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(71) Applicant: **Paik, Hae Sun**
Seoul 03075 (KR)

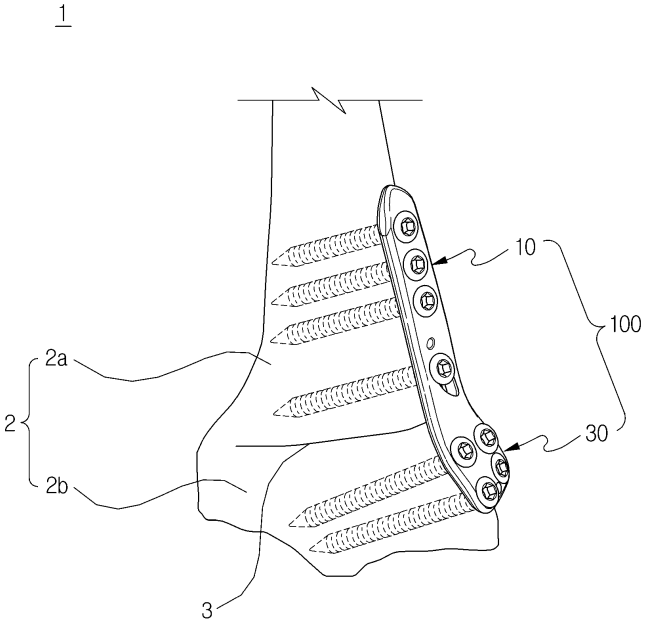
(72) Inventor: **Paik, Hae Sun**
Seoul 03075 (KR)

(74) Representative: **Sanger, Phillip Simon**
Vault IP Limited
Cavendish House
39 Waterloo Street
Birmingham B2 5PP (GB)

(54) FIXING MECHANISM FOR CLOSED DISTAL FEMUR OSTEOTOMY

(57) A fixing mechanism for a closed distal femur osteotomy according to an exemplary embodiment of the present invention is installed on a femur incised by the closed distal femur osteotomy, and the fixing mechanism includes: a body portion which is in close contact with the femur and has a plurality of coupling holes and an oblong hole; a head portion which is connected to one end of the body portion and has a plurality of coupling holes; screws which are inserted into the coupling holes; and a sliding screw which is inserted into the oblong hole by adjusting a coupling position, in which the head portion has a predetermined inclination angle in an upward direction based on a lower surface of the head portion.

Fig. 1



EP 3 228 270 A1

Description

[Technical Field]

[0001] The present invention relates to a fixing mechanism for a distal femur osteotomy. More particularly, the present invention relates to a fixing mechanism for a distal femur osteotomy which ensures secure fixing force by fixing a plate after a closed distal femur osteotomy.

[Background Art]

[0002] In general, in the case of degenerative arthritis, legs are deformed to 'X'-shaped legs as the knees are bent outward, and in some instances, an arrangement of knee joints is abnormally deformed due to an innate factor, an acquired factor caused by life habits, or other diseases such as a fracture or an avascular necrosis caused previously.

[0003] In this case, there is a knee joint osteotomy as one of the surgical methods, and the knee joint osteotomy is a treatment method which corrects an abnormal axis of a lower limb and shifts a load, which is applied to a knee joint, to a more healthy joint surface, thereby improving a distribution of stress and a joint alignment, and thus improving pain.

[0004] Unlike artificial knee joint replacement, the knee joint osteotomy is a method capable of preserving the joint and has an advantage in that an artificial joint surgery time may be delayed, and a joint movement range may be maintained to be almost similar to a joint movement range before the surgery.

[0005] A distal femur osteotomy, which is an example of the knee joint osteotomy, is performed by cutting a predetermined amount of bone, removing the bone by the amount corresponding to a necessary angle, bonding the bone, and fixing the incised bone by using a plate and screws.

[0006] However, the plate in the related art does not match with Korean body types, and angles at an osteotomy site are misaligned, and as a result, there is a problem in that complications are caused after the surgery.

[Document of Related Art]

[0007] Korean Patent No. 10-0916334

[Disclosure]

[Technical Problem]

[0008] An exemplary embodiment of the present invention provides a fixing mechanism for a distal femur osteotomy which is capable of having secure coupling force by rotating a head portion of a plate.

[0009] In addition, an exemplary embodiment of the present invention provides a fixing mechanism for a distal femur osteotomy in which an angle is formed at a head portion so that screws are not withdrawn from a bone.

[Technical Solution]

[0010] A fixing mechanism for a closed distal femur osteotomy according to an exemplary embodiment of the present invention is installed on a femur incised by the closed distal femur osteotomy, and the fixing mechanism may include: a body portion which is in close contact with the femur and has a plurality of coupling holes and an oblong hole; a head portion which is connected to one end of the body portion and has a plurality of coupling holes; screws which are inserted into the coupling holes; and a sliding screw which is inserted into the oblong hole by adjusting a coupling position, in which the head portion has a predetermined inclination angle in an upward direction based on a lower surface of the head portion.

[0011] Particularly, the head portion may be twisted in a left or right direction based on the body portion and coupled to the body portion.

[0012] Particularly, the coupling holes may be formed in the head portion along a plurality of rows, and the plurality of coupling holes may be formed at each of the rows.

[0013] Particularly, the head portion and the body portion may be formed to be curved and be in close contact with the femur.

[0014] Particularly, the screws coupled to the head portion may be coupled to be directed toward a particular point.

