section, the sleeve having a through-opening for the shank and two openings opposed to each other in the wall or recesses being closed towards the shank for the rod, and a nut screwable onto the shank is provided in order to fix the sleeve at the head of the pedicle screw.

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ABSTRACT

CONNECTING ELEMENT FOR A STABILIZING SYSTEM FOR A HUMAN SPINE

Connecting element for fixing a rod at a pedicle screw or the like for a stabilizing system for a human spine, the element having a first section for receiving a pedicle screw and a second section for receiving and fixing by clamping the rod passed therethrough, wherein the second section is formed at a tension member having a thread shank, further a sleeve is slidingly arranged on the second section, the sleeve having a through-opening for the shank and two openings opposed to each other in the wall or recesses being closed towards the shank for the rod, and a nut screwable onto the shank is provided in order to fix the sleeve at the head of the pedicle screw.

CONNECTING ELEMENT FOR A STABILIZING SYSTEM FOR A HUMAN SPINE

The invention relates to a connecting element for fixing a rod at a pedicle screw or the like for a stabilizing system for a human spine, the element having a first section for receiving the pedicle screw and a second section for receiving and fixing by clamping the rod passed therethrough.

Stabilizing systems for the human spine usually comprise rods which are dorsally secured at the spine with pedicle, sacral or iliac screws for distraction or compression of the spine or are secured with hooks grasping around the transverse processes of the vertebrae. For connecting the

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screws and the hooks with the rod, connecting elements are utilized. For instance, connecting elements are known (ISOLA(R) system), wherein a first section for receiving a pedicle screw or the like is formed as an elongated hole being led onto the head of the screw and secured with a nut. A second section for receiving the rod comprises a conically formed opening in which the rod is put and fixed by a screw which presses against the rod from the top with the end of the shank.

A disadvantage of these known connecting elements is that two securing means have to be operated in order to connect the rod with the screws inserted into the spine, namely the nut for securing the connecting elements at a screw in the spine and the screw for fixing the rod in the receiving opening of the connecting elements.

Thus, the object of the invention is to provide a connecting element for connecting a screw in the spine and a stabilizing rod, the element being easily and time-savingly securable.

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The invention provides connecting element for fixing a rod at a pedicle screw or the like for a stabilizing system for a human spine, the element having a first section for receiving a pedicle screw and a second section for receiving and fixing by clamping the rod passed therethrough, characterized in that the second section is formed at a tension member having a thread shank, further that a sleeve is slidingly arranged on the second section, the sleeve having a through-opening for the shank and two openings opposed to each other in the wall or recesses being closed towards the shank for the rod, and that a nut screwable onto the shank is provided in order to fix the sleeve at the head of the pedicle screw.

In the connecting element according to the invention, the second section serving for receiving the rod is part of a tension member which further has a thread shank. A sleeve having a through-opening for the shank is arranged around the second section in order that the sleeve can be slidingly moved parallel to the shank axis. In the wall of the sleeve two openings opposed to each other or recesses closed towards the shank are formed for the rod. Furthermore, the connecting element comprises a nut which can be screwed onto the shank in order to fix the head of the pedicle screw or of a similar screw, which is to be screwed into the spine, at the sleeve. Simultaneously with the fixation of the screw the sleeve is so far displaced towards the end of the tension member being opposed to the shank that the rod being inserted into the receptacle is secured between the walls of the receptacle and the openings or the recesses of the sleeve by clamping.

This connecting element has the advantage both the rod can be fixed in the receptacle of the tension member and the connecting element can be secured at the screw head by a single securing process, namely the tightening of the nut.

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The second section serving for receiving the rod can comprise a circular receiving opening for the rod. Preferably, the center thereof lies on the longitudinal axis of the connecting element. Thereby, a turning of the connecting element or at least a part of the rod which usually is flexible around the longitudinal axis of the connecting element during fixation is more easily possible.

