LV 11270

(19) LATVIJAS REPUBLIKAS
PATENTU VALDE

(11) LV 11270 B

(51) Int.Cl. 6 A61F2/38

Latvijas patents uz izgudrojumu
1995.g. 30.marta Latvijas Republikas likums

(12) Īsziņas

(21) Pieteikuma numurs: P-95-277

(22) Pieteikuma datums: 11.09.1995

(41) Pieteikuma publikācijas datums: 20.06.1996

(45) Patenta publikācijas datums: 20.12.1996

(30) Prioritāte:
930460 10.02.1993 NO

(86) PCT pieteikums:
PCT/NO94/00033, 09.02.1994

(87) PCT publikācija:
WO 94/17758, 18.08.1994

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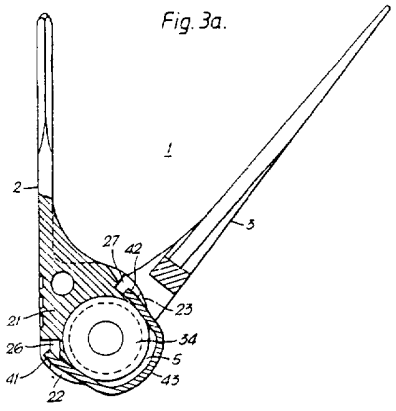
(54) Virsraksts: **Elkoņa protēze**

(57) Kopsavilkums: Implantējama elkoņa protēze (1) satur apakšdelma komponentu (2) un augšdelma komponentu (30, kur apakšdelma komponenta galviņai (21) ir divzaru forma ar diviem ragiem un augšdelma komponenta galviņa (31) satur rotējošu vārpstu (34) starp diviem uz āru izvirzītiem vaigiem (32,33). Protēzes locītavas komponentu veido apakšdelma komponenta galviņa (21), kas novietota tā, lai sakabinātos ar augšdelma komponenta rotējošo vārpstu (34). Katrā no apakšdelma komponenta (2) ragiem (22,23) ir izveidota veidrieva (24,25), kas beidzas attiecīgā katra raga ligzdā (26,27). Pusriņķa formas spaile (4) savieno apakšdelma komponenta un augšdelma komponenta galviņas (21,31) laikā, kad uzturama vēlamā elkoņa locītavas kustības brīvības pakāpe un iepriekš noteiktā kustības pielaide. Spaile (4) ietver augšdelma komponenta (3) vārpstu (34), atstājot spraugu (5) starp spailes loku (43) un vārpstu, un ir savienota ar apakšdelma komponentu (2) ar spailes galiem (41,42), kuri ir iesprausti apakšdelma komponenta ragu (22,23) veidrievās (24,25) un kontaktē ar ligzdām (26,27). Tas nodrošina to, ka apakšdelma komponents nepalaiž vaļā augšdelma komponenta vārpstu (34), kamēr tai pat laikā ir iegūts vēlamais kustības apjoms aktuālajā locītavas savienojumā, kas ir protēzes funkcionālā raksturojuma būtiska detaļa.



PATENTA FORMULA

1. Elkoņa protēze (1) implantēšanai bojātās elkoņa locītavās ar elkoņa kaula komponentu (2) un augšdelma kaula komponentu (3) no ar audiem saderīga materiāla, kur elkoņa kaula komponenta galviņa (21) ir divzaru formas ar diviem ragiem (22, 23), kur augšdelma kaula komponenta galviņa (31) satur rotējošu, aizvietojamu spoli vai vārpstu (34) no ar audiem saderīga un izturīga plastiska materiāla starp diviem uz āru izvirzītiem vaigiem (32, 33) un kur protēzes locītavas komponentu veido elkoņa kaula komponenta galviņa, kas novietota tā, lai sakabinātos ar augšdelma kaula komponenta rotējošo vārpstu (34),
atšķirīga ar to, ka katrs no elkoņa kaula komponenta (2) ragiem (22,23) ir apgādāts ar veidrievu (24, 25), kas beidzas attiecīgā katra raga (22, 23) ligzdā (26, 27), pie kam ligzdas (26, 27) izvietotas apmēram diametrāli pretī viena otrai attiecībā pret elkoņa kaula komponenta savienojuma centru,
ka elkoņa protēze (1) ietver pusriņķa formas spaili (4), kas iemontēta elkoņa kaula komponenta un augšdelma kaula komponenta galviņu (21, 31) savienošanai laikā, kad uzturama vēlamā elkoņa locītavas kustības brīvības pakāpe un iepriekš noteiktā kustības pielaide, un
ka spaile (4) ietver sevī augšdelma kaula komponenta (3) vārpstu (34), atstājot spraugu (5) starp spailes loku (43) un vārpstu, un ir savienota ar elkoņa kaula komponentu (2) ar spailes galiem (41, 42), kuri ir iesprausti elkoņa kaula komponenta ragu (22, 23) veidrievās (24, 25) un kontaktē ar ligzdām (26, 27).

