
(12) PATENT ABRIDGMENT (11) Document No. AU-B-29567/89
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 610334

(54) Title
ELECTRIC TOOTHBRUSH

International Patent Classification(s)
(51)⁴ **A46B 013/02**

(21) Application No. : **29567/89** (22) Application Date : **02.02.89**

(30) Priority Data

(31) Number (32) Date (33) Country
3803646 06.02.88 DE FEDERAL REPUBLIC OF GERMANY

(43) Publication Date : **10.08.89**

(44) Publication Date of Accepted Application : **16.05.91**

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(57) Claim

1. Electric toothbrush with a brush rod housed in ~~the~~ a toothbrush casing so as to be rotatable, the brush rod being movable in pendulum motion around its longitudinal axis by an electric motor with a rotating motor shaft by means of an eccentric pin which engages with a lever, the lever being securely fixed to the brush rod, characterized in that, the brush rod is, in addition, arranged so as to be slidable in axial direction and that the lever is axially parallel to the brush rod and the eccentric pin is perpendicular to the brush rod, the eccentric pin gripping into a socket in the lever, the socket being in transverse direction to the brush rod.

2. Electric toothbrush according to claim 1, characterized in that, arranged on the eccentric pin, so as to be rotatable, is a sliding member which engages with the socket and that the sides of the sliding member running axially parallel to

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the brush rod, and/or the corresponding sides of the socket, run curved or bevelled to enable a tilting movement of the lever.

610334

COMPLETE SPECIFICATION

FOR OFFICE USE

Application Number:
Lodged:

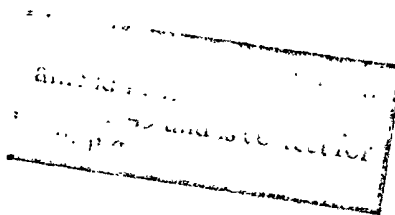
Class

Int. Class

Complete Specification - Lodged:
Accepted:
Published:

Priority:

Related Art:



TO BE COMPLETED BY APPLICANT

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Complete Specification for the invention entitled:

ELECTRIC TOOTHBRUSH

The following statement is a full description of this invention, including the best method of performing it known to us:

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Our Ref: JC:GD:gimelli

The invention relates to an electric toothbrush which has a brush rod housed in the toothbrush casing in such a way as to be rotatable, the brush rod being movable in pendulum motion around its longitudinal axis by an electric motor with a rotating motor shaft by means of an eccentric pin which engages with a lever, the lever being securely fixed to the brush rod. Such an electric toothbrush is in general familiar and conventional.

The rotary motion of the motor is converted, in the familiar toothbrushes, into a pendulum movement of the brush rod by means of a lever which is transversely aligned to the brush rod and which engages with an eccentric pin aligned parallel to the brush rod. Thus, a brush element placed on the brush rod moves in pendulum motion accordingly. Recently this simple movement of the brush element has often been considered insufficient and a demand for a circling movement has arisen. For this movement, the brush rod must not only accomplish a pendulum movement around its longitudinal axis but must also be moved simultaneously backwards and forwards in a lengthwise direction. To produce both of these superposed movements, relatively complicated gearing has been provided for the familiar toothbrushes up to the present so that the production of this sort of toothbrush is on the whole expensive.

The object of the invention is to construct a toothbrush of the type named at the beginning so that the rotary motion of its motor may be converted, with the most simple gearing as possible, into a simultaneous pendulum and backwards and forwards movement.

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The object is achieved in accordance with the invention in that the brush rod is, in addition, arranged so as to be slidable in axial direction and that the lever is axially parallel to the brush rod and the eccentric pin
5 is perpendicular to the brush rod, the eccentric pin gripping into a socket in the lever, the socket being in transverse direction to the brush rod.

This construction allows the eccentric cam to push the lever backwards and forwards with the brush rod, in the
10 direction of the brush rod so that the desired axial shift of the brush rod takes place. Simultaneously, the eccentric cam effects tilting of the lever to one side or the other when it moves in its orbit towards the sides. In this way, the two desired and superposed move-
15 ments of the brush rod are achieved by means of a simple crank mechanism. Owing to the invention a very simple and therefore, reasonably priced toothbrush may be produced, the brush elements of which performing a circular movement which is advantageous for thorough cleaning of
20 the teeth.