[0015] Particularly, a line, which connects central portions of the coupling holes formed along a first row on an upper surface of the head portion, may be inclined 3 to 5 degrees based on a reference line.

[0016] Particularly, a line, which connects central portions of the coupling holes formed along a first row on a lower surface of the head portion, may be inclined 5 to 7 degrees based on the reference line.

[0017] Particularly, a line, which connects central portions of the coupling holes formed along a second row on the lower surface of the head portion, may be inclined 1.5 to 2.5 degrees based on the reference line.

[0018] Particularly, one surface of the head portion may have an inclination angle of 20 to 22 degrees based on the body portion, and the other surface of the head portion may have an inclination angle of 24 to 26 degrees based on the body portion.

[0019] Particularly, one surface of the body portion may have a predetermined inclination based on a lateral surface of the head portion.

[0020] Particularly, the body portion may have an angle of 7 to 9 degrees.

[0021] Particularly, two coupling holes may be formed along each of the plurality of rows, the screw, which is inserted into the coupling hole formed in a first row, may have an inclination angle of 13 to 15 degrees based on a reference line, and the screw, which is inserted into the coupling hole formed in a second row, may have an inclination angle of 17 to 19 degrees based on the refer-

ence line.

[0022] Particularly, at least one guide hole to which a guide pin is fixed may be formed in the head portion or the body portion.

[0023] Particularly, two coupling holes may be formed along each of the plurality of rows, and the screw, which is inserted into the coupling hole formed in a second row, may be inclined 16 to 18 degrees based on a vertical line.

[Advantageous Effects]

[0024] According to the fixing mechanism for a distal femur osteotomy according to the exemplary embodiment of the present invention, it is possible to securely couple the plate and the bone by rotating the head portion.

[0025] In addition, since angles are formed at the head portion and thus the screws are not withdrawn from the bone, it is possible to reduce complications after the surgery.

[Description of Drawings]

[0026]

FIG. 1 is a view illustrating a state in which a fixing mechanism for a distal femur osteotomy according to an exemplary embodiment of the present invention is coupled to a femur.

FIG. 2 is a view illustrating a shape of a plate which is a constituent element of the present invention.

FIG. 3 is a view illustrating a coupling angle at which a body portion and a head portion of the plate in FIG. 2 are coupled.

FIG. 4 is a view illustrating a coupled state of the fixing mechanism for a distal femur osteotomy according to the exemplary embodiment of the present invention.

FIG. 5 is a view illustrating a coupling angle formed between screws coupled to the head portion according to the exemplary embodiment of the present invention.

FIG. 6 is a view illustrating one side inclination of the head portion according to the exemplary embodiment of the present invention.

FIG. 7 is a view illustrating the other side inclination of the head portion according to the exemplary embodiment of the present invention.

FIG. 8 is a view illustrating an inclination of a lower surface of the head portion according to the exemplary embodiment of the present invention.

FIG. 9 is a view illustrating an inclination of an upper surface of the head portion according to the exemplary embodiment of the present invention.

[Best Mode]

[0027] Hereinafter, a fixing mechanism for a distal femur osteotomy according to an exemplary embodiment of the present invention will be described in detail with reference to the accompanying drawings. First, in denoting reference numerals to constituent elements of the respective drawings, it should be noted that the same constituent elements will be designated by the same reference numerals, if possible, even though the constituent elements are illustrated in different drawings. Further, an exemplary embodiment of the present invention will be described below, but the technical spirit of the present invention is not limited thereto and may be modified and variously carried out by those skilled in the art.

[0028] FIG. 1 is a view illustrating a state in which a fixing mechanism for a distal femur osteotomy according to an exemplary embodiment of the present invention is coupled to a femur.

[0029] Referring to FIG. 1, a femur 2 is divided into an upper femur 2a and a lower femur 2b based on cut surfaces 3 which are cut by a distal femur incision procedure for incising the femur 2.

[0030] A fixing mechanism 1 for a closed distal femur osteotomy according to the exemplary embodiment of the present invention may include a body portion 10 which is in close contact with the femur 2 and has a plurality of coupling holes 14 and an oblong hole 16, a head portion 30 which is connected to one end of the body portion 10 and has a plurality of coupling holes 34, screws 12 and 32 which are inserted into the coupling holes 14 and 34, and a sliding screw 54 which is inserted into the oblong hole 16.

[0031] A plate 100 may include the body portion 10 and the head portion 30, and may have the plurality of coupling holes 14 and 34 into which the screws 12 and 32 to be fixed to the femur 2 are inserted.

[0032] The body portion 10 may be formed in an elongated shape, and the plurality of coupling holes 14 may be formed in a longitudinal direction of the body portion 10. The coupling holes 14 formed in the body portion 10 are formed at predetermined intervals so as to uniformly distribute supporting force. The screws 12 and 32, which penetrate the coupling holes 14 formed in the body portion 10, may be coupled to the upper femur 2a at a right angle to the upper femur 2a. A length of each of the screws 12 and 32 coupled to the body portion 10 may be variously modified in accordance with a diameter of the upper femur 2a.

[0033] The sliding screw 54 may be coupled to the oblong hole 16 formed in the body portion 10. A bone is cut as much as needed for a distal femur osteotomy procedure, and the cut surfaces 3 are connected to each other in order to correct an abnormal axis of a lower limb. In this case, the cut surface 3 may not be formed at a predetermined position. The sliding screw 54 is coupled to the oblong hole 16, and the sliding screw 54 may be coupled to the femur 2 by being moved in accordance with a position of the cut surface 3. The sliding screw 54 may be inserted into the upper femur 2a so as not to penetrate the cut surface 3.

