Title: ANNULAR BONE FIXATION SYSTEM WITH NINE LEGS AND APPARATUS

Abstract: The invention is related to Annular Bone Fixation System With Nine Legs and Apparatus which brings two separate parts or surface to a required distance, rotation and angulation, particularly used for orthopaedic surgery and also other branches of medicine and industry, providing multiplanar correction of fragments with 6+3 method at circular external fixator surgeries, supporting bone parts with circular rings, plates and struts elongating between them at orthopaedic fixation operations. The struts are mounted on plates two for each and these plates are connected to other circular ring with the help of one each joints; and its specification is characterized by consisting of; Double ends jointed strut (1), Single End Jointed Strut (2), Lower Joint (3), Upper Joint (4), Upper End without joint (5), Upper Jointed End (6), Lower End of the Single End Jointed Strut (7), Lower Ends of the Double Ends Jointed Strut (8), Upper Strut Joint (9), Upper Strut Upper End (10), Hole (11), Middle Hole (12), Hole (13), Plate (14), Single End Jointed Upper Strut (15), Lower End of the Upper Strut (16), Upper Ring (17), Lower Ring (18), Double Ends Jointed Strut (19), Single End Jointed Strut (20), Double Ends Jointed Strut (21) and Single End Jointed Strut (22).
TR, OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:
— of inventorship (Rule 4.17(iv))

Published:
— with international search report (Art. 21(3))
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
ANNULAR BONE FIXATION SYSTEM WITH NINE LEGS AND APPARATUS

Technical Area:

The invention is related to Annular Bone Fixation System With Nine Legs and Apparatus which brings two separate parts or surface to a required distance, rotation and angulation, particularly used for orthopaedic surgery and also other branches of medicine and industry, providing multi-planar correction of fragments with 6+3 method at circular external fixator surgeries, supporting bone parts with circular rings, plates and struts capable of elongating between them at orthopaedic fixation operations. The struts are mounted on plates two for each and these plates are connected to other circular ring with the help of one each joints.

Known Status of the Technique

Order of bone fragments should usually be corrected in orthopaedics and traumatology operations. Plaster, brace, internal implant or external fixation are applied after these operations.

External fixation is applied for bone fracture, soft tissue wounding, bone non-union, malunion corrections, congenital bone deformities, bone elongation, bone order corrections in orthopaedics and traumatology.

Bone fragments can be moved through three translational axis combination (x, y and z axes). External fixation frames can vary in terms of design, but they mostly consist of rings, struts, wires, bars, rods, clamps and various assistive apparatus. In general, bone fragments are hold in a very fixed way by using external fixation. However, some frames allow movements on 6 axes.

Circular external fixation system has been discovered by Ilizarov. These fixators consist of minimum two rings applied around the extremity and pins fixing rods and connectors fixing pins to rings. This system allows corrections on all axes, but it has a very detailed clinical use. It is often required to make changes on some axes after surgery.

In the patent file named "Annular bone detection methods with 8 legs and apparatus" recorded in TPI with 2009/06060 number which also belongs to us, the aim of the invention is to repair
the bone which osteotomy is applied or inclined and fractured by 4 struts connected between 2 rings, together with elongating and shortening 4 struts whose one end angularly connected to upper ring and one end to the middle of next strut. The aim of our new invention is the same, but the method of treatment is different. The bone osteotomy is applied is corrected by elongating and shortening 9 struts in total connected between two rings by being grouped as 3 each.

**Description of Images**

<table>
<thead>
<tr>
<th>Image</th>
<th>Description</th>
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<tbody>
<tr>
<td>Image 1</td>
<td>Perspective view of the used struts and their structure</td>
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<td>Perspective view of plate connecting struts to each other</td>
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<td>Image 5</td>
<td>Perspective view of our invention</td>
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**Description of References:**

1. Double ends jointed strut
2. Single end jointed strut
3. Lower Joint
4. Upper Joint
5. Upper end without joint
6. Upper jointed end
7. Lower end of the single end jointed strut
8. Lower end of the double ends jointed strut
9. Joint of upper strut
10. Upper end of the upper strut
11. Hole
12. Middle hole
13. Hole
14. Plate
15. Single end jointed upper strut
16. Upper strut lower end
17. Upper ring
18. Lower ring
19. Double ends jointed strut
20. Single end jointed strut
21. Double ends jointed strut
Description of the Invention:

The invention is related to Annular Bone Fixation System With Nine Legs and Apparatus which brings two separate parts or surface to a required distance, rotation and angulation, used particularly for orthopaedic surgery and also other branches of medicine and industry, providing multi-planar correction of fragments with 6+3 method at circular external fixator surgeries, supporting bone parts with circular rings, plates and struts capable of elongating between them at orthopaedic fixation operations. The struts are mounted on plates two for each and these plates are connected to other circular ring with the help of one each joints. The invention is characterized by consisting of: Double ends jointed strut (1), Single End Jointed Strut (2), Lower Joint (3), Upper Joint (4), Upper End without joint (5), Upper Jointed End (6), Lower End of the Single End Jointed Strut (7), Lower Ends of the Double Ends Jointed Strut (8), Joint of the Upper Strut (9), Upper End of the Upper Strut (10), Hole (11), Middle Hole (12), Hole (13), Plate (14), Single End Jointed Upper Strut (15), Lower end of the Upper Strut (16), Upper Ring (17), Lower Ring (18), Double Ends Jointed Strut (19), Single End Jointed Strut (20), Double Ends Jointed Strut (21) and Single End Jointed Strut (22).