It is of particularly great advantage if a sliding member is positioned on the eccentric pin so as to be rotatable, the sliding member engaging with the socket and if both sides of the sliding member running axially parallel to the brush rod, and/or the corresponding sides
25 of the socket, run curved or bevelled to enable a tilting movement of the lever. Such an arrangement operates with very little friction and may be produced at a reasonable price.

To enable the tilting movement of the lever, either the sides of the sliding member are convex or the sides of the socket in the lever, in contact with the sliding member, are concave. It is of course also possible for each of the contacting areas to be curved.

The toothbrush is structurally especially simple, in accordance with one advantageous embodiment of the invention, if the eccentric pin is provided on the face of a gear, this being transversely rotatable to the brush rod and housed in the toothbrush casing, whereby on the motor shaft, a pinion engages with the gear. The gear may, for example, be a bevel gear or a crown wheel. It is simply important that the motor shaft has a bell-crank drive so that the axis of the eccentric pin runs in transverse direction to the motor shaft and thus, in transverse direction to the brush rod.

The tilting movement of the lever is especially simple to produce, in accordance with another embodiment of the invention, if the part of the lever with the socket for the sliding member is of radial distance from the brush rod. This embodiment has a sliding member which engages with the tilting lever at a considerable distance from the swivelling axis of the latter, the swivelling axis of the tilting lever being simultaneously the brush rod. This results in a relatively great tilting momentum so that the pendulum movement of the brush element occurs with great enough force.

Another embodiment is very space-saving if, according to this embodiment, the eccentric pin engages with the sliding member from the side of the brush rod.

Manually operated dental instruments are normally bent at the point where the handle begins. The brush element of an electric toothbrush may also have this bent form if, according to a further development of the invention, 5 the gear is arranged in a front part of the toothbrush which bears the brush rod, the front part being rotatable and tiltable by means of a ball head and positioned in a ball cup in the handle of the toothbrush casing, the handle housing the motor. The centre of the 10 ball head lies at the point of intersection of the gear axle and the motor shaft axle.

The gear allows for tilting of the front part of the toothbrush when necessary only around the gear axle due to the pinion engaging with the gear. To exclude forces 15 on the gear and on the pinion, in an attempt to tilt the front part of the toothbrush into another direction, it is advantageous if the front part of the toothbrush has a support at each side of the axle which bears the gear, the support being in contact with a collar at the front 20 of the handle. These supports prevent tilting into directions other than a direction transverse to the gear axle.

The possible direction of tilt of the front part of the toothbrush is clearly fixed if, according to another embodiment of the invention, the front part of the toothbrush is in contact with the collar at the front of the 25 handle with a support area covering 180 degrees and if its tiltability is restricted by an inclined area adjoining this support area.

30 Another, very simple possibility of preventing the front part of the toothbrush from tilting into a direction which is not transverse to the gear axle is achieved when the gear axle protrudes out of the ball head on at least one side and engages with a bow-shaped groove in
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the handle.

The invention permits numerous embodiments. To clarify the basic principle of the invention further, an embodiment of the latter is represented in drawing and subsequently described.

Fig. 1 is a view of a toothbrush constructed according to the invention,

Fig. 2 is a longitudinal section through the gearing area of the toothbrush according to Fig. 1,

Fig. 3 is a top plan view of a lever in the toothbrush with neighbouring components,

Fig. 4 is a cross section through the toothbrush without its casing along the line IV - IV in Fig. 2,

Fig. 5 is a longitudinal section through the toothbrush according to Fig. 1 and in respect of Fig. 2 has been rotated through 90 degrees.

The toothbrush represented as a whole in figure 1 has a casing 1 which consists essentially of a handle 2 and a front part 3 out of which a brush rod 4 protrudes. When the toothbrush is in use, a brush element, (not shown), is placed on this protruding part of the brush rod 4.

