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3,459,180

FEMORAL PINS

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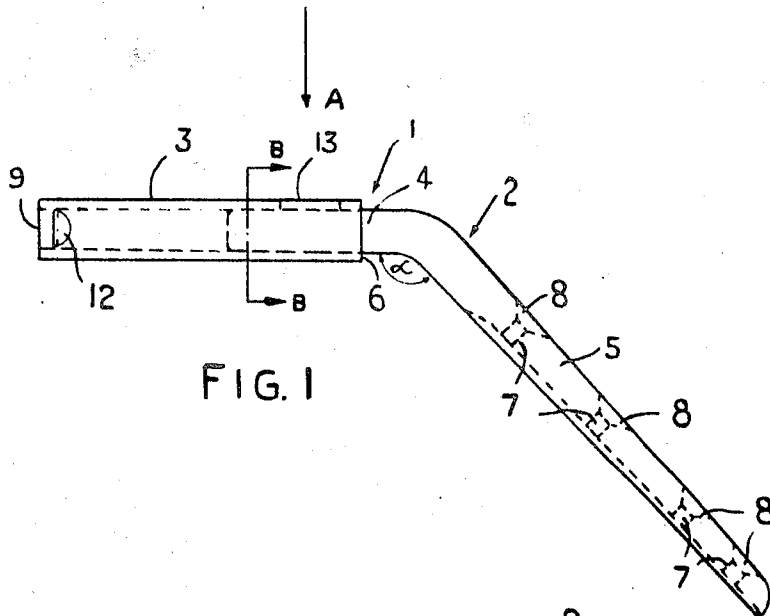


FIG. 1

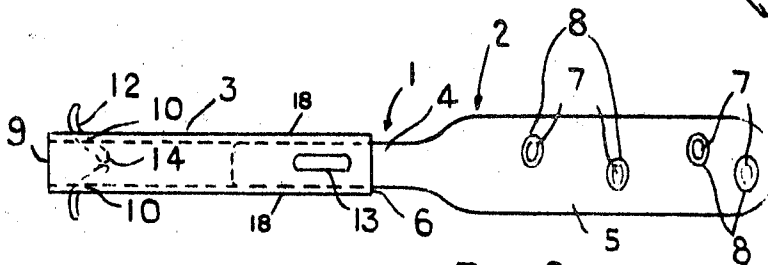


FIG. 2

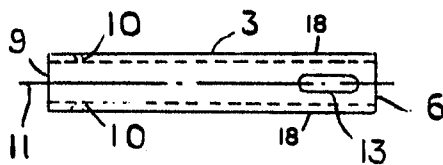


FIG. 3

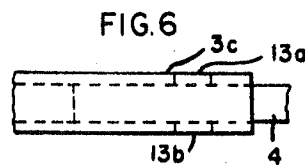


FIG. 6

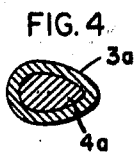


FIG. 4

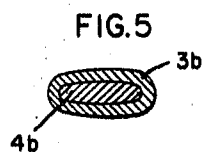


FIG. 5

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FEMORAL PINS

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10 Claims

ABSTRACT OF THE DISCLOSURE

A femoral pin comprising a first member having two limbs disposed at an obtuse angle, one of said limbs being adapted to be rigidly secured to the shank of a femur and a second member constituted by a nail adapted to prevent relative rotation between the head and the shank of the femur and to one end of which the other limb of the first member is adapted to be slidably engaged and non-rotatably coupled, said nail being of tubular form and having a non-circular cross-section.

This invention is concerned with an improved femoral pin. A femoral pin, which is often colloquially referred to as a hip pin, is used, when a person suffers a fracture of the neck of the femur in one of his or her legs, non-rotatably to interconnect the head of the femur, which is joined to the pelvis, with the shank of the femur, the surfaces of the fracture being restrained in the correct relative positions. The pin may either be removed once the surfaces of the fracture have properly knitted together or may be left in place indefinitely to provide additional strength at the location of the fracture.

Femoral pins of the type with which the present invention is concerned each comprise a first member which is screw-threadedly or otherwise rigidly attachable to the shank of the femur and a second member constituted by a nail which operatively prevents relative rotation between the head and shank of the femur and to which, when in use, the first member is non-rotatably connected.

According to one hitherto known construction of femoral pin of the type referred to the nail is, in cross-section, in the form of a spherical triangle, the main faces of the nail being concave. While a nail of this cross-sectional form adequately fulfils the requirement that the nail prevent relative rotation between the head and the shank of the femur the three sharp edges presented by the nail and extending longitudinally thereof have, in practice, tended to induce stress cracking of the adjacent bone structure and it is the primary object of the present invention to provide a femoral pin of the type referred to in which this disadvantage is not associated with the nail, when in use.