2. Elkoņa protēze saskaņā ar 1. punktu,
atšķirīga ar to, ka spaile (4) ir izgatavota no ar audiem saderīga materiāla, vislabāk no titāna sakausējuma.

3. Elkoņa protēze saskaņā ar 2. punktu,
atšķirīga ar to, ka spailes (4) gali (41, 42) ir veidoti kā profilēts pagarinājums ar aptuvenu pusloka formu un to maksimālais platums ir apmēram 5 mm.

4. Elkoņa protēze saskaņā ar 3. punktu,
atšķirīga ar to, ka elkoņa kaula komponenta ragu (22, 23) veidrievu (24, 25) platums atbilst spailes (4) platumam starp spailes loku (43) un tās galiem (41, 42).

5. Elkoņa protēze saskaņā ar 4. punktu,
atšķirīga ar to, ka samontētā protēzē katrs no elkoņa kaula komponenta galviņas (21) ragu (22, 23) galiem ir izvirzīti uz āru aiz vārpstas (34) diametra augšdelma kaula komponentā (3), vislabāk 5 mm.

6. Elkoņa protēze saskaņā ar 5. punktu,
atšķirīga ar to, ka spaile (4) ir piemērota tam, lai to varētu ielikt vai izņemt protēzes (1) implantēšanas laikā vai pēc tam.

Elbow prosthesis

The invention concerns an elbow prosthesis for implantation in destroyed elbow joints, with an ulnar component and a humeral component in tissue-compatible material, wherein the head of the ulnar component is designed in a bifurcated form with two horns, wherein the head of the humeral component comprises a rotatable, replaceable spool or spindle of a tissue-compatible and strong plastic material between two projecting flanges and wherein the joint component of the prosthesis is formed by the head of the ulnar component being arranged to engage with the rotatable spindle of the humeral component.

A large number of elbow prostheses are known in the literature and the art. EP-0 098 466 shows an elbow prosthesis wherein a fixed spindle on the humeral component engages with a substantially cylindrical sliding piece in a cut-out on the spindle and wherein the sliding piece is anchored on a shaft which is attached to the ulnar component. The sliding piece is thereby rotatably mounted in the fixed spindle and is locked to it by means of a sleeve which has a C-shaped cross section and which is pushed over the spindle.

Furthermore EP-A-0057793 shows an elbow prosthesis of a similar kind with a spindle-like element on the humeral component and a bifurcated element on the ulnar component. The object is to achieve an optimum joining of the joint components and ensure stability, low loading and mobility with a minimum removal of bone tissue.

The basis for the present application is NO patent application no. 76 3136 which was submitted on 14. September 1976 by one of the present inventors and shelved on 4. November 1977 without having been made generally available. In this an elbow prosthesis is shown with a rotatable spindle or spool which engages with a bifurcated section of the second prosthesis component and wherein the prosthesis components are attached in the usual way to the medullary cavities in those bones which are to be connected, i.e. the humerus and the ulna. This prosthesis has later become known in practice and it will be referred to here in its entirety as an example of the state of the art which forms the basis of the present invention.

The known prosthesis consists of several sizes of humeral components and several sizes of ulnar components with a common joint component, thus

enabling for each patient the selection of the component size which is best suited to the individual bones. The joint connection is free and this prosthesis is therefore dependent on good ligaments and muscle tendons in order to keep the joint in place. If the ligaments are not adequate, e.g. due to fracture and injury, the prosthesis will be able to come out of joint.

