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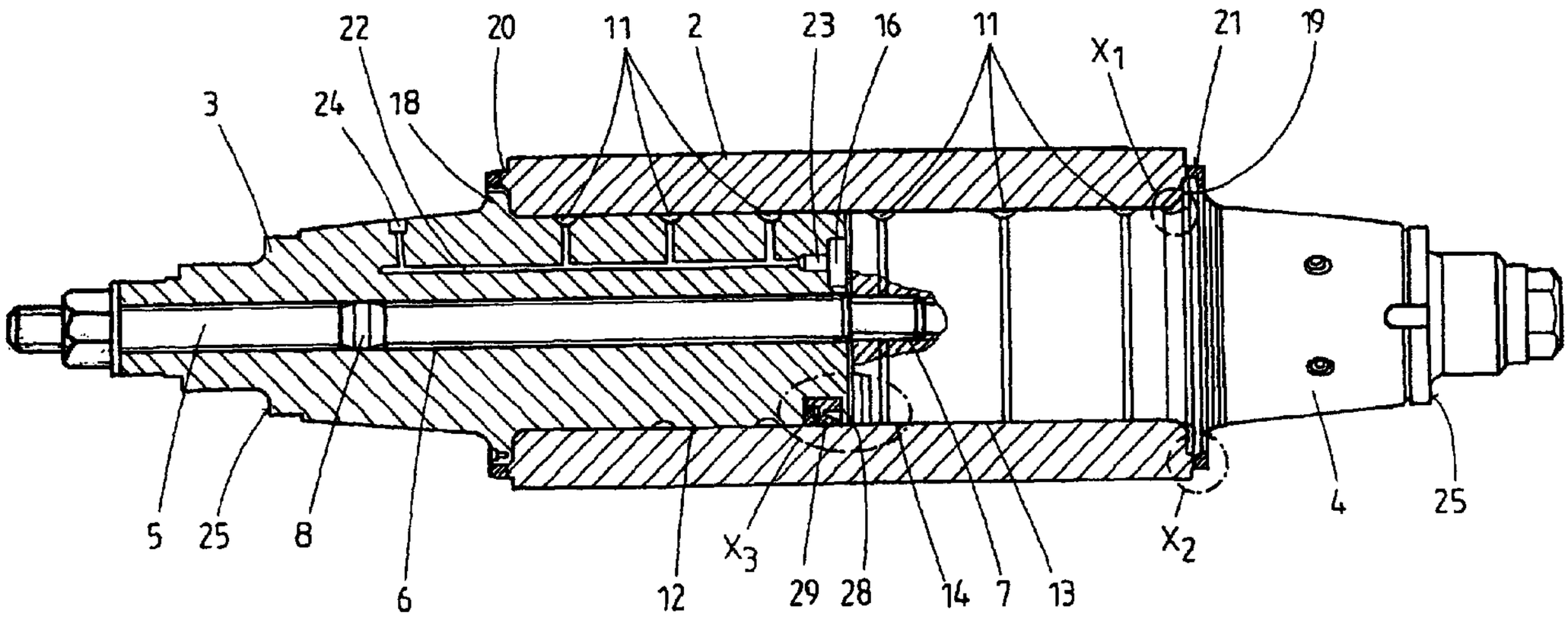


(57) Abrégé/Abstract:
In a roller (1), in particular a working or support roll for a rolling mill such as a plate rolling mill, flat rolling mill or the like; comprising - a sleeve (2); - a left half-pin (3); and - a right half-pin (4); - wherein in the region surrounded by the sleeve (2), the half-pins (3, 4) are configured as truncated-cone-shaped and form a left surface (12) on the left half-pin (3) and a right surface (13) on the right half-pin (4), the left half- pin (3) and the right half-pin (4) is configured with holes (24) and grooves (11) corresponding therewith, wherein the grooves (11) are formed on the surfaces (12, 13). The invention also relates to a method for producing a roller (1), in particular a working or support roll, whereby - the left half-pin (3) and the right half-pin (4) are inserted in the sleeve (2); - the right half-pin (3) and the left half-pin (4) are braced with respect to one another by means of at least one tie rod (5); - hydraulic oil in holes (22) and grooves (11) is guided into or onto the left half-pin (3) and the right half-pin (4); - the hydraulic oil exerts a pressure on the sleeve (2), by which means the sleeve (2) is expanded; and - when the sleeve (2) is expanded, the stop faces (18, 19) with the front faces (20, 21) of the sleeve (2) are pressed onto one another by means of the tie rod (5).