A femoral pin according to the present invention comprises a first member which is adapted to be rigidly secured to the shank of a femur and a second member constituted by a nail which is adapted to prevent relative rotation between the head and the shank of the femur and to one end of which the first member is adapted to be nonrotatably coupled, in which the nail is of tubular form and has a non-circular cross-section.

The nail may be of rectangular form, and is preferably of square form, in cross-section. Alternatively, the nail may be of substantially oval or elliptical form in cross-section.

Preferably two opposed slots, each disposed substantially at right angles to the longitudinal axis of the nail, are formed in the walls of the nail, and there is an anchorage member substantially of the form of a capital letter U with serifs, the anchorage member being adapted to be

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mounted within the nail with the limbs of the anchorage member engaging in the slots in the walls of the nail. Each of the opposed slots formed in the walls of the nail is preferably so inclined, relative to the faces of the wall of the nail in which it is formed, that the end of the slot which communicates with the external face of the wall of the nail is spaced a greater distance from the end of the nail to which the first member is adapted to be non-rotatably coupled than the other end of the slot which communicates with the interior of the nail.

The first member may present two limbs, one of which is of such cross-sectional form and dimensions as to be slidably engageable in non-rotatable manner within the end portion of the nail at the end thereof to which the first member is adapted to be non-rotatably coupled.

The nail may be formed with means for engagement by a withdrawal tool, said means preferably comprising either an elongated slot formed in, and disposed substantially parallel to the longitudinal axis of, the nail, or two opposed holes formed in the walls of the nail.

In order that the invention may be more easily understood and more readily carried into effect the same will now, by way of example, be described more fully with reference to the accompanying drawing in which FIG. 1 is a side view of a femoral pin according to a preferred embodiment of the invention, the pin being shown in the condition of use but with the associated parts of the femur omitted for clarity;

FIG. 2 is a plan view in the direction of the arrow A of FIG. 1;

FIG. 3 is a plan view again in the direction of the arrow A of FIG. 1 but showing only the nail;

FIGS. 4 and 5 are cross-sectional views corresponding to line B—B in FIG. 1 but showing modifications; and FIG. 6 is a partial view similar to FIG. 1, but showing a modification.

With reference to the drawing, 1 denotes generally a femoral pin comprising a first member 2 which is adapted to be rigidly secured to the shank of a femur and a second member constituted by a nail 3 which is adapted to prevent relative rotation between the head and shank of the femur. The nail 3 is tubular and is of square form in cross-section although it is to be understood that the nail 3 may be of any non-circular cross-section. For example, the nail 3 may be of rectangular but non-square form in cross-section or may be, for example, of oval cross-section as shown in FIG. 4 at nail 3a around mating limb 4a or elliptical cross-section as shown in FIG. 5 at nail 3b around mating limb 4b.

The first member 1 presents two limbs 4, 5 which are disposed, relative to one another, at an obtuse angle (α), the limb 4 being of square form in cross-section and of such dimensions as to be a sliding non-rotatable fit within the end portion of the nail 3 at the end 6 thereof.

A plurality of spaced holes 7 formed with countersunk recesses 8 are formed in the limb 5 of the first member 1, a screw (not shown) being operatively passed through each of the holes 7 and being screw-threadedly connected to the shank of the femur.

The two opposed side walls 18 of the nail 3 are each formed adjacent to the end 9 of the nail 3 with a slot 10 which is disposed substantially at right angles to the longitudinal axis 11 (FIG. 3) of the nail 3, and which is so inclined, relative to the faces of the side wall 18 in which it is formed, that the end of each slot 10, which communicates with the external face of said side wall 18 is spaced a greater distance from the end 6 of the nail 3 than the end of the slot 10 which communicates with the interior of the nail 3. An anchorage member

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12, which is substantially of the form of a capital letter U with serifs, is operatively mounted in association with slots 10 as hereinafter described.

An elongated slot 13 disposed parallel to the longitudinal axis 11 of the nail 3 is formed in one of the side walls of the nail 3 adjacent to the end 6 thereof, the slot 13 serving, as hereinafter described, to facilitate removal of the nail 3 should this at any time be required. Alternatively, diagonally opposed apertures may be formed in opposite side walls of the nail 3 adjacent to the end 6 thereof, as shown at 13a and 13b in nail 3c in FIGURE 6 the diagonally opposed apertures serving the same function as the slot 13.