Thus the object of the present application is to modify the known prosthesis in such a way that the free joint connection can be blocked and converted to a so-called "semi-constrained" prosthesis which can also be used where the ligaments are not adequate and there is a risk of the prosthesis coming out of joint.

This object is achieved with an elbow prosthesis according to the present invention, characterized in that in each of the horns on the ulnar component there is provided a groove which terminates in a respective blind hole on each horn, the blind holes being approximately diametrically opposite each other in relation to the ulnar component's joint centre, that the elbow prosthesis contains a C-ring-like clip arranged to connect the heads of the ulnar component and the humeral component while maintaining the desired degree of freedom of movement for the elbow joint and a predetermined tolerance of movement, and that the clip embraces the spindle on the humeral component with a clearance between the arc of the clip and the spindle and is locked to the ulnar component, the ends of the clip being inserted into the grooves on the horn of the ulnar component and engaging with the blind holes. Further features and advantages of the elbow prosthesis according to the invention are described in the attached independent claims.

The elbow prosthesis according to the invention will now be described in more detail in connection with an embodiment and with reference to the attached drawing.

Fig. 1a-1c show schematically the head of the ulnar component of the prosthesis seen from the rear, from the side and from above towards the opening between the horns respectively.

Fig. 2a-2c show the clip of the present invention seen in a planar state from the side and in a top view respectively and from the side after the clip has been bent into a C-ring shape.

Figs. 3a and 3b illustrate the elbow prosthesis according to the invention in an assembled condition, seen from the side and from the rear along the axis of the ulnar component respectively and with the clip inserted.

With reference to fig. 1b it can be seen that the head 21 of the ulnar component 2 forms a bifurcated structure with two horns 22,23, the ends of which project somewhat beyond a diameter in the fork arc. On the outside of each horn 22,23 there are formed grooves 24,25 which each terminate in a bore or blind hole 26,27 in each horn. Moreover in fig. 3a and 3b it is shown how the ends 41,42 of a C-ring-like clip 4 can engage with the head 21 of the ulnar component, the ends 41,42 of the clip being inserted into and in abutment with the grooves 24,25 on the horn 22,23 of the ulnar component and engaging with the blind holes 26,27 in the horns.

This C-ring-like clip 4 is illustrated in more detail in fig. 2a-2c. In the example shown the clip 4 is in the form of an approximately 40 mm long sheet component of, e.g. a titanium alloy and normally has a cross section of approximately 1.5 by 3 mm. The ends 41,42 of the clip are extended to form a semicircular sheet component with a diameter of approximately 5 mm. The clip 4 is bent into a C-ring shape as illustrated in fig. 2c, the arc 43 in the C-ring being substantially composed of a slightly wider section of the clip, while between this section and the ends 41,42, the clip is made somewhat narrower in order to provide optimum strength and elasticity. The inside of the arc 43 on the clip 4 can be polished on those surfaces which can enter into contact with the spindle 34 on the humeral component 3 in order to prevent unnecessary wear. When locking the prosthesis the ends 41,42 of the clip 4 are inserted into the grooves 24,25 in the horns 22,23 on the ulnar component 2, as shown in fig. 3a and 3b, these grooves being provided approximately diametrically opposite each other in relation to the joint centre of the ulnar component. The clip 4 is passed over the spindle 34 which is mounted on the humeral component 3 and locks it to the ulnar component 2, the ends 41,42 of the clip engaging in the blind holes 26,27 on the ulnar component. The groove 24,25 in each of the horns 22,23 has a width corresponding to that of the clip, thus ensuring that after being attached the clip 4 will remain securely in place without the occurrence of any lateral movements which may cause wear. The arc 43 in the clip 4 is made wide enough to permit sufficient mobility between the humeral component 3 with the spindle 34 and the ulnar component 2 and a suitable elasticity to ensure that the clip 4 is securely attached when its ends 41,42 have engaged with the blind