ABSTRACT

In a roller (1), in particular a working or support roll for a rolling mill such as a plate rolling mill, flat rolling mill or the like; comprising

- a sleeve (2);

- a left half-pin (3); and

- a right half-pin (4);

- wherein in the region surrounded by the sleeve (2), the half-pins (3, 4) are configured as truncated-cone-shaped and form a left surface (12) on the left half-pin (3) and a right surface (13) on the right half-pin (4), the left half-pin (3) and the right half-pin (4) is configured with holes (24) and grooves (11) corresponding therewith, wherein the grooves (11) are formed on the surfaces (12, 13).

The invention also relates to a method for producing a roller (1), in particular a working or support roll, whereby

- the left half-pin (3) and the right half-pin (4) are inserted in the sleeve (2);

- the right half-pin (3) and the left half-pin (4) are braced with respect to one another by means of at least one tie rod (5);

- hydraulic oil in holes (22) and grooves (11) is guided into or onto the left half-pin (3) and the right half-pin (4);

- the hydraulic oil exerts a pressure on the sleeve (2), by which means the sleeve (2) is expanded; and

- when the sleeve (2) is expanded, the stop faces (18, 19) with the front faces (20, 21) of the sleeve (2) are pressed onto one another by means of the tie rod (5).

Figure 3

MULTIPART ROLLER

The invention relates to a roller, in particular working or support rolls for a rolling mill such as a plate rolling mill, flat rolling mill or the like; comprising a sleeve, a left half-pin and a right half-pin.

Known from EP 1 056 553 B1 is a rolling mill comprising working rolls and multipart support rolls, consisting of a basic body with a plurality of rolling bearings which are arranged next to one another on the basic body in its longitudinal direction and with their outer rings rotatably support a sleeve which surrounds the rolling bearings. The sleeve bears with its inner surface, all-round, on the outer surfaces of the outer rings of the rolling bearings. The outer surface forms the roll barrel of the support roll, three rolling bearings, of which the middle rolling bearing is designed as a tapered roller bearing, being provided over the length of the basic body. The two outer rolling bearings are configured as cylindrical roller bearings and located between the two cylindrical roller bearings and the basic body is respectively one eccentric bush which can be rotated by motor about the longitudinal axis of the basic body, wherein a tilting segment allowing the skewing of the cylindrical roller bearing is provided in the load region of the basic body between said body and the eccentric bush.

A multipart roller is furthermore disclosed in US 4,407,151.

WO 2007 / 006 467 A1 as the nearest prior art discloses a support roller for a rolling mill such as a plate rolling mill, flat rolling mill or the like, consisting of a sleeve and a roll shaft or roll axle, wherein the roll shaft or roll axle is configured as multipart, in particular the roll shaft or roll axle is formed from a left half-pin and a right half-pin. The process for producing such a shaft provides that the sleeve is heated internally and thus expands. The half-pins are then inserted in the sleeve and slid onto the right and the left front wall of the sleeve. For exact positioning, the half-pins for example have at least one bearing edge on their periphery. The support roll, consisting of sleeve, right half-pin and left half-pin is held together by a shrink joint after cooling the sleeve. A rigid support roll is provided.

In this method of production, shrinkage stresses can remain in the joint after cooling and these can also be released during the actual rolling process. This

can have the result that after the first rolling, the roller is permanently deformed. The ensuing planeness errors can be up to one millimetre. The planeness error formed is eliminated, for example, by overgrinding. Due to a high rolling force acting on the roller in a different phase position, further deformation occurs in the new direction.

It is therefore the object of the invention to provide a roller and a method for producing the roller in which shrinkage stresses are avoided.

This object is achieved according to the invention whereby, in a roller, in particular a working or support roll for a rolling mill such as a plate rolling mill, flat rolling mill or the like; comprising

- a sleeve;

- a left half-pin; and

- a right half-pin;

- wherein in the region surrounded by the sleeve, the half-pins are configured as truncated-cone-shaped and form a left surface on the left half-pin and a right surface of the right half-pin, the left half-pin and the right half-pin is configured with holes and grooves corresponding therewith, wherein the grooves are formed in the surfaces.

One embodiment of the invention provides that the grooves are formed circumferentially. A uniform pressure is hereby achieved over the entire circumference, which expands the sleeve uniformly in all directions.

Further embodiments of the roller are obtained from the relevant dependent claims.

The invention additionally relates to a method for producing a roller, in particular a working or support roll, wherein

- the left half-pin and the right half-pin are inserted in the sleeve;

- the right half-pin and the left half-pin are braced with respect to one another by means of at least one tie rod;

- hydraulic oil in holes and grooves is guided into or onto the left half-pin and the right half-pin;

- the hydraulic oil exerts a pressure on the sleeve, by which means the sleeve is expanded; and

- when the sleeve is expanded, the stop faces with the front faces of the sleeve are pressed onto one another by means of the tie rod.