As may be seen in figure 1, the front part 3 of the toothbrush is mounted with a support 5 on a collar 6 at the front of the handle 2. The support 5 adjoins an inclined area 7 on the front part 3 of the toothbrush. Thus, it is possible to tilt the front part 3 of the

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toothbrush out of the position represented in unbroken lines in the drawing so far to the left till the position represented in dots and dashes is reached and the inclined area 7 rests on the collar 6 of the handle 2, the support 5 being instead directed away from the collar 6 at an angle.

Apart from being able to tilt the front part 3 of the toothbrush, it is also possible to turn the latter with its brush rod 4 around the longitudinal axis of the toothbrush. Both possible movements are clarified in figure 1 by arrows.

Figure 2 clarifies in particular the construction of a gearing 8 which enables movement of the front part 3 of the toothbrush. The gearing 8 has a gear 9 which is borne in the front part 3 of the toothbrush by an axle 10. This axle 10 runs transversally to the brush rod 4. The gear 9 is driven by a pinion 11 which is arranged coaxially to the brush rod 4 and is located on a motor shaft 12 of an electric motor 13.

Towards one face, the gear 9 has an eccentric pin 14 which is consequently also aligned transverse to the brush rod 4. A sliding member 15 is arranged on this eccentric pin 14 and is held so as to be unrotatable in a socket 16 of a lever 17. This lever 17 is positioned on the brush rod 4 so as to be rotatable and in the area of the socket 16 is of lateral distance from the brush rod 4. The lever 17 moves up and down due to the movement of the sliding member 15 caused by the circular movement of the eccentric pin 14. The lever 17 tilts simultaneously in this movement with the brush rod 4 upon which it is fixed. The exact sequence of motion becomes clearer with the following figures.

To be seen further in figure 2 is that the front part 3 of the toothbrush engages with a ball head 18 in a ball cup 19 of the handle 2. By means of this construction the front part 3 of the toothbrush may be turned around
5 the longitudinal axis of the toothbrush. In addition, the front part 3 of the toothbrush is tiltable in transverse direction to the plane of the drawing. For this tilting movement it is important that the centre line of the axle 10 intersects the centre line of the motor
10 shaft 12 and that this intersection, positioned at 21 in the drawing, is simultaneously the centre of the ball head 18 and the ball cup 19.

The socket 16 of the lever 17 is held on the brush rod 4 in such a manner that it may only rotate with the brush
15 rod 4. The socket 16 is rectangular in cross section and the sliding member 15 is correspondingly rectangular. This sliding member 15 has a hole 22 in which the eccentric pin 14 engages. If the eccentric pin 14 turns through 180 degrees and thus, reaches its lower position
20 represented in dots and dashes, the lever 17 moves correspondingly downwards so that the brush rod 4 shifts in an axial direction. Since the eccentric pin 14 is in its intermediate position, (not shown), to the side of the axis of the brush rod 4, the lever 17 should actually
25 shift to the side as well. This movement, however, is impossible because the brush rod 4 is fixed at the side. Instead of moving sideways, the lever 17 makes a tilting movement which is possible due to the sliding member 15 being sloped in a bow-shape on two side areas 23, 24 and
30 due to the brush rod 4 lying underneath the sliding member 15, as seen in figure 3. Thus, tilting momentum is created if the sliding member 15 in its socket 16 moves the lever 17 towards the side so that the lever 17 tilts around the brush rod 4 and therefore, shifts the brush
35 rod 4 correspondingly.

Figure 4 clarifies that the side areas 23, 24 of the sliding member 15 are sloped in a bow-shape. Thus, the lever 17 may occupy the tilted position, when the eccentric pin 14 is in its represented position and in re-
5 spect of figure 3 a position shifted through 90 degrees, so that the lever 17 must not move to the side.

Figure 5 shows the inclined area 7 and the support area 5 of the front of the toothbrush already mentioned in figure 1. To be noticed further in figure 5, located on
10 the brush rod 4, is the lever 17 which is moved up and down and in addition, moved in pendulum motion around its longitudinal axis by means of the sliding member 15. Also to be seen in figure 5 is the eccentric pin 14 which engages with the sliding member 15. Not shown, how-
15 ever, are the gear 9 and its axle 10 since these components lie, seen in respect of figure 5, behind the lever 17.