[0034] FIG. 2 is a view illustrating a shape of the plate which is a constituent element of the present invention, and FIG. 3 is a view illustrating an angle of the body portion which is a constituent element of the present invention.

[0035] Referring to FIGS. 2 and 3, the plate 100 of the fixing mechanism 1 for a closed distal femur osteotomy according to the exemplary embodiment of the present invention may be classified into a left-hand plate and a right-hand plate in accordance with a surgical site, and the left-hand plate and the right-hand plate define a symmetrical structure.

[0036] The body portion 10 is coupled to the upper femur 2a, and may have an elongated shape. As an exemplary embodiment, the body portion 10 may be formed such that a width of the body portion 10 is increased in a direction from the upper femur 2a to the cut surface 3. The reason is to stably support a load when the body portion 10 is coupled to the cut surface 3.

[0037] The plurality of coupling holes 14 and 34 formed in the body portion 10 may be provided in the longitudinal direction of the body portion 10. The coupling holes 14 and 34 formed in the body portion 10 are formed at predetermined intervals, and the screws 12 and 32 are inserted into the coupling holes 14 and 34, thereby stably supporting the surgical site.

[0038] The oblong hole 16 may be formed at one end of the body portion 10, that is, at a side where the body portion 10 is coupled to the head portion 30. The oblong hole 16 is formed in the longitudinal direction of the body portion 10, thereby allowing a position of the sliding screw 54 to be adjusted when the sliding screw 54 is coupled to the oblong hole 16. The oblong hole 16 allows a coupling position to be adjusted, thereby enabling the plate 100, which is ergonomically designed, to come into close contact with the femur 2, and enabling the plate 100 to stably support a load.

[0039] The head portion 30 is connected to one end of the body portion 10, and may have the plurality of coupling holes 34. The head portion 30 is formed to be wider in width than the body portion 10, and may be coupled to the lower femur 2b.

[0040] The coupling holes 34 formed in the head portion 30 may be formed along a plurality of rows and a plurality of columns, and the screws 32 are inserted into the coupling holes 34, respectively, thereby fixing the plate 100 to the lower femur 2b.

[0041] As an exemplary embodiment, the coupling holes 34 formed in the head portion 30 are formed along the plurality of rows, and the plurality of coupling holes 34 may be formed along the rows, respectively. Particularly, the coupling holes 34 formed in the head portion 30 may be formed along two rows and two columns. The arrangement of the coupling holes 34 may be variously modified in accordance with a shape of the head portion 30.

[0042] The body portion 10 and the head portion 30 are divided as necessary, but the body portion 10 and the head portion 30 may be integrally formed. A thickness of each of the body portion 10 and the head portion 30 may be 4 to 6 mm, particularly, 5 mm. A thickness of each of the body portion 10 and the head portion 30 may be variously modified in accordance with an age and a thickness of a bone of a patient subjected to the surgery.

[0043] A lateral surface of the body portion 10 may form a predetermined angle based on a lateral surface of the head portion 30. As an exemplary embodiment, an angle, which is formed by the lateral surface of the body portion 10 based on the lateral surface of the head portion 30, may be 7 to 9 degrees. The reason why the body portion 10 has a predetermined angle based on the head portion 30 is to couple the plate 100 to the femur 2 so that the plate 100 is in close contact with the femur 2. The angle formed by the body portion 10 is just an example, and may be variously modified.

[0044] At least one guide hole 40 to which a guide pin (not illustrated) is fixed may be formed in the plate 100. The plate 100 may be temporarily fixed by installing the guide pin (not illustrated) before inserting the screws 12 and 32.

[0045] The reason is to prevent the plate 100 from moving when the screws 12 and 32 are inserted into the coupling holes 14 and 34 formed in the plate 100. The guide pin (not illustrated) is removed after the plate 100 is installed.

[0046] As an exemplary embodiment, at least one guide hole 40 may be formed in the head portion 30 in order to fix the head portion 30, and at least one guide hole 40 may also be formed in the body portion 10 in order to prevent swaying of the body portion 10.

[0047] FIG. 4 is a view illustrating a coupled state of the fixing mechanism for a closed distal femur osteotomy according to the exemplary embodiment of the present invention, and FIG. 5 is a view illustrating a coupling angle formed between screws coupled to the head portion according to the exemplary embodiment of the present invention.

[0048] Referring to FIGS. 4 and 5, the head portion 30 may be formed to have a predetermined inclination based on the body portion 10. In this case, the screw 32 coupled to the head portion 30 may have a predetermined inclination angle based on a vertical line. The inclination angle of the screw 32 may be naturally formed by the inclination of the head portion 30, and may be changed in accordance with an angle of the coupling hole 34

[0049] As an exemplary embodiment, the coupling holes 34 may be formed along two rows and two columns, and the screw 32, which is coupled to the coupling hole 34 in a second row, may be formed to have an inclination angle of 16 to 18 degrees based on the vertical line.

[0050] In addition, the screws 32, which are coupled to the coupling holes 34 in the first and second rows, may be coupled to be directed toward a particular point. The reason is to stably maintain a coupled state with the lower femur 2b by preventing the screw 32 from penetrating the lower femur 2b when the head portion 30 is coupled

to the lower femur 2b.