Alternatively, it can be provided that the second section comprises a recess being open transversely to the shank axis. This can be a longitudinal recess with a semi-circular end. This form of the receptacle has the advantage that the rod can be put in and does not have to be pushed through the opening which can save time when using a longer rod which is to be secured at several connecting elements.

The recesses of the sleeve can be open towards the free end thereof, whereby a sliding onto the second section from the side facing the shank is possible if a rod is located in the second section. Preferably, the receptacle for the rod and the recesses of the sleeve are formed so that an opening is formed which extends transversely

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through sleeve and tension member, with the rod being fixed by clamping in the opening.

The sleeve can comprise a toothing around the throughgoing opening of the shank for engaging with a toothing of the pedicle screw head. Especially if such a toothing is provided, it is advantageous if the sleeve is round in cross section and turnable on the tension member around the shank axis thereof.

The sleeve can be slidable onto the shank of the tension member, whereby the sleeve through-opening for the shank is smaller than the transverse dimensions of the second section so that the sleeve upon a sliding in the direction of the second section finally strikes it if no rod is inserted into the receptacle. Therefore, the second section preferably can comprise an inwardly inclined region within the transition region towards the shank, the inclined region constituting a stop face for the corresponding inner surface of the sleeve.

For engaging with an opening or recess in the pedicle screw head, the nut can have a collar.

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In the following the invention will be illustrated with reference to drawings.

Fig. 1 shows a connecting element in elevational view, partly in sectional view, and schematically a pedicle screw.

Fig. 2 shows the connecting element of Fig. 1 seen in direction of the arrow A, whereby the pedicle screw of Fig. 1 is not shown and additionally a received rod is shown.

Fig. 3 shows a further embodiment of the connecting element according to the invention in elevational view and partly in sectional view.

Fig. 4 shows the connecting element of Fig. 3, whereby the sleeve is located in a position which allows for putting the rod into the connecting element.

Fig. 1 shows a connecting element 2 which consists of a tension member 4, a sleeve 6 and a nut 8. Furthermore,

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Fig. 1 shows schematically a pedicle screw 10 at which the connecting element 2 is secured.

The tension member 4 comprises a first section 12 for receiving the pedicle screw 10 and a second section 14 for receiving and fixing a rod (not shown) by clamping for stabilizing a human spine. The first section 12 is a thread shank onto which the nut 8 can be screwed. The second section 14 attaches to the shank 12 via a curved transition region 16 and has larger transverse dimensions than the shank 12. As is to be seen in Fig. 2, the second section has a cylindrical shape. The second section 14 includes a circular through-receiving opening 18 which extends transversely relative to the longitudinal axis 20 of the connecting member 2.

The sleeve 6 is also cylindrical. The sleeve 6 includes a through-opening 28 for the shank 12 in an end plane 26 facing the shank. A toothing 30 is formed around the through-opening 28. The cylindrical inner wall surface 34 of the sleeve 6 nearly matchingly, however, glidingly receives the cylindrical outer wall surface 36 of the second

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section 14. The sleeve wall 32 includes a conical ring surface 38 which is inclined towards the opening 30 and which is parallel to the surface area 40 of the transition region 16 of the first section 14. In the sleeve wall 32 two circular through-openings 42 being opposed to each other are formed which in the position of the sleeve 6 shown in Fig. 1 are concentric with the opening 18 of the tension member 4, however, which have a slightly smaller diameter.

The nut 8 includes an essentially hexagonal head 44 which is adjoined by a collar 46 towards the shank, whereby the nut 8 engages with the collar with a circular opening 50 in the head 52 of the pedicle screw 10.

On its outer surface the head 52 of the pedicle screw 10 includes a toothing 54 around the opening 50 in order to engage with the toothing 30 of the sleeve 6.