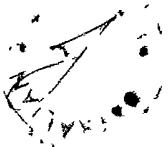
The claims form part of the disclosure of this specification.

The claims defining the invention are as follows:

1. Electric toothbrush with a brush rod housed in ~~the~~ a toothbrush casing so as to be rotatable, the brush rod being movable in pendulum motion around its longitudinal axis by an electric motor with a rotating motor shaft by means of an eccentric pin which engages with a lever, the lever being securely fixed to the brush rod, characterized in that, the brush rod is, in addition, arranged so as to be slidable in axial direction and that the lever is axially parallel to the brush rod and the eccentric pin is perpendicular to the brush rod, the eccentric pin gripping into a socket in the lever, the socket being in transverse direction to the brush rod.

2. Electric toothbrush according to claim 1, characterized in that, arranged on the eccentric pin, so as to be rotatable, is a sliding member which engages with the socket and that the sides of the sliding member running axially parallel to the brush rod, and/or the corresponding sides of the socket, run curved or bevelled to enable a tilting movement of the lever.

3. Electric toothbrush according to claims 1 or 2, characterized in that, the eccentric pin is provided on the face of a gear, this being transversely rotatable to the brush rod and housed in the toothbrush casing, whereby on the motor shaft, a pinion engages with the gear.



4. Electric toothbrush according to at least one of the claims 1 to 3, characterized in that, the part of the lever with the socket for the sliding member is of radial distance from the brush rod.

5. Electric toothbrush according to at least one of the previous claims, characterized in that, the eccentric pin engages with the sliding member from the side of the brush rod.

6. Electric toothbrush according to at least one of the previous claims, characterized in that, the gear is arranged in a front part of the toothbrush which bears the brush rod, the front part being rotatable and tiltable by means of a ball head and positioned in a ball cup in the handle of the toothbrush casing, the handle housing the motor, whereby the centre of the ball head lies at the point of intersection of the axle of the gear and the motor shaft axle.

7. Electric toothbrush according to at least one of the previous claims, characterized in that, the front part of the toothbrush has a support at each side of the axle which bears the gear, the support being in contact with a collar at the front of the handle.

8. Electric toothbrush according to at least one of the previous claims, characterized in that, the front of the toothbrush is in contact with the collar at the front of the handle with a support area covering 180 degrees and that its tiltability is restricted by an inclined area adjoining this support area.

9. Electric toothbrush according to at least one of the previous claims, characterized in that, the axle of the gear protrudes out of the ball head on at least one side and engages with a bow-shaped groove in the handle.

10. An electric toothbrush substantially as herein described with reference to the accompanying drawings.

~~11. The articles, things, parts, elements, steps, features, methods, processes, compounds and compositions referred to or indicated in the specification and/or claims of the application individually or collectively, and any and all combinations of any two or more of such.~~