holes 26,27 on the horn 22,23 of the ulnar component. The ulnar component 2 is thereby securely attached to the humeral component 3 and holds the spindle 34 of the humeral component in a secure grip, while at the same time some play is permitted in the actual joint connection, a vital circumstance for the functional characteristics of the prosthesis. The mounted prosthesis with the clip 4 in place is illustrated in figs. 3a and 3b and fig. 3a clearly shows the clearance 5 between the spindle 34 and the arc 43 of the clip and also that the ends of the horns 22,23 on the ulnar component 2 project somewhat above a diameter on the spindle 34, e.g. approximately 5 mm beyond this diameter. This means that the clip 4 cannot work loose or fall off unless it breaks. Any tension load on the clip 4 will in fact act outwards through the middle of the arc 43 of the clip and the tension load will therefore only help to further tighten the clip. The ends of the clip will never be able to be pushed out of the bores by the forces acting on the prosthesis during use.

The clip and the other metal components in the prosthesis are made of tissue-compatible material, preferably titanium alloy, as are the other metal components in the prosthesis, thus making the prosthesis very strong and durable, e.g. it has a tensile strength of several thousand kilonewton.

The ulnar component 2 and the clip 4 are designed in such a manner that the clip can be fitted at any time in the course of an operation, even after the actual prosthesis has been cemented into the bones and the joint put in place. Similarly, the clip can also be easily removed if it subsequently proves to be unnecessary, possibly by means of a subsequent operation.

Thus by means of the present invention an elbow prosthesis has been provided which can also be used where the ligaments are not adequate, thereby eliminating any risk of the prosthesis coming out of joint.

PATENT CLAIMS

1. An elbow prosthesis (1) for implantation in destroyed elbow joints, with an ulnar component (2) and a humeral component (3) of a tissue-compatible material, wherein the head (21) of the ulnar component is designed in a bifurcated form with two horns (22,23), wherein the head (31) of the humeral component comprises a rotatable, replaceable spool or spindle (34) of a tissue-compatible and strong plastic material between two projecting flanges (32,33), and wherein the joint component of the prosthesis is formed by the head of the ulnar component being arranged to engage with the rotatable spindle (34) of the humeral component,
characterized in that in each of the horns (22,23) on the ulnar component (2) there is provided a groove (24,25) which terminates in a respective blind hole (26,27) on each horn (22,23), the blind holes (26,27) being approximately diametrically opposite each other in relation to the joint centre of the ulnar component, that the elbow prosthesis (1) includes a C-ring-like clip (4) arranged to connect the heads (21,31) of the ulnar component and the humeral component while maintaining the desired degree of freedom of movement for the elbow joint and a predetermined tolerance of movement, and that the clip (4) embraces the spindle (34) on the humeral component (3) with a clearance (5) between the arc (43) of the clip and the spindle and is locked to the ulnar component (2) by the ends (41,42) of the clip being inserted in the grooves (24,25) on the horn (22,23) of the ulnar component and engaging with the blind holes (26,27).

2. An elbow prosthesis according to claim 1,
characterized in that the clip (4) is made of a tissue-compatible material, preferably titanium alloy.

3. An elbow prosthesis according to claim 2,
characterized in that the ends (41,42) of the clip (4) are formed as a sheet-shaped extension with an approximately semicircular shape and with a maximum width of about 5 mm.

4. An elbow prosthesis according to claim 3,
characterized in that the grooves (24,25) in the horn (22,23) of the ulnar component have a width corresponding to the width of the clip (4) between the arc (43) of the clip and its ends (41,42).

5. An elbow prosthesis according to claim 4, characterized in that the ends of the horns (22,23) on the head (21) of the ulnar component each projects beyond a diameter of the spindle (34) on the humeral component (3) when the prosthesis is mounted, preferably by approximately 5 mm.

6. An elbow prosthesis according to claim 5, characterized in that the clip (4) is arranged to be installed or removed during or after the installation of the prosthesis (1).