The expansion of the sleeve by means of the hydraulic oil makes it possible to achieve a deformation having no shrinkage stresses such as those which occur during heating. The expansion undertaken in the elastic area of the sleeve has the effect that after the excess pressure has stopped, the sleeve returns to its initial shape.

Further embodiments of the method are obtained from the relevant dependent claims.

The roller comprising sleeve, left half-pin and right half-pin is configured with seals to prevent the penetration of, for example, dirt particles and liquids such as water, coolant, lubricant and thereby avoid corrosion (tribocorrosion).

An exemplary embodiment of the invention is described in detail with reference to a very schematic drawing. In the figures:

Fig. 1 shows a roller comprising a sleeve, a left half-pin and a right half-pin in a three-dimensional view when assembled;

Fig. 2 shows an exploded diagram of the roller from Figure 1;

Fig. 3 is a cutaway side view of the roller from Figure 1;

Fig. 4 shows in detail the position Y; and

Fig. 5 shows in detail the position X

Figure 1 shows a roller 1 comprising a sleeve 2, a left half-pin 3 and a right half-pin 4 braced by means of a tie rod 5, in a three-dimensional view when assembled.

Figure 2 shows the roller 1 from Figure 1 with further elements as an exploded view. In the diagram shown the left half-pin 3 is configured with a through-hole 6 (see Figure 3) through which the tie rod 5 is guided and then screwed into a tapped hole 7 (see Figure 3) of the right half-pin 4. At least one local thickening 8 is optionally formed on the tie rod 5 so that the tie rod 5 is guided in the through hole 6 and cannot impact. The thickening 8 can also be slid on as a separate part or separate parts. The thickening 8 can also be used to accommodate a seal therein. During demounting this makes it possible to build up a driving-apart compressive force internally. On one side the tie rod 5 has a thread corresponding to the tapped hole 7 and on the other side, a thread with nut and optional washer. Alternatively, instead of the nut, the tie rod 5 can be configured as a screw. The roller 1 is furthermore configured with seals 9 and seal carriers 10 which prevent any ingress or egress of dirt and liquids.

At the surfaces 12 and 13 coming in contact with the inner surface 14 of the sleeve 2, the left half-pin 3 and the right half-pin 4 each have at least one groove 11 through which hydraulic oil is guided. The hydraulic oil in the left half-pin 3 and in the right half-pin 4 is supplied via corresponding connections (see Figure 3).

In one embodiment, the opposing front faces 15 of the left half-pin 3 and the right half-pin 4 have recesses 16 for stoppers (see Figure 3) and/or opposing holes 17 by which means rotation is prevented between the two half-pins 3 and 4 by means of inserted bolts (not shown).

The roller 1 is shown in cutaway side view in Figure 3. Both the left half-pin 3 and also the right half-pin 4 have stop faces 18 and 19 in contact with the left front face 20 and the right front face 21 of the sleeve 2. The stop faces 18 and 19 are optionally configured with seal carriers 10 and seals 9 which prevent the ingress and egress of dirt and liquids into or out of the roller. Corresponding details are shown in Figures 4 and 5.

For joining together the roller 1, the left half-pin 3 and the right half-pin 4 are slid into the sleeve 2 and braced by the tie rod 5. A hydraulic tensioning device (not shown) is placed on the tie rod 5 by which means the left half-pin 3 and the right half-pin 4 are pulled towards one another inside the sleeve 2. The joining process is improved by expanding the sleeve 2 by means of hydraulic oil until the front face 20 comes in contact with the stop face 18 and the front face 21 comes in contact with the stop face 19. The pressure of the hydraulic oil is then released and the sleeve 2 is connected to the left half-pin 3 and the right half-pin 4 in a press fit. The roller 1 is demounted for exchanging or for separate after-grinding of the sleeve 2. For this purpose, the sleeve 2 is likewise expanded by the hydraulic oil and the left half-pin 3 and the right half-pin 4 are pulled from the sleeve 2 or the press fit is released. In order to expand the sleeve 2, the hydraulic oil is guided through holes 22 in the half-pins 3, 4 to the grooves 11. The preferably circumferential grooves 11 receive the hydraulic oil. When the hydraulic oil is pressed into the holes 22 and the grooves 11 by means of suitable devices, the pressure is transferred to the inner surface 14 of the sleeve 2 and the sleeve 2 is widened. During mounting the left half-pin 3 and the right half-pin 4 are pulled towards one another by means of the tie rod 5 and/or the tensioning device until the sleeve 2 is exactly positioned by the stop faces 18, 19.