DATED THIS 1st February, 1989

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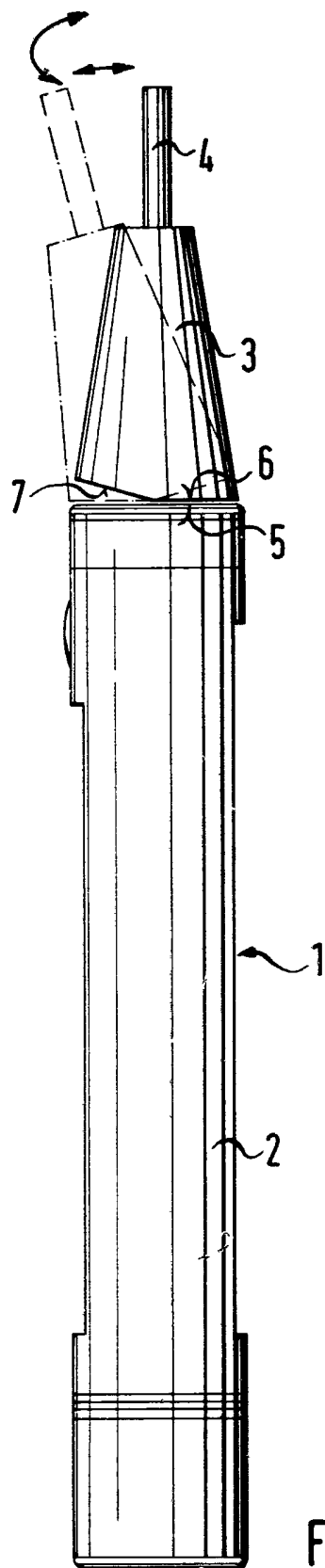
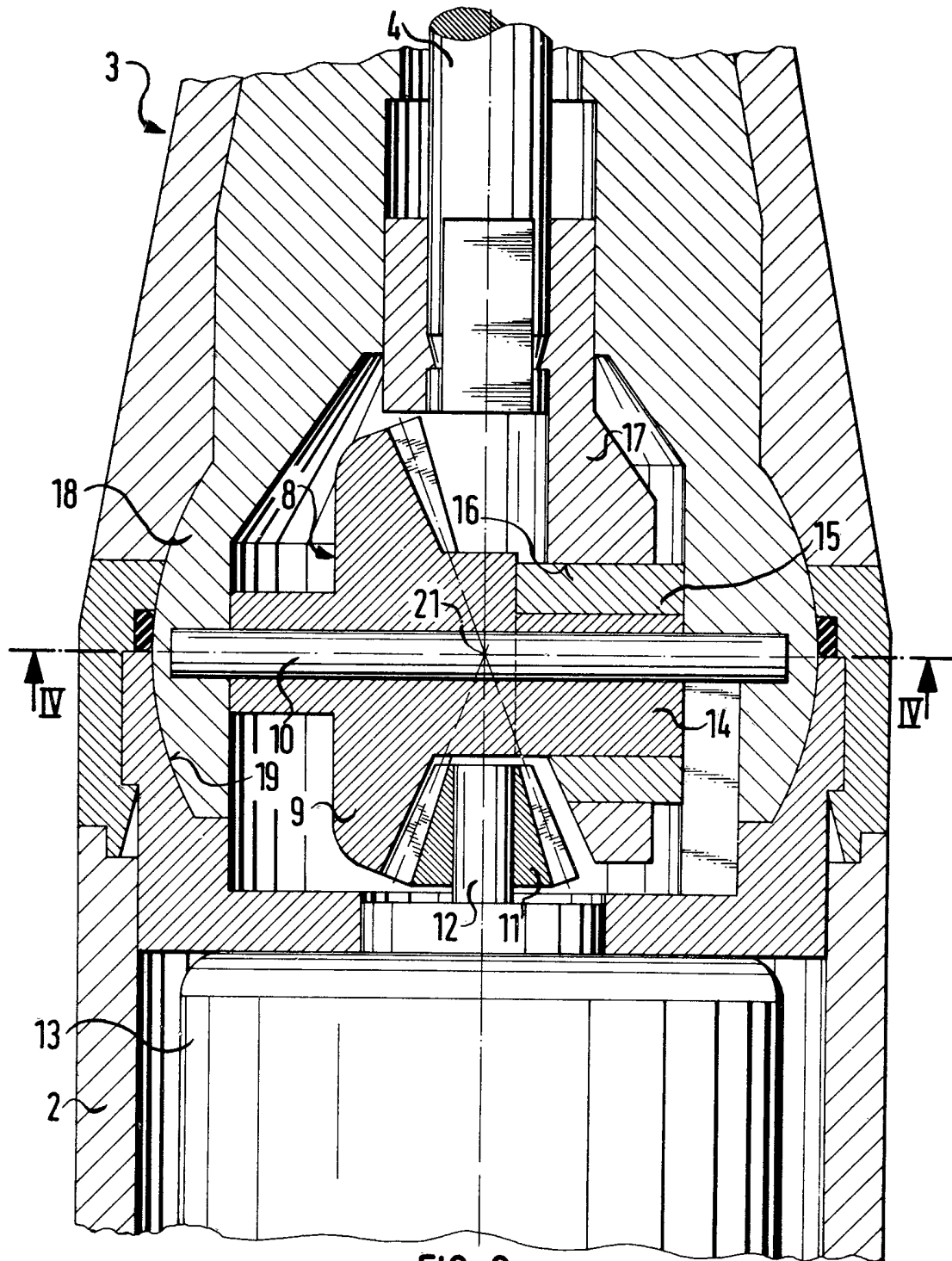