Upper ends without joint (5) of single end jointed struts (2, 20, 22) are connected to the hole (11) on the left of a plate (14); jointed upper ends (6) of double ends jointed struts (1, 19, 21) are connected to the hole (13) on the right of the same plate (14) and lower end (16) of single end jointed upper strut (15) to middle hole (12) of the same plate (14) and all these stmts are connected to each other for creating 3 parts in total.

From these struts connected to each other, upper ends (10) of single end jointed upper joints (15) are connected to upper ring (17), lower ends (8) of double ends jointed struts (1, 19, 21) and lower ends (7) of single end jointed struts (2, 20, 22) are connected to lower ring (18). The system is transferred to inclined or short bone as either lower ring (18) to the upper part of leg, upper ring (17) to lower part of leg and osteotomy is done, or osteotomy is done initially and then lower ring (18) to upper part of leg and upper ring (17) to lower part of leg. The doctor decides which one to apply.
The system is placed where osteotomy applied as double ends jointed strut (19) and single end jointed strut (20) stay anterior (front), and connected to upper and lower rings (17, 18) after shank screws are sent to bone in accordance with the procedure.

X-ray film is taken as Ape section will stay between double ends jointed strut (19) and single end jointed strut (20). Such measurements as angulation, etc. are taken through film and entered into the computer and required strut values are gathered by calculating formula existing in software.

Distraction of bone line is carried out by elongating and shortening double ends jointed struts (1, 19, 21) and single end jointed struts (2, 20, 22).

Lateral angulation in fracture line is corrected by elongating double ends jointed strut (1) and single end jointed strut (2); shortening double ends jointed strut (21) and single end jointed strut (22); medial angulation is corrected by shortening double ends jointed strut (1) and single end jointed strut (2) and elongating double ends jointed strut (21) and single end jointed strut (22).

Anterior angulation of fracture line is corrected by elongating double ends jointed strut (19) and single end jointed strut (20); shortening double ends jointed struts (1, 21) and single end jointed struts (2, 22); posterior angulation is corrected by shortening double ends jointed strut (19) and single end jointed strut (20) and elongating double ends jointed struts (1, 21) and single end jointed struts (2, 22).

Lateral translation in fracture line is corrected by elongating single end jointed strut (20) and shortening single end jointed strut (20); medial translation is corrected by shortening double ends jointed strut (19) and elongating single end jointed strut (20).

Anterior translation of fracture line is corrected by elongating single end jointed strut (2) and double ends jointed strut (21), shortening double ends jointed strut (1) and single end jointed strut (22); posterior translation is corrected by shortening single end jointed strut (2) and double ends jointed strut (21), elongating double ends jointed strut (1) and single end jointed strut (22).

Medial rotation in fracture is corrected by elongating single end jointed struts (2, 20, 22) and shortening double ends jointed struts (1, 19, 21); lateral rotation is corrected by shortening single end jointed struts (2, 20, 22) and elongating double ends jointed struts (1, 19, 21).
Elongating and shortening amounts are taken as on-line after being determined by the formula calculated by the software.
1. The invention is related to Annular Bone Fixation System with nine legs and apparatus, and its specification is characterized by consisting of; Double ends jointed strut (1), Single End Jointed Strut (2), Lower Joint (3), Upper Joint (4), Upper End without joint (5), Jointed Upper End (6), Lower End of the Single End Jointed Strut (7), Lower End of the Double Ends Jointed Strut (8), Joint of Upper Strut (9), Upper end of the Upper Strut (10), Hole (11), Middle Hole (12), Hole (13), Plate (14), Single End Jointed Upper Strut (15), Upper Strut Lower End (16), Upper Ring (17), Lower Ring (18), Double Ends Jointed Strut (19), Single End Jointed Strut (20), Double Ends Jointed Strut (21) and Single End Jointed Strut (22).

2. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having Double Ends Jointed Strut (1) connected to lower ring (18) from its lower end (8), transforming circular movement into linear movement consisting of lower joint (3), upper joint (4) jointed upper end (6) and lower end of double ends jointed strut (8).

3. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having Single End Jointed Strut (2) connected to lower ring (18) from its lower end (7), arranging length of the bone which osteotomy is applied by elongating and shortening through rotating interior grooved stick, and having lower joint (3), upper end without joint (5) and lower end of the single end jointed strut (7) within its body.

4. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having the Lower Joint (3) located at lower end (7) of single end jointed strut (2) and lower end (8) of double ends jointed strut (1).

5. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is being characterized by having Upper Joint (4) located at the upper end (6) of double ends jointed strut (1).

6. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having Upper End without joint (5) connecting single end jointed strut (2) to plate (14) by passing from the hole (11) on the plate (14) and located in single end jointed strut (2).

7. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having Jointed Upper End (6) connecting double ends jointed strut (1) to plate (14) by passing through the hole (13) on the plate (14) located on double ends jointed strut (1).

8. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having Lower End of the Single End Jointed Strut (7) located under single end jointed struts (1) and connected to lower ring (18).
9. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having Lower End of the Double Ends Jointed Strut (8) connected double ends jointed struts (2) to lower ring (18) and located under double ends jointed struts (2).

10. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having Upper Strut Joint (9) located over the single end jointed upper strut (15).