For joining, the left half-pin 3 and the right half-pin 4 are configured as cones. In the interior the sleeve 2 has a mating cone. For this purpose a flat cone having a conical tapering of 1:15 to 1:100 is taken into account in the components. The cone is configured in single-stage or multi-stage (stepped or in the form of steps) conical or cylindrical form. For supplying the hydraulic oil, at least one hole 22 is formed in each case in the half-pins 3, 4. The holes 22, which are arranged as axially parallel, are closed at one end in the area of the front faces 15 by stoppers 23. Located at the other end is a connection 24 for a hydraulic oil device (not shown) by which means hydraulic oil enters into the hole 22 and the grooves 11 and pressure is built up. The connection 24 is alternatively made on the outer front side 25 of the half-pins 3, 4 and/or on the cylindrical outer faces of the stop faces 18 and 19.

In the area of the front faces 15, the left half-pin 3 and the right half-pin 4 are configured with a circumferential sealing groove 28 and a seal 29 inserted therein. By this means, the edge pressure is supported in such a manner when

the sleeve 2 is only expanded on one side, the hydraulic oil cannot flow away when inserting only one half-pin 3 or 4.

Special embodiments of the roller 1 are shown in detail in Figure 4 (position X2), in Figure 5 (position X1) and in Figure 6 (position X3).

Figure 4 shows the seal carrier 10 with the seal 9 in an enlarged view. The seal carrier 10 is secured to the stop face 19 by means of screws, whereby a seal 9 is pressed against the right front face 21 of the sleeve 2. The right front face 21 of the sleeve 2 is furthermore configured with a water draining groove 26.

Figure 5 shows an undercut 27 at the transition from the stop face 19 to the cone of the right half-pin 4 in an enlarged view. In this case, the inner surface 14 of the sleeve 2 is configured such that the inner surface 14 ends in the undercut 27. The overhang protruding into the undercut 27 reduces the relative movement in this range.

Figure 6 shows the left half-pin 3 and the right half-pin 4 with the respective front faces 15 in an enlarged view. In the area of the front face 15, the left half-pin 3 and/or the right half-pin 4 is configured with a sealing groove 28 for receiving a seal 29. The shape of the sealing groove 28 is dependent on the shape of the seal 29. All known seals can be considered as seal 29. This embodiment is taken into account when only one half-pin 3 or 4 is first mounted to avoid any drain-off of hydraulic oil.

REFERENCE LIST

1. Roller
2. Sleeve
3. Left half-pin
4. Right half-pin
5. Tie rod
6. Through hole
7. Tapped hole
8. Thickening
9. Seal
10. Seal carrier
11. Groove
12. Left surface
13. Right surface
14. Surface
15. Front faces
16. Recess
17. Hole
18. Stop face
19. Stop face
20. Left front face
21. Right front face
22. Hole
23. Stoppers
24. Connection
25. Front face
26. Water draining groove
27. Undercut
28. Sealing groove
29. Seal

CLAIMS

1. A roller (1), in particular a working or support roll for a rolling mill such as a plate rolling mill, flat rolling mill or the like; comprising

- a sleeve (2);
- a left half-pin (3); and
- a right half-pin (4);
- wherein in the region surrounded by the sleeve (2), the half-pins (3, 4) are configured as truncated-cone-shaped and form a left surface (12) on the left half-pin (3) and a right surface (13) on the right half-pin (4),

characterised in

that the left half-pin (3) and the right half-pin (4) is configured with holes (24) and grooves (11) corresponding therewith, and the grooves (11) are formed on the surfaces (12, 13) circumferentially in a spiral manner.

2. The roller (1) according to claim 1,

characterised in that the left half-pin (3) and/or the right half-pin (4) is formed with at least one axially parallel through hole (6).

3. The roller (1) according to claim 1 or 2,

characterised in that the left half-pin (3) and/or the right half-pin (4) is formed with a tapped hole (7).

4. The roller (1) according to claim 1 or 2,

characterised in that the left half-pin (3) and/or the right half-pin (4) is formed with a sealing groove (28) for receiving a seal (29).

5. The roller (1) according to any one of claims 1 to 4,

characterised in that the sleeve (2) has front sides (20, 21) configured with a water drainage groove (26).

6. The roller (1) according to any one of claims 1 to 5,

characterised in that the sleeve (2) is configured internally as truncated-cone shaped.

7. The roller (1) according to any one of claims 1 to 6,

characterised in that the sleeve (2) is formed from a high-quality, cast and/or forged heat-treatable steel.