Abstract

An implantable elbow prosthesis (1) comprises an ulnar component (2) and a humeral component (3) wherein the head (21) of the ulnar component is designed in a bifurcated shape with two horns (22, 23) and that the head (31) of the humeral component comprises a rotatable spindle (34) between two projecting flanges (32, 33). the joint component of the prosthesis is formed by arranging the head (21) of the ulnar component to engage with the spindle (34) of the humeral component. In each of the horns (22, 23) on the ulnar component (2) there is provided a groove (24, 25) which terminates in a respective blind hole (26, 27) on each horn (22, 23). A C-ring form of clip (4) connects the heads (21, 31) of the ulnar component and the humeral component, while maintaining the desired degree of freedom of movement for the elbow joint and a predetermined tolerance of movement. The clip (4) embraces the spindle (34) on the humeral component (3) with a clearance (5) between the arc (43) of the clip and the spindle and is locked to the ulnar component (2), the ends (41, 42) of the clip being inserted into the grooves (24, 25) on the horns (22, 23) of the ulnar component and engaging with the blind holes (26, 27). This ensures that the ulnar component (2) does not lose its grip on the spindle (34) of the humeral component, while at the same time the desired play is obtained in the actual joint connection, a vital circumstance for the functional characteristics of the prosthesis.

Fig. 1A.

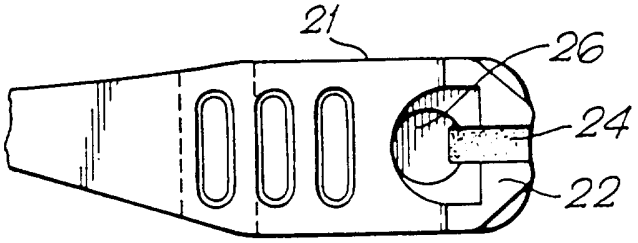


Fig. 1B.

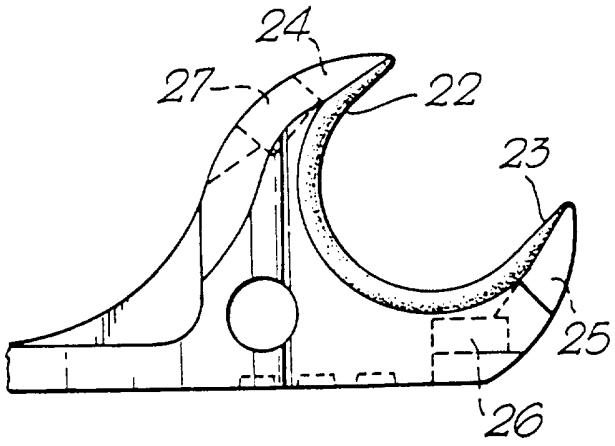


Fig. 1C.

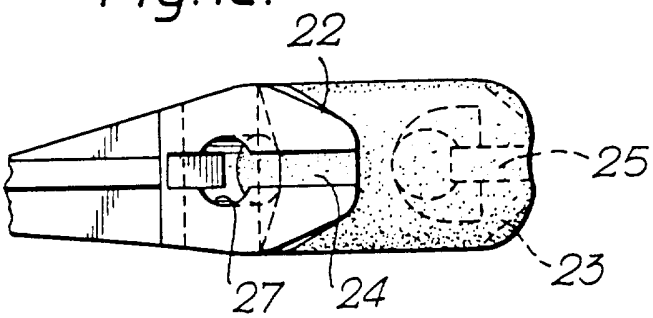


Fig. 2A.

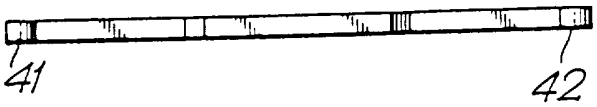


Fig. 2B.

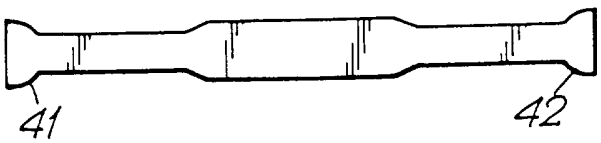


Fig. 2C.

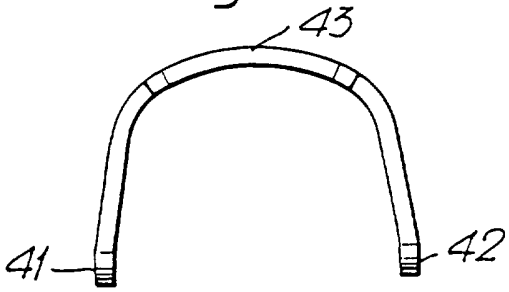


Fig. 3a.