[0051] As an exemplary embodiment, the screw 32, which is inserted into the head portion 30, may form a predetermined angle based on a reference line when the screw 32 is coupled to the lower femur 2b. In a case in which the plate 100 stands on its side, the screw 32, which is coupled to a first row of the head portion 30, may have an inclination angle of 13 to 15 degrees based on a horizontal line, and the screw 32, which is coupled to a second row of the head portion 30, may have an inclination angle of 17 to 19 degrees based on the horizontal line.

[0052] A coupling angle of the screw 32 coupled to the head portion 30 may be variously modified in accordance with a thickness of the lower femur 2b.

[0053] FIG. 6 is a view illustrating one side inclination of the head portion according to the exemplary embodiment of the present invention, and FIG. 7 is a view illustrating the other side inclination of the head portion according to the exemplary embodiment of the present invention.

[0054] Referring to FIGS. 6 and 7, the head portion 30 according to the exemplary embodiment of the present invention may be formed to be twisted in a left or right direction based on the body portion 10. The reason is to bring the head portion 30 into close contact with the lower femur 2b in accordance with a skeleton structure of the femur 2. As the head portion 30 is twisted based on the body portion 10, an angle formed by one surface of the head portion 30 and an angle formed by the other surface of the head portion 30 may be different from each other.

[0055] As an exemplary embodiment, one surface of the head portion 30 may be formed to have an inclination angle of 20 to 22 degrees based on the body portion 10, and the other surface thereof may be formed to have an inclination angle of 24 to 26 degrees based on the body portion 10. An inclination angle of the head portion 30 may be variously modified in accordance with a shape of the lower femur 2b.

[0056] FIG. 8 is a view illustrating an inclination of a lower surface of the head portion according to the exemplary embodiment of the present invention, and FIG. 9 is a view illustrating an inclination of an upper surface of the head portion according to the exemplary embodiment of the present invention.

[0057] Referring to FIGS. 8 and 9, the plate 100 may be formed to be curved so as to have a predetermined curvature so that the plate 100 may be in close contact with an outer circumferential surface of the femur 2. There is no limitation on the curvature of the plate 100, and the curvature of the plate 100 may be variously modified.

[0058] The head portion 30 of the plate 100 may be formed to have an upward inclination based on the body portion 10, and as described above, the head portion 30 may be formed to be twisted in the left or right direction based on the body portion 10.

[0059] A line, which connects central portions of the coupling holes 34 formed along the first row on the upper surface of the head portion 30, may be formed to have an inclination angle of 3 to 5 degrees based on the reference line, that is, the horizontal line.

[0060] In addition, a line, which connects central portions of the coupling hole 34 formed along the first row on the lower surface of the head portion 30, may be formed to have an inclination angle of 5 to 7 degrees based on the horizontal line, and a line, which connects central portions of the coupling holes 34 formed along the second row, may be formed to have an inclination angle of 1.5 to 2.5 degrees based on the horizontal line.

[0061] The reason why the inclination angles of the coupling holes 34 formed in the head portion 30 are different from one another is that a shape of the femur 2 does not have a predetermined curvature, and the head portion 30 having the coupling holes 34 may be coupled to the femur 2 by being in close contact with the femur 2.

[0062] As described above, according to the fixing mechanism for a distal femur osteotomy according to the exemplary embodiment of the present invention, it is possible to securely couple the plate and the bone by rotating the head portion.

[0063] In addition, since angles are formed at the head portion and thus the screws are not withdrawn from the bone, it is possible to reduce complications after the surgery.

[0064] The above description is simply given for illustratively describing the technical spirit of the present invention, and those skilled in the art to which the present invention pertains will appreciate that various modifications, changes and substitutions are possible without departing from the essential characteristic of the present invention. Accordingly, the exemplary embodiment disclosed in the present invention and the accompanying drawings are intended to not limit but describe the technical spirit of the present invention, and the scope of the technical spirit of the present invention is not limited by the exemplary embodiment and the accompanying drawings. The protective scope of the present invention should be construed based on the following claims, and all the technical spirit in the equivalent scope thereto should be construed as falling within the scope of the present invention.

Claims

1. A fixing mechanism for a closed distal femur osteotomy, which is installed on a femur incised by the closed distal femur osteotomy, the fixing mechanism comprising:

   a body portion which is in close contact with the femur and has a plurality of coupling holes and an oblong hole;

   a head portion which is connected to one end of the body portion and has a plurality of coupling holes;

screws which are inserted into the coupling holes; and
a sliding screw which is inserted into the oblong hole by adjusting a coupling position,
wherein the head portion has a predetermined inclination angle in an upward direction based on a lower surface of the head portion.

2. The fixing mechanism of claim 1, wherein the head portion is twisted in a left or right direction based on the body portion and coupled to the body portion.

3. The fixing mechanism of claim 2, wherein the coupling holes are formed in the head portion along a plurality of rows, and the plurality of coupling holes is formed at each of the rows.

4. The fixing mechanism of claim 2, wherein the head portion and the body portion are formed to be curved and are in close contact with the femur.

5. The fixing mechanism of claim 2, wherein the screws coupled to the head portion are coupled to be directed toward a particular point.

6. The fixing mechanism of claim 3, wherein a line, which connects central portions of the coupling holes formed along a first row on an upper surface of the head portion, is inclined 3 to 5 degrees based on a reference line.