8. The roller (1) according to any one of claims 1 to 7,

characterised in that the sleeve (2) is formed with wear-resistant weld cladding on its outer circumferential surface.

9. A method for producing a roller (1), in particular a working or support roll, according to any one of claims 1 to 8,

characterised in that

- the left half-pin (3) and the right half-pin (4) are inserted in the sleeve (2);
- the right half-pin (3) and the left half-pin (4) are braced with respect to one another by means of at least one tie rod (5);
- hydraulic oil in holes (22) and grooves (11) is guided into or onto the left half-pin (3) and the right half-pin (4);
- the hydraulic oil exerts a pressure on the sleeve (2), by which means the sleeve (2) is expanded; and
- when the sleeve (2) is expanded, stop faces (18, 19) of the left half-pin

and the right half-pin with associated front faces (20, 21) of the sleeve (2) are pressed onto one another respectively by means of the tie rod (5).

10. The method according to claim 9,

characterised in

that the roller is demounted by reversing the steps from claim 11.

11. The method according to claim 9 or 10,

characterised in

that the tie rod (5) is screwed into the tapped hole (7) inserted in one of the two half-pins (4, 5).

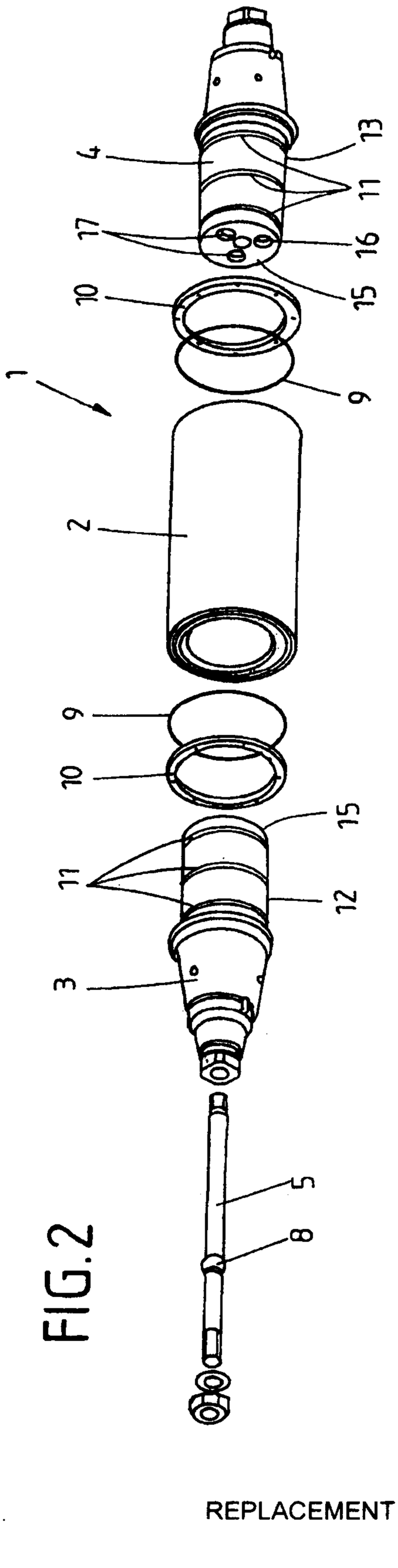


FIG.1

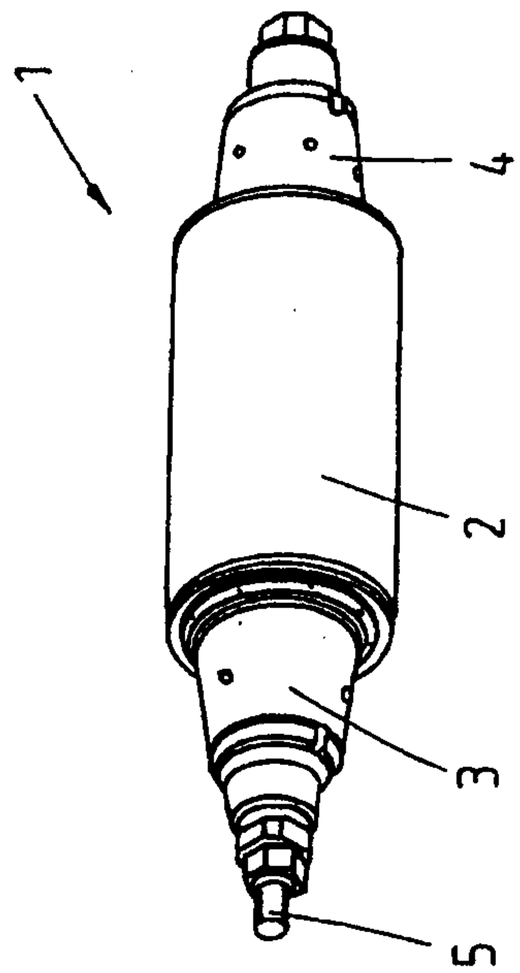


FIG.2

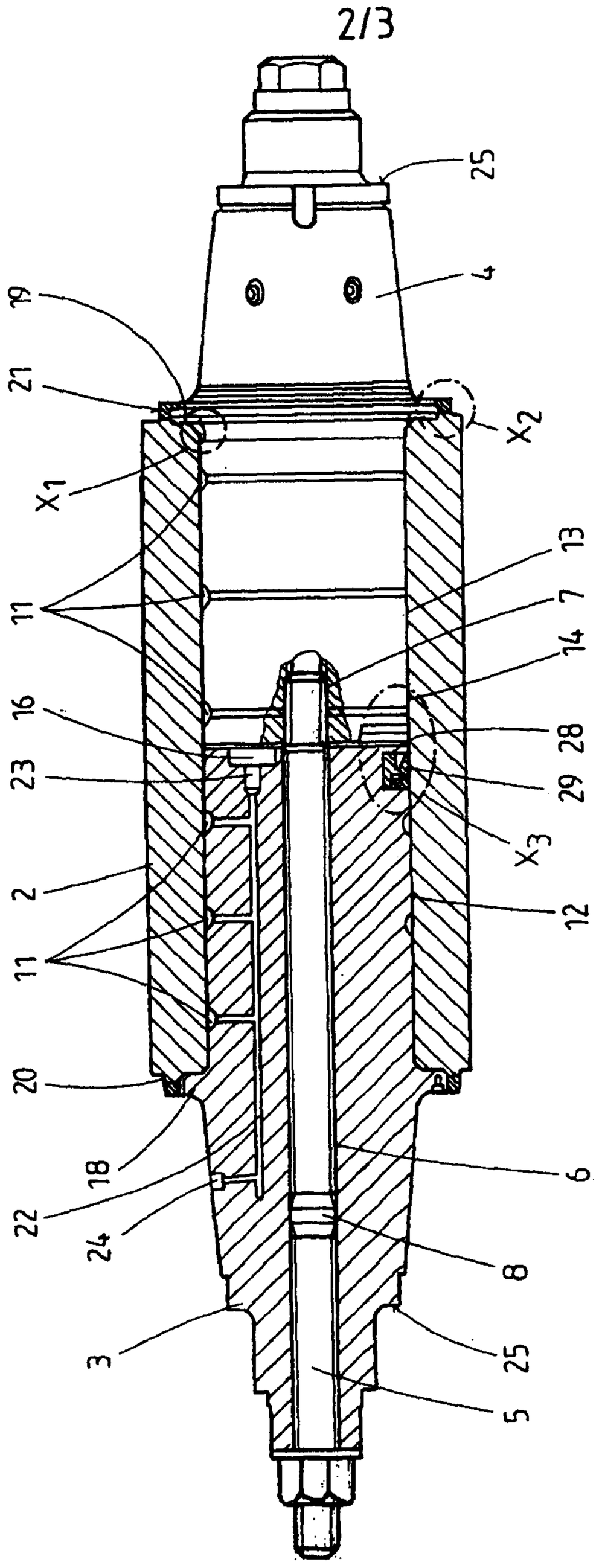


FIG.3

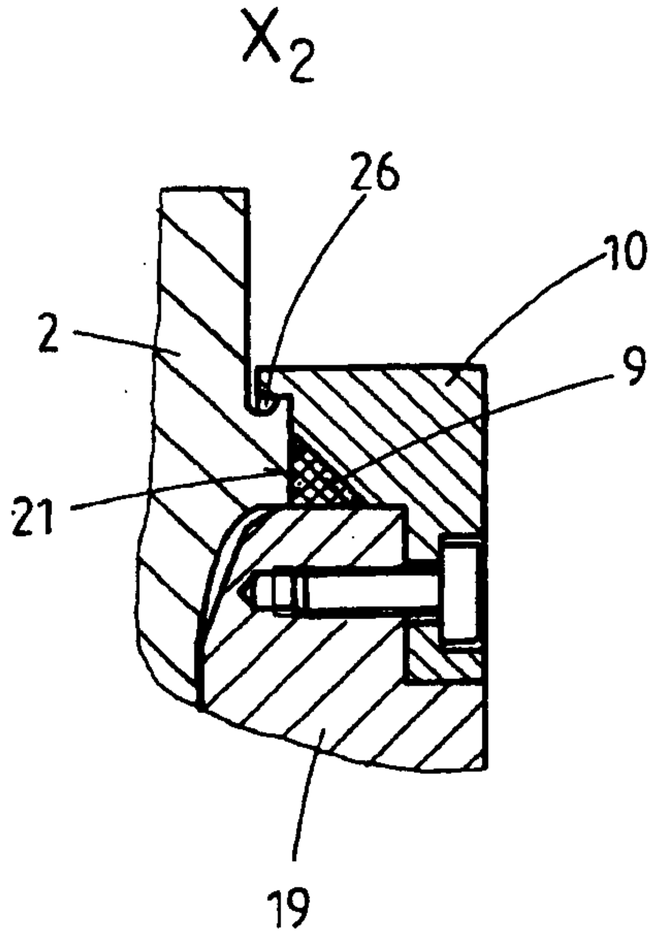


FIG.4

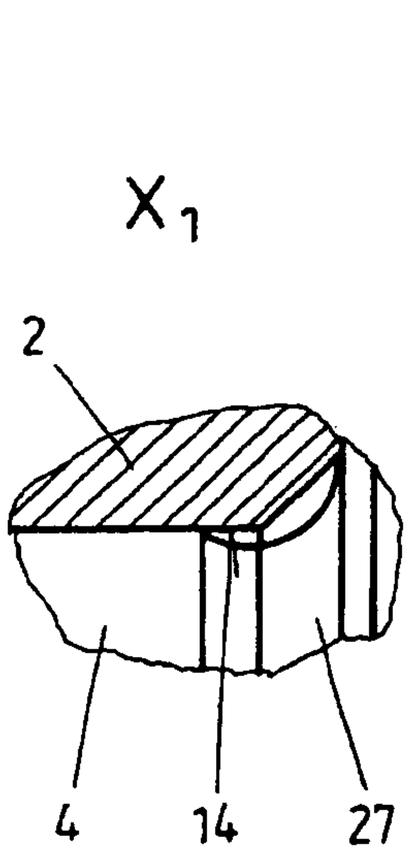


FIG.5

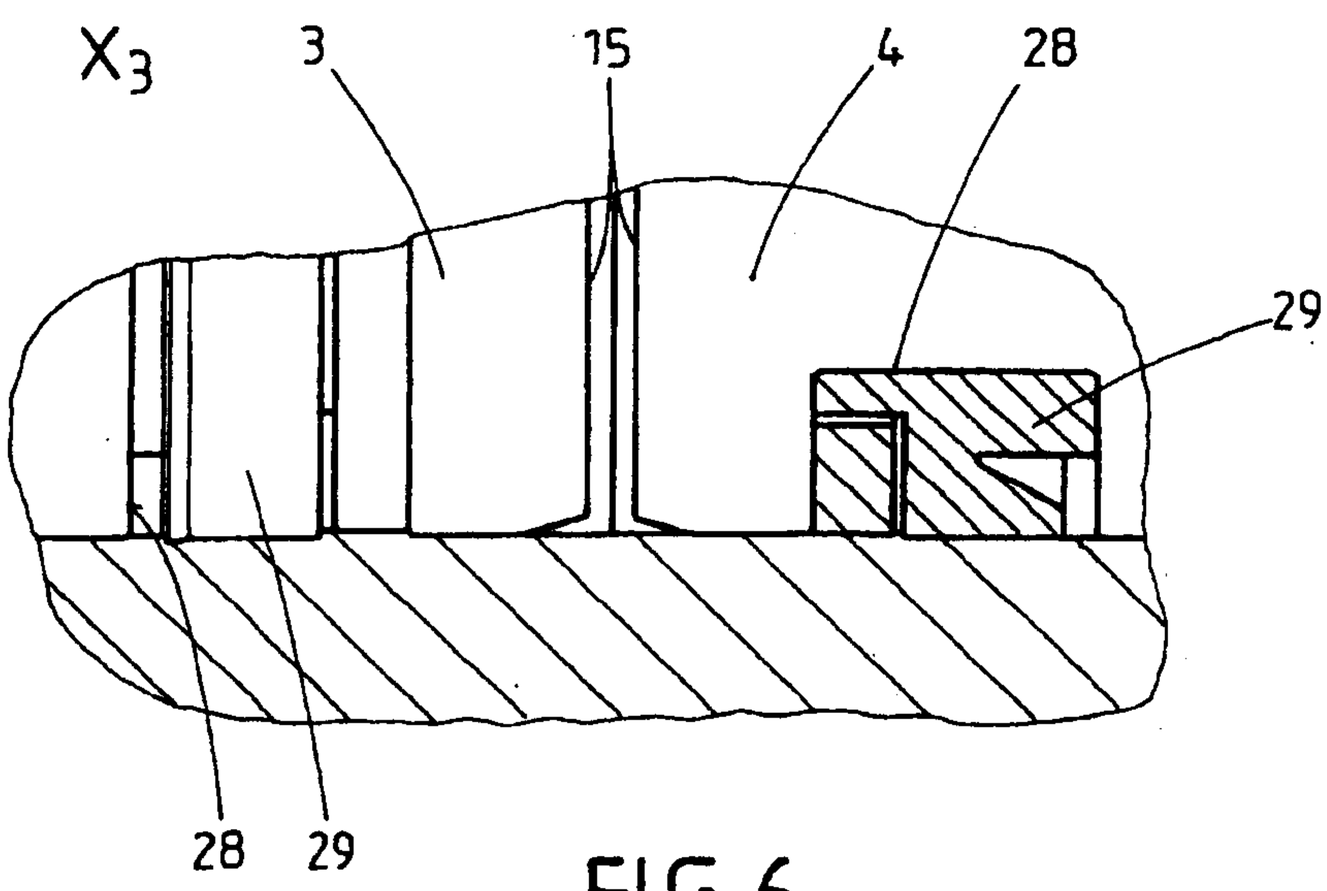
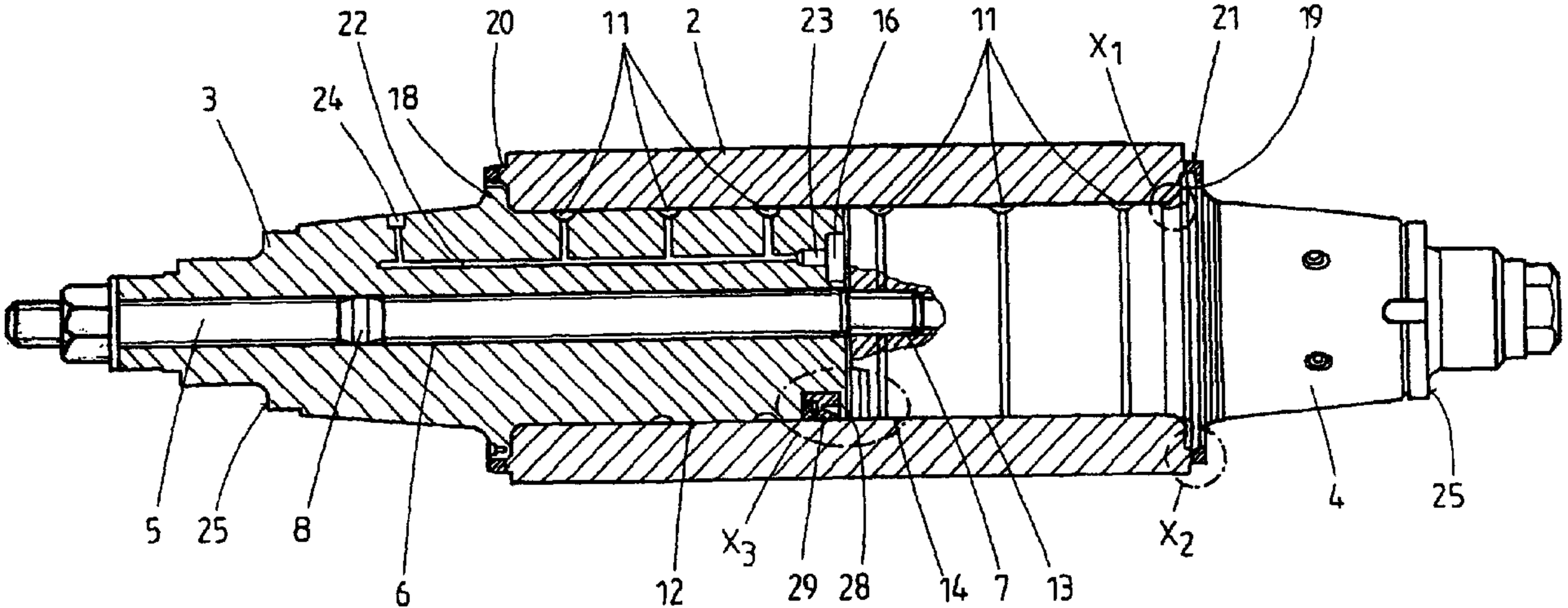


FIG.6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