The parts constituting the femoral pin 1 are formed of stainless steel although any other material or materials, which is or are suitable for surgical implantation may be used.

In practice, the shank and the head of the femur which has been fractured at the neck are disposed in the correct relative positions with the surfaces of the fracture in contact. A blind hole is then formed, for example by a broaching operation, through the neck and into the head of the femur, the hole being of corresponding cross-sectional form to the external faces of the walls of the nail 3 and of such dimensions that the nail 3 may be inserted into the hole until the end 9 of the nail is disposed within the head of the femur.

The anchorage member 12 is inserted, limbs first, into the bore of the tubular nail, before the nail is inserted into the blind hole formed in the femur, with the ends of said limbs bearing against the side walls 18 of the nail 3 in which the slots 10 are formed. After the nail 3 has been inserted into the blind hole formed in the femur the anchorage member 12 is pushed through the bore of the nail 3, for example by means of a driving tool (not shown) which appropriately contacts the anchorage member 12 until the ends of the limbs of the anchorage member 12 enter the slots 10 in the side walls 18 of the nail 3. Further insertion of the anchorage member 12 into the bore of the nail 3 causes the limbs of the member 12 to pass through the slots 10, the ends of said limbs cutting into the adjacent bone structure of the head of the femur securely to anchor the nail 3 in the head of the femur. Because of the inclined character of the slots 10, in conjunction with the form of the limbs of the anchorage member 12, the ends of said limbs are caused, to some extent, to double back as they cut into the head of the femur.

The driving tool is then disengaged from the anchorage member 12 and is withdrawn. Finally, the limb 4 of the first member 2 is slidably inserted into the bore of the nail 3 and the limb 5 of the first member 2 is securely attached to the shank of the femur.

The anchorage member 12 may be removed prior to inserting the limb 4 of the first member 2 into the bore of the nail 3 or after subsequent removal of the limb 4 of the first member 2 from the nail 3 by screwing a removal tool (not shown) into the screwed hole 14 formed in the anchorage member 12, and withdrawing the anchorage member 12.

If it be required at any time to remove the nail 3 the anchorage member 12 is withdrawn as described in the last preceding paragraph and a withdrawal tool (not shown) is inserted into the bore of the nail 3 from the end 6 thereof. A projecting tooth or oppositely directed projections presented by the withdrawal tool are then engaged respectively, with the elongated slot 13 or with

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the diagonally opposed apertures, as the case may be, and the nail 3 is withdrawn with a pulling action on the withdrawal tool. In the case where the engagement between the withdrawal tool and the nail 3 is by the oppositely directed projections presented by the tool and the diagonally opposed apertures formed in the nail 3 the tool is engaged with the nail 3 by a turning action of the tool relative to the nail 3.

What is claimed is:

1. A femoral pin comprising a first member having two limbs disposed at an obtuse angle, one of said limbs being adapted to be rigidly secured to the shank of a femur, a second member constituted by a nail adapted to prevent relative rotation between the head and the shank of the femur and to one end of which the other limb of the first member is slidably engaged and non-rotatably coupled, said nail being of tubular form and of non-circular cross-section and having two opposed slots, each disposed substantially at right angles to the longitudinal axis of the nail, formed in the walls of the nail, and an anchorage member substantially of the form of a capital letter U with serifs, said anchorage member being mounted within said nail with the limbs of the anchorage member engaging in said slots in said walls of said nail.

2. A femoral pin according to claim 1 wherein the nail presents two parallel walls in cross-section, said opposed slots being located in said parallel walls.

3. A femoral pin according to claim 1 in which said nail is of rectangular form in cross-section.

4. A femoral pin according to claim 1 in which said nail is of square form in cross-section.

5. A femoral pin according to claim 1 in which said nail is of substantially oval form in cross-section.

6. A femoral pin according to claim 1 in which said nail is of substantially elliptical form in cross-section.

7. A femoral pin according to claim 1 in which each of said opposed slots formed in said walls of said nail is so inclined, relative to the faces of said wall of said nail in which it is formed, that the end of said slot which communicates with the external face of said wall of said nail is spaced a greater distance from the end of said nail to which said first member is non-rotatably coupled than the other end of said slot which communicates with the interior of said nail.

8. A femoral pin according to claim 1 in which means is formed on said nail for engagement by a withdrawal tool.

9. A femoral pin according to claim 8 in which said means for engagement by a withdrawal tool comprises an elongated slot formed in, and disposed substantially parallel to the longitudinal axis of, said nail.

10. A femoral pin according to claim 8 in which said means for engagement by a withdrawal tool comprises two opposed holes formed in the walls of said nail.

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