7. The fixing mechanism of claim 6, wherein a line, which connects central portions of the coupling holes formed along a first row on a lower surface of the head portion, is inclined 5 to 7 degrees based on the reference line.

8. The fixing mechanism of claim 7, wherein a line, which connects central portions of the coupling holes formed along a second row on the lower surface of the head portion, is inclined 1.5 to 2.5 degrees based on the reference line.

9. The fixing mechanism of claim 2, wherein one surface of the head portion is inclined 20 to 22 degrees based on the body portion, and the other surface of the head portion is inclined 24 to 26 degrees based on the body portion.

10. The fixing mechanism of claim 1, wherein one surface of the body portion is formed to have a predetermined inclination based on a lateral surface of the head portion.

11. The fixing mechanism of claim 10, wherein the body portion has an angle of 7 to 9 degrees.

12. The fixing mechanism of claim 3, wherein two coupling holes are formed along each of the plurality of rows, the screw, which is inserted into the coupling hole formed in a first row, is inclined 13 to 15 degrees based on a reference line, and the screw, which is inserted into the coupling hole formed in a second row, has an inclination angle of 17 to 19 degrees based on the reference line.

13. The fixing mechanism of claim 1, wherein at least one guide hole to which a guide pin is fixed is formed in the head portion or the body portion.

14. The fixing mechanism of claim 3, wherein two coupling holes are formed along each of the plurality of rows, and the screw, which is inserted into the coupling hole formed in a second row, is inclined 16 to 18 degrees based on a vertical line.