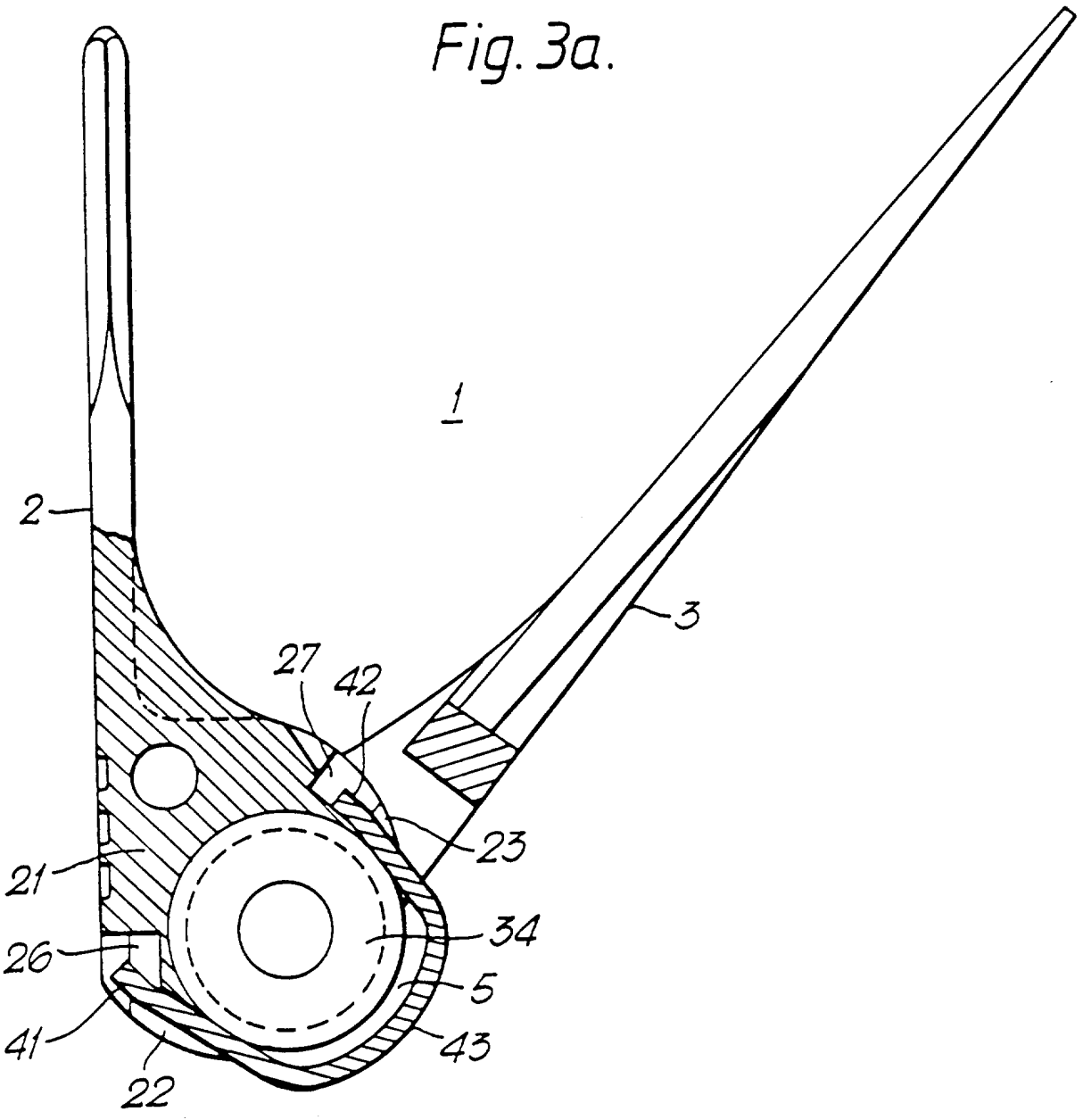


Fig. 3b.