The connecting element 2 is applied as follows. At first it is passed with the shank 12 through the opening 50 of the pedicle screw head 52. Thereafter, the nut 8 is screwed onto the shank 12 so far until the opening 18 of

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the tension member 4 and the openings 42 of the sleeve 6 are concentric. Then, the rod to be secured (not shown) is passed through the openings and the nut 8 is tightened so that the sleeve 6 is fixed against the head 52 of the pedicle screw 10 and simultaneously the sleeve is displaced towards the shank 12 relative to the tension member 4 so far until the rod between the opening 18 and 42 is clamped.

Fig. 2 shows the connecting element 2 of Fig. 1 in direction of the arrow A. Therein, the pedicle screw 10 is not shown. Additionally, a thread rod 56 fixed in the connecting element 2 for stabilizing a spine is shown. At an end, the rod 56 has an eye-shaped opening 58 for securing at an iliac screw. The rod 56 is passed transversely relative to the longitudinal direction 20 of the connecting elements 2 through the openings 42 of the sleeve 6 and the opening 18 of the second section. A nut 60 is screwed on at the end of the rod 56 being opposed to the opening 58. The nut 60 is screwed against the connecting element 2. As a result, a traction can be applied to the rod 56 and thus to the screw passed through the opening 58 before the rod 56 is fixed in the connecting element 2. The Figs. 3 and 4 show a further embodiment 2' of the connecting element

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according to the invention. The connecting element 2' differs from the connecting element 2 shown in Fig. 1 essentially in that instead of the opening 18 of the connecting element 2, the connecting element 2' is provided with a recess 18' and further instead of the openings 42 with recesses 42'.

The recess 18' is located in a second section 14' of a tension member 4' and is opened transversely relative to an axis 20' of a thread shank 12' (Fig. 4). Apart from the open side, the recess 18' is formed like an elongated hole which is oriented perpendicular relative to the longitudinal axis 20'.

The recesses 42' are provided in a sleeve 6' and have a shape which is essentially the same as that of the recess 18', however, they are open towards the end of the sleeve 6' opposed to the shank 12', whereby the longitudinal axes of the recesses 42' are parallel relative to the shank axis 20'.

In Fig. 3 the sleeve 6' is slided over the second section 14' such that a closed opening for a rod is provided by superposition of the recesses 18' and 42'. In Fig. 4 the

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sleeve 6′ is shown displaced towards the shank 12′ so that the recess 18′ of the tension member 4′ is not covered and a rod can be put into the recess 18′ through its open end. Subsequently, the rod can be fixed by clamping as the sleeve 6′ is slided towards the second section 14′ and the nut 8′ is tightened as explained above.

C l a i m s :

1. Connecting element for fixing a rod at a pedicle screw or the like for a stabilizing system for a human spine, the element having a first section for receiving a pedicle screw and a second section for receiving and fixing by clamping the rod passed therethrough, characterized in that the second section (14, 14') is formed at a tension member (4, 4') having a thread shank (12, 12'), further that a sleeve (6, 6') is slidingly arranged on the second section (14, 14'), the sleeve having a through-opening (28) for the shank (12, 12') and two openings (42) opposed to each other in the wall (32) or recesses (42') being closed towards the shank for the rod (56), and that a nut (8, 8') screwable onto the shank is provided in order to fix the sleeve (6, 6') at the head (52) of the pedicle screw (10).

2. Connecting element according to claim 1, characterized in that the second section (14) comprises a circular receiving opening.

3. Connecting element according to claim 1, characterized

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in that the second section (14′) comprises a recess (18′) opened transversely relative to the shank axis (20′).

4. Connecting element according to any one of claims 1 to 3, characterized in that the recesses (42′) of the sleeve (6′) are open towards the free end of the sleeve.

5. Connecting element according to any one of claims 1 to 4, characterized in that the sleeve (6, 6′) comprises a toothing (30) around the through-opening (28) for the shank (12, 12′) for engagement with a toothing (54) of the pedicle screw head (52).

6. Connecting element according to any one of claims 1 to 5, characterized in that the sleeve (6, 6′) is round in cross section.

7. Connecting element according to any one of claims 1 to 6, characterized in that the through-opening (28) of the sleeve (6, 6′) for the shank (12, 12′) is smaller than the transverse dimensions of the second section (14, 14′).