Fig. 1

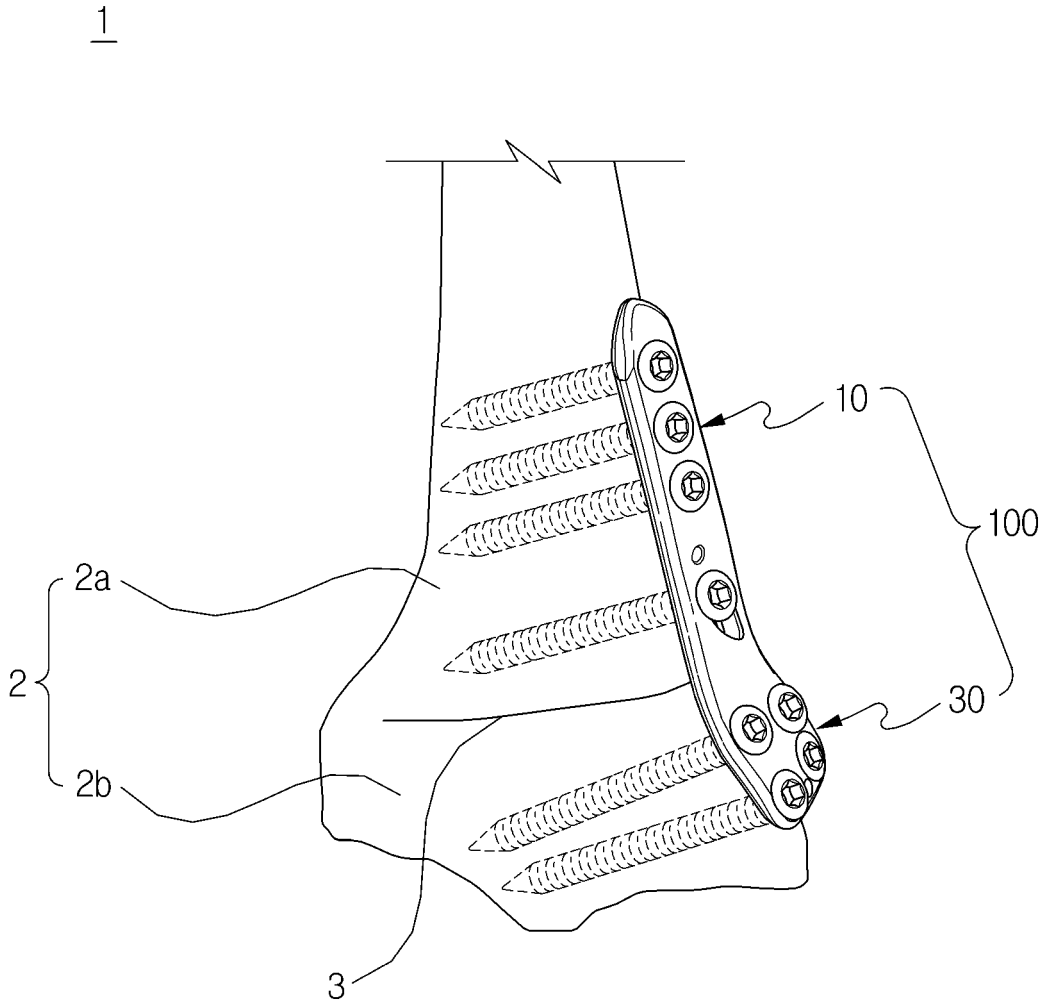


Fig. 2

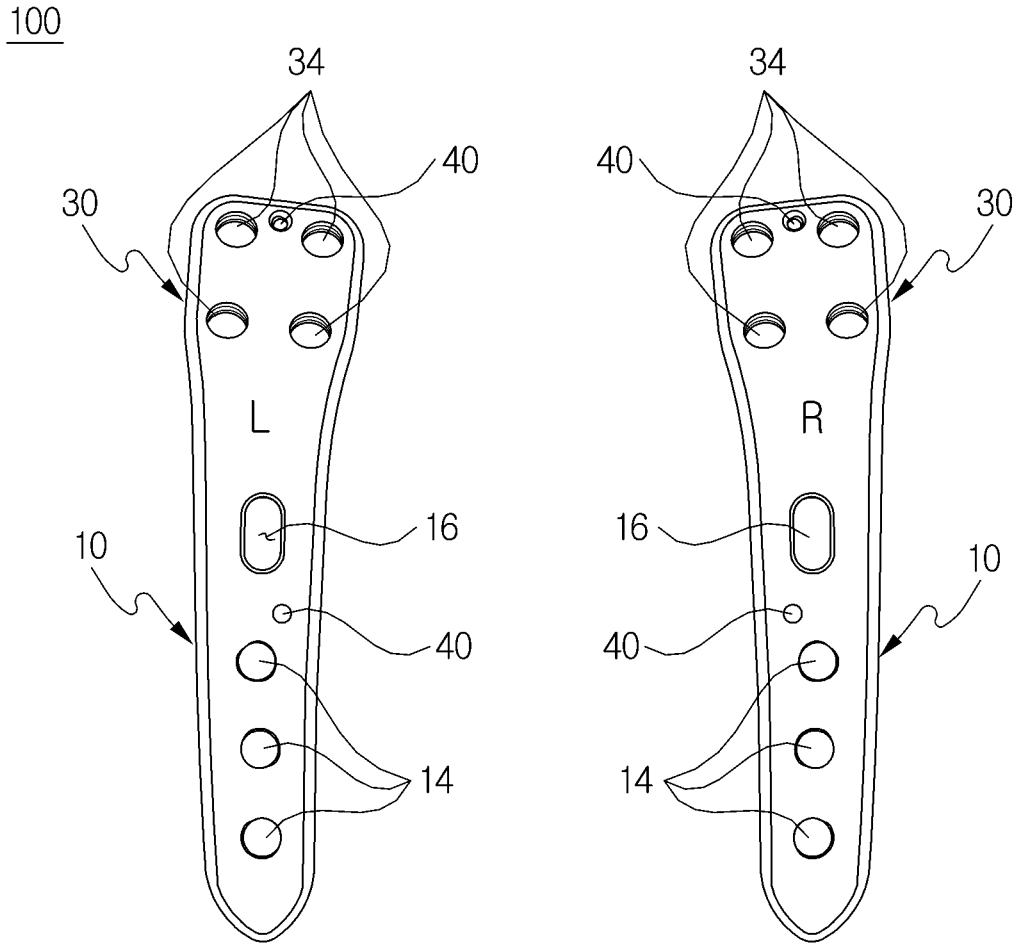


Fig. 3

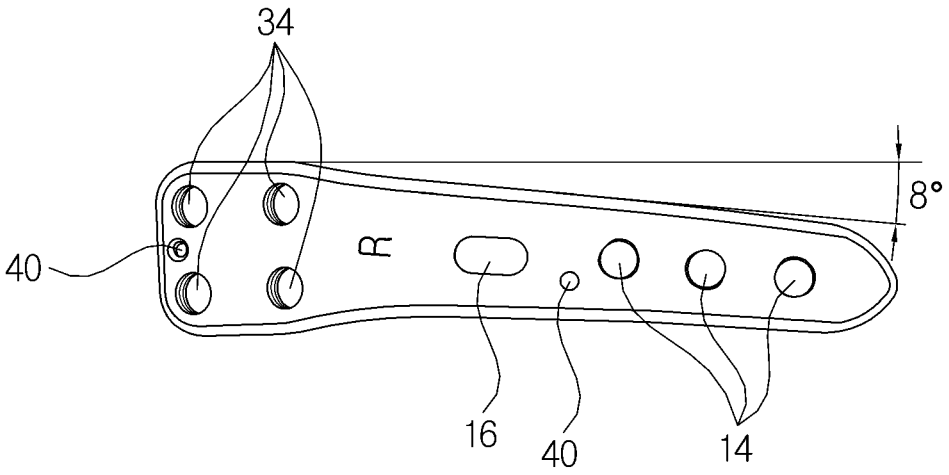


Fig. 4

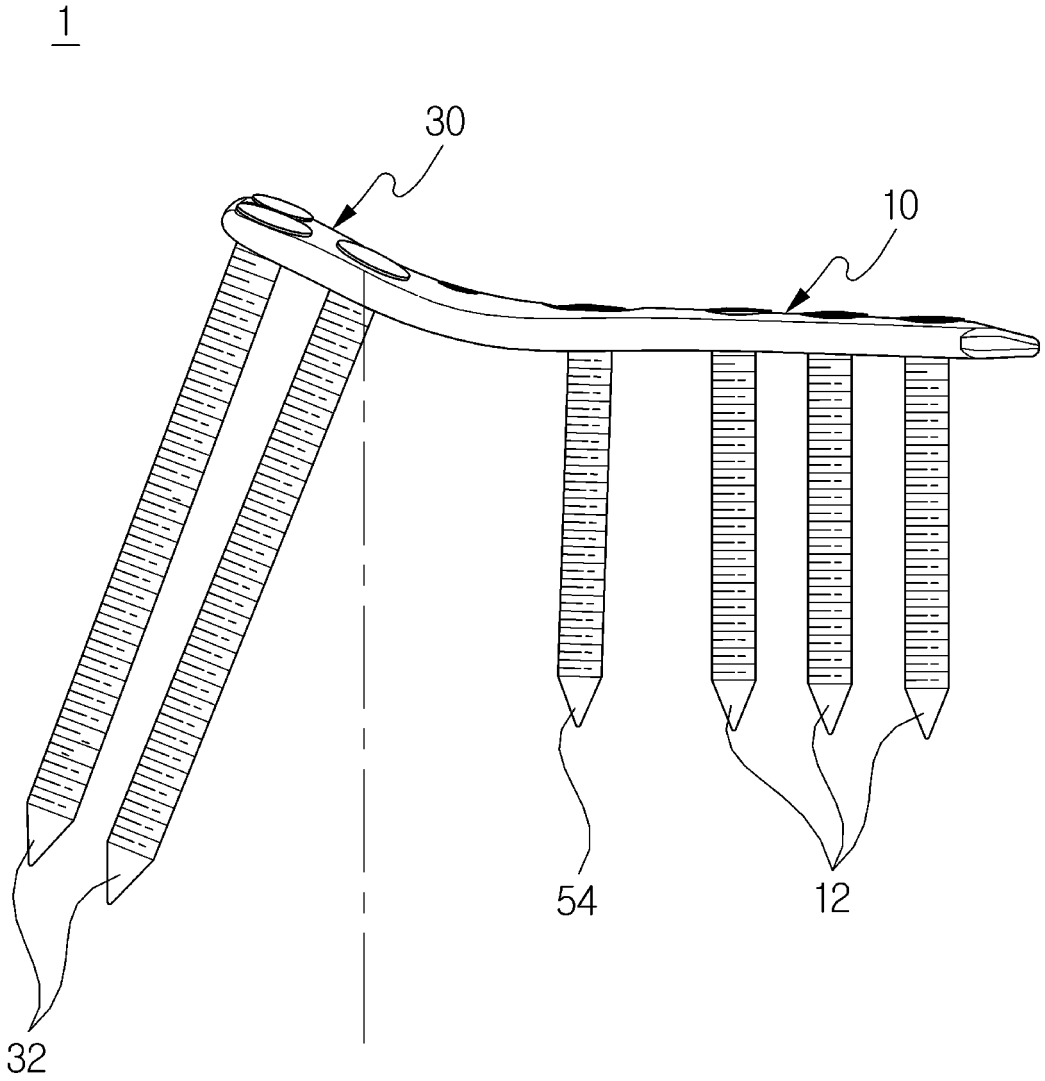


Fig. 5

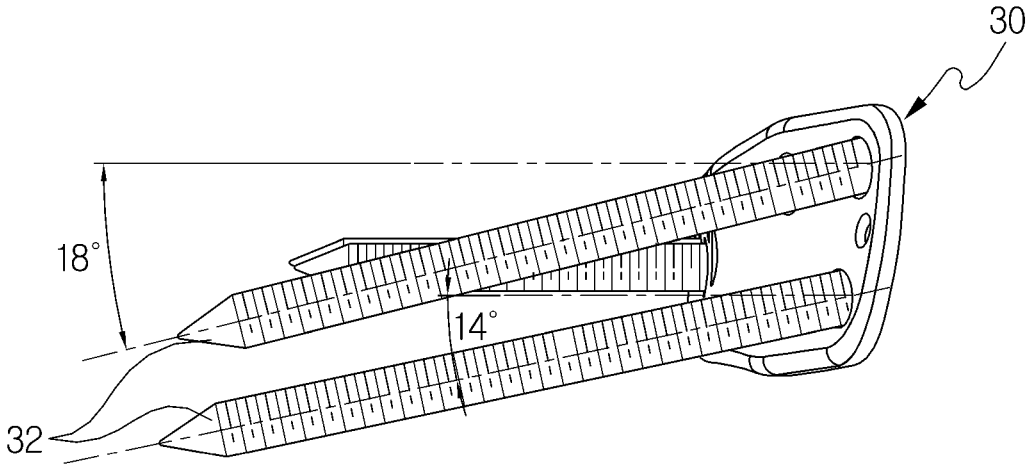


Fig. 6

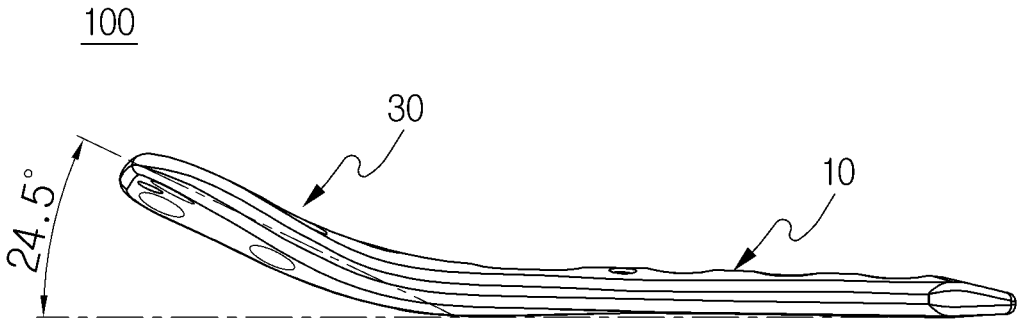


Fig. 7

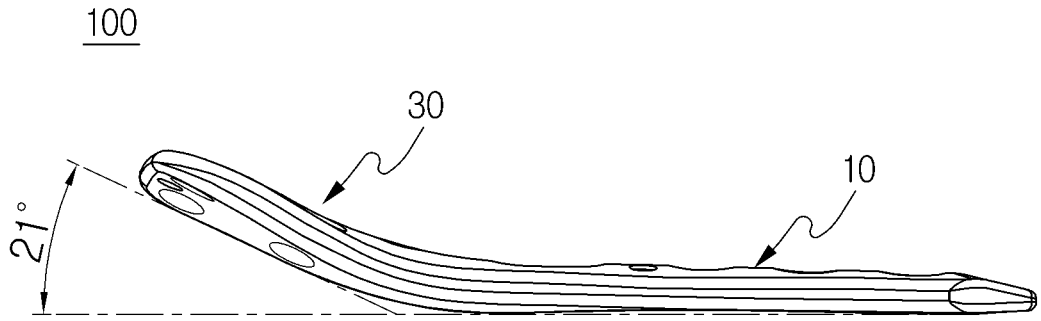


Fig. 8

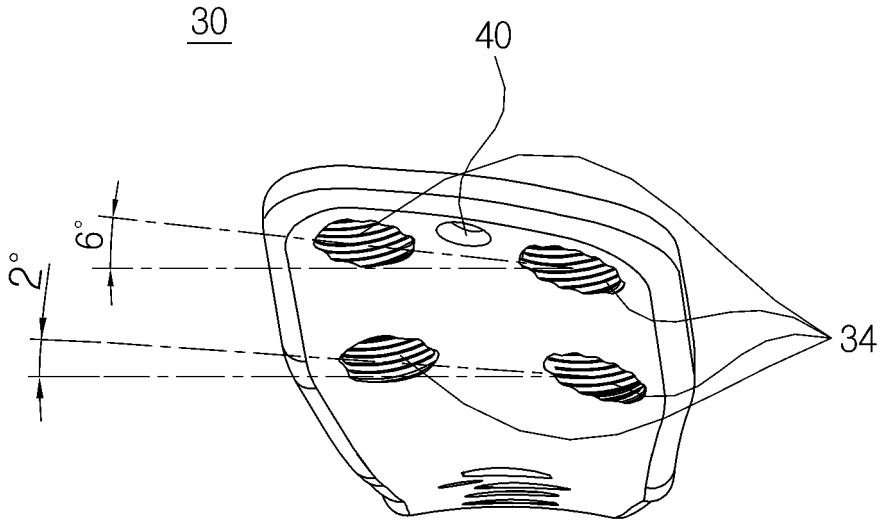
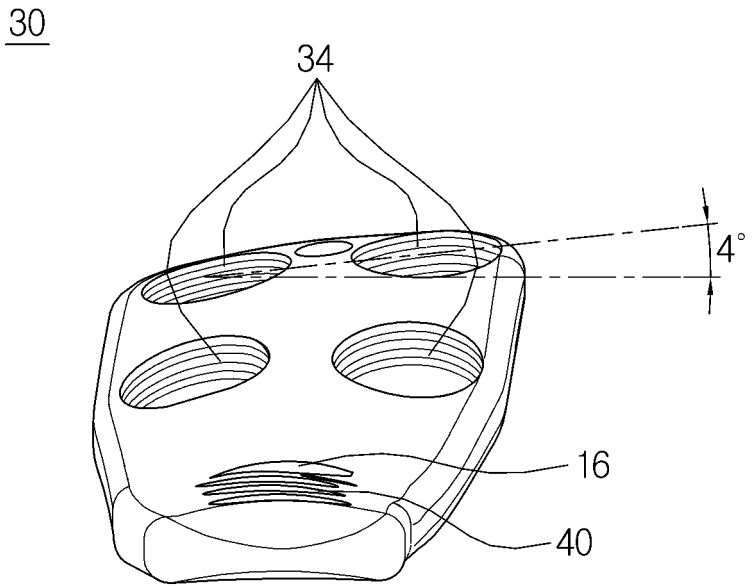


Fig. 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2015/011459

A. CLASSIFICATION OF SUBJECT MATTER