FIG. 1

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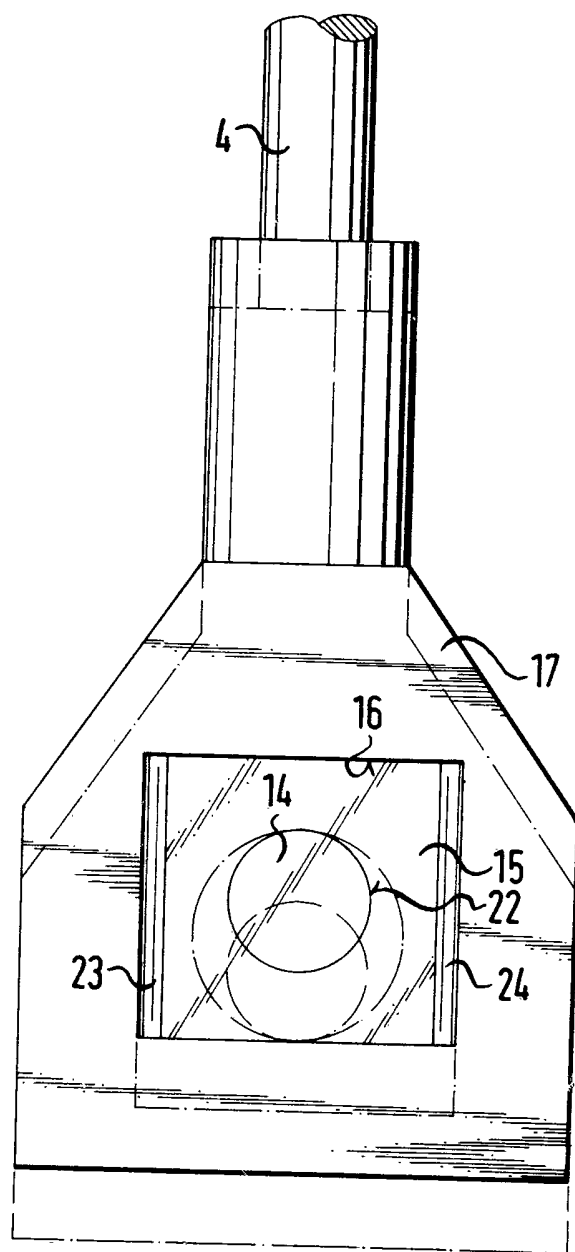


FIG. 3

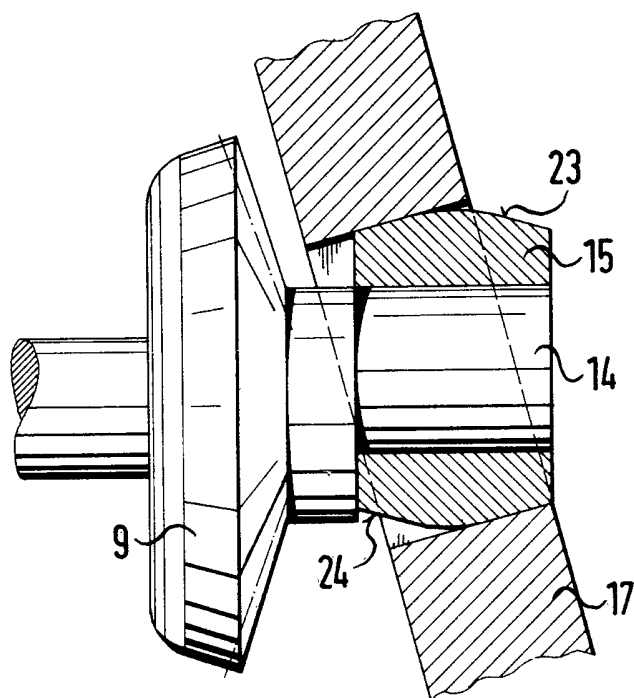


FIG. 4

FIG. 5