8. Connecting element according to any one of claims 1 to 7, characterized in that in the region (16) of transition to the shank (12, 12′) the second section (14, 14′) comprises a preferably inwardly inclined region which constitutes a stop face for an inner surface (38) of the sleeve (6, 6′).

9. Connecting element according to any one of claims 1 to 8, characterized in that the nut (8, 8') comprises a collar (46) for engagement with an opening (50) of the pedicle screw head (52).

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Fig.1

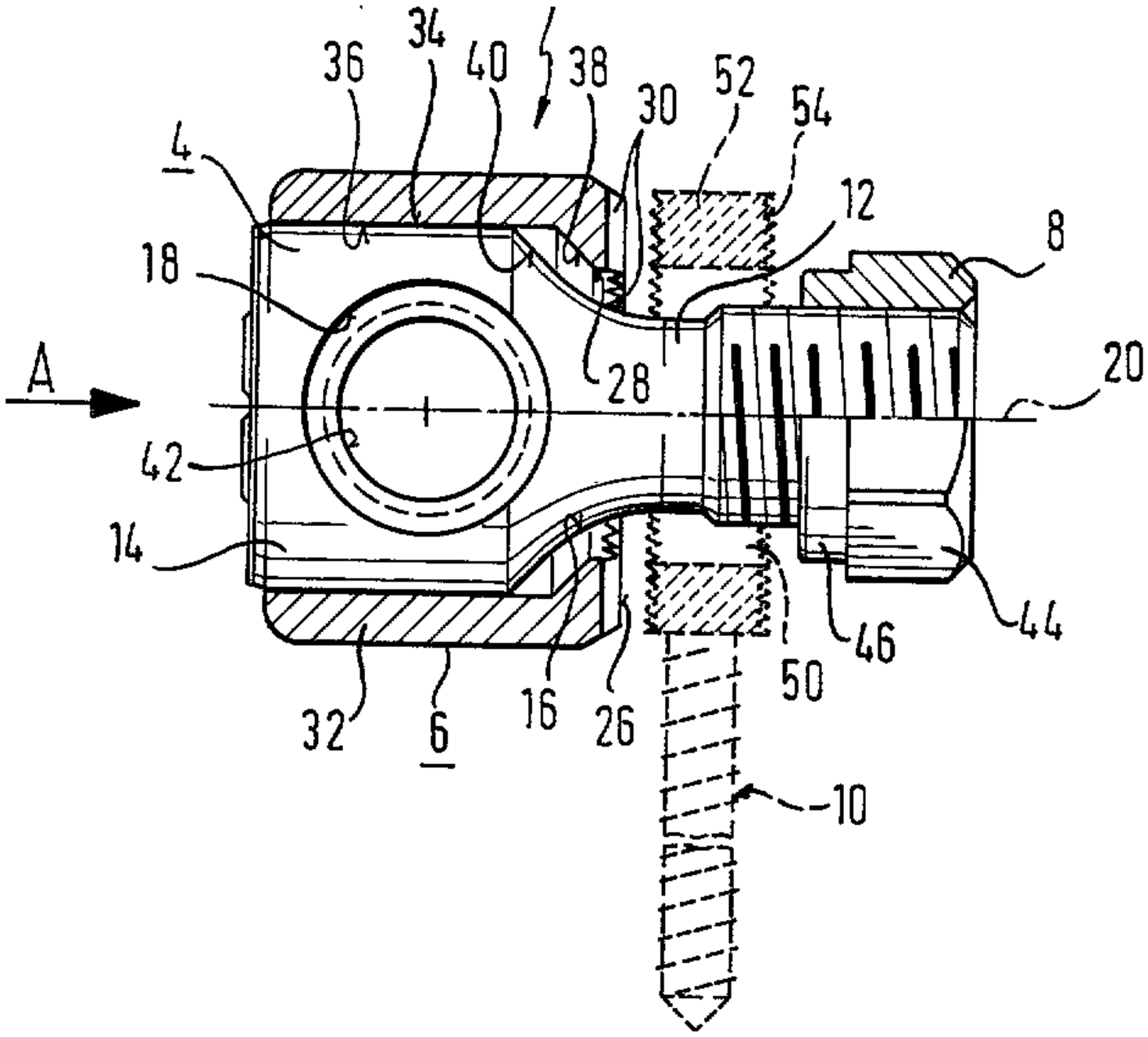

Fig.2

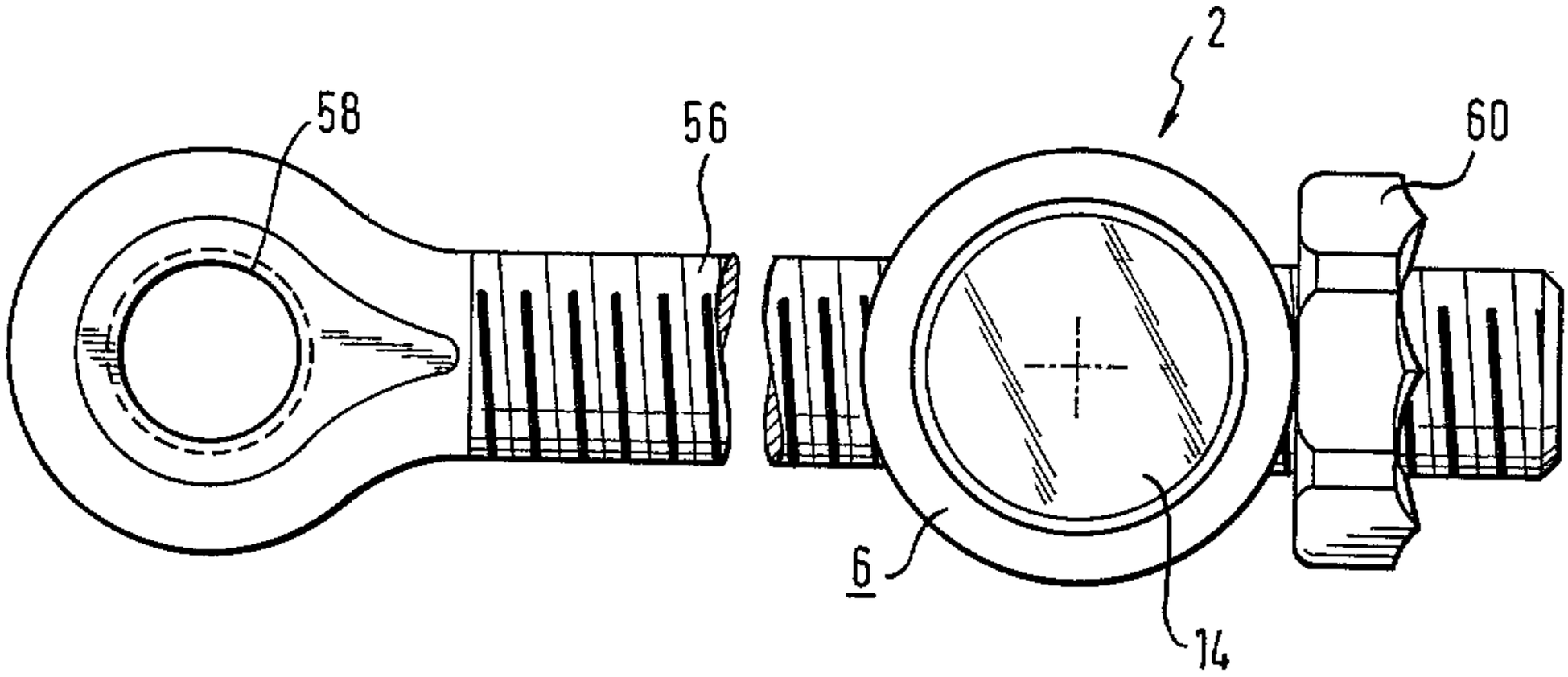

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Fig.3

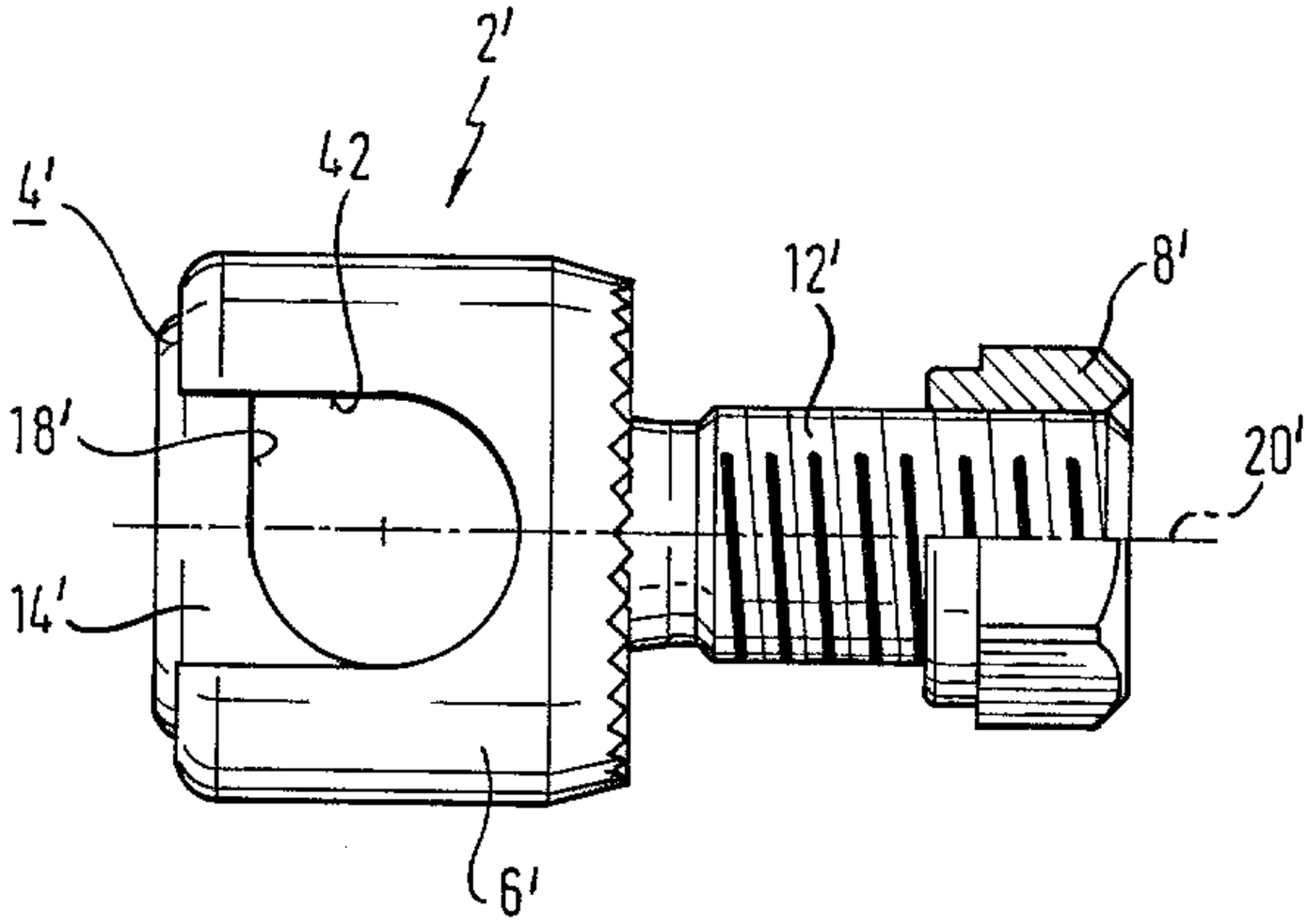
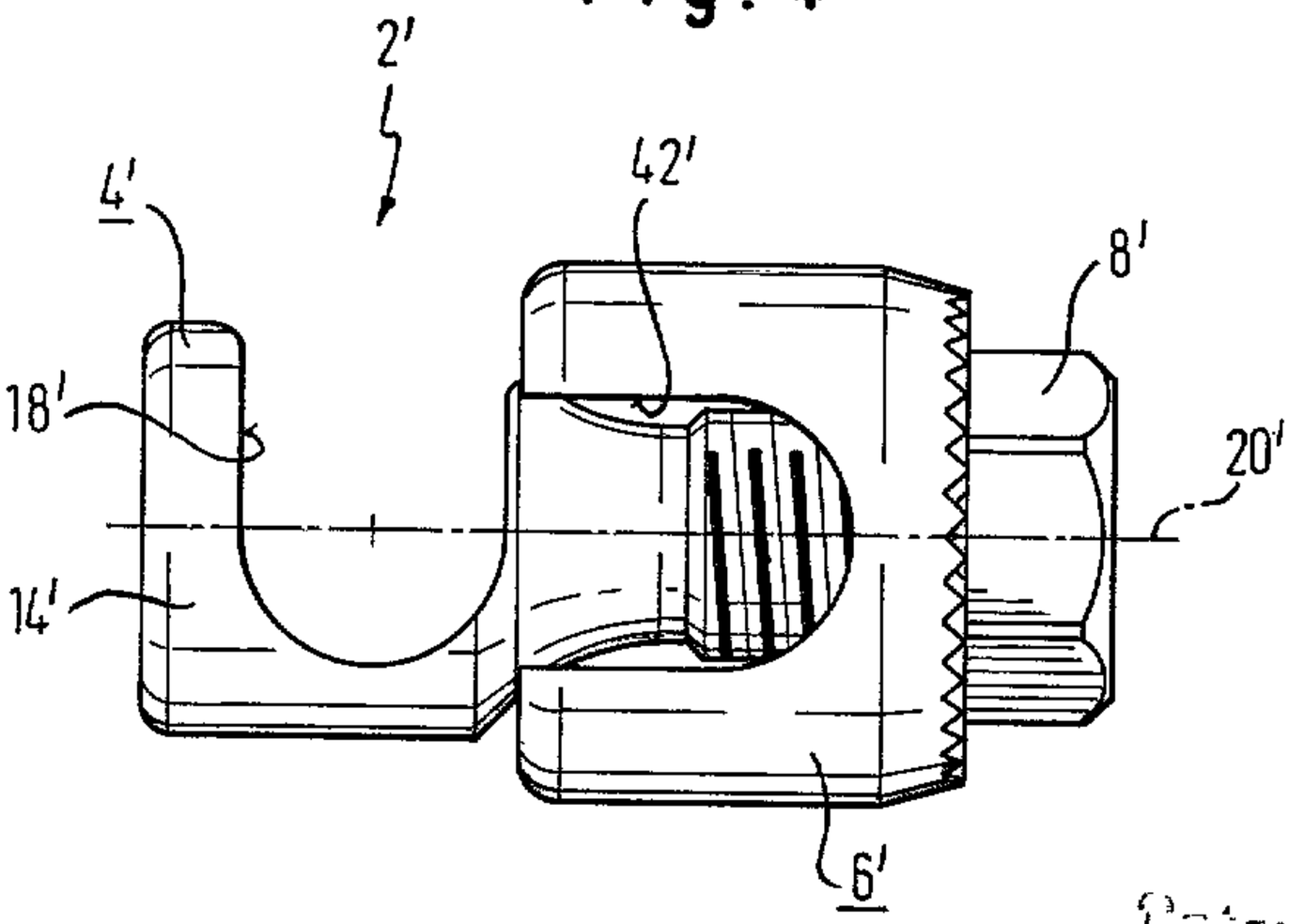


Fig.4



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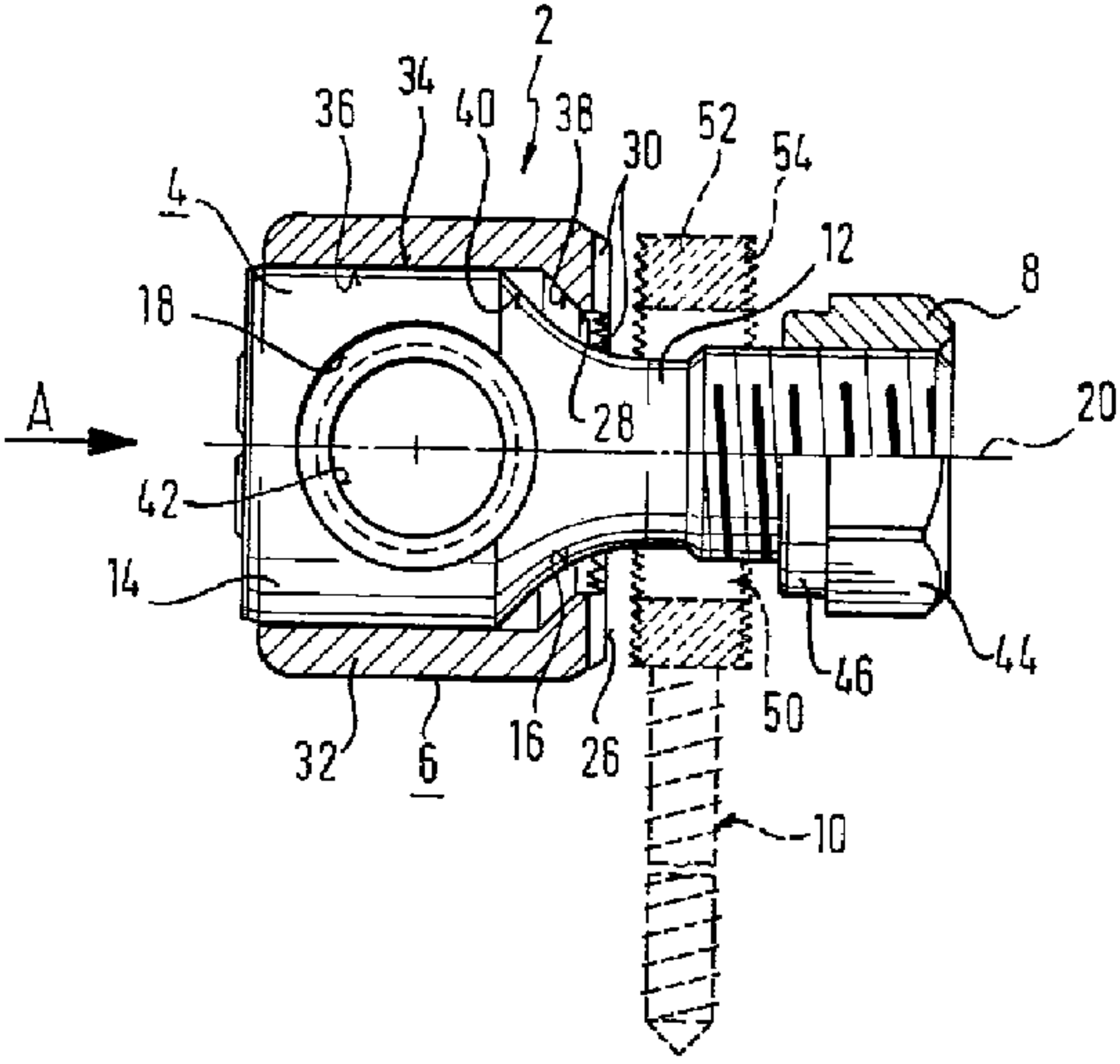
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