A61B 17/74(2006.01)i, A61B 17/76(2006.01)i, A61B 17/80(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61B 17/74; A61F 2/28; A61B 17/68; A61B 17/80; A61B 17/58; A61B 17/56; A61B 17/76

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS (KIPO internal) & Keywords: plate, slope, angle, femur, patella, fixing, screw, curved

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2006-0035604 A (SYNTHES GMBH.) 26 April 2006 See pages 5-11; claims 1-114; and figures 1-28.	1,2,4,5,9-11,13
Y		3,6-8,12,14
Y	US 8641744 B2 (WEAVER, Paul C. et al.) 04 February 2014 See column 4, line 15-column 7, line 42; claims 1-35; and figures 1-26.	3,6-8,12,14
A	US 8267972 B1 (GEHLERT, Rick J.) 18 September 2012 See column 4, line 24-column 7, line 64; claims 1-20; and figures 1-4.	1-14
A	KR 10-2008-0107390 A (SYNTHES GMBH.) 10 December 2008 Paragraphs [8]-[56]; claims 1-20; and figures 1-14.	1-14
A	KR 10-2006-0115603 A (INION OY.) 09 November 2006 See pages 3-8; claims 1-27; and figures 1-6.	1-14

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
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"P" document published prior to the international filing date but later than the priority date claimed
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 FEBRUARY 2016 (22.02.2016)	**23 FEBRUARY 2016 (23.02.2016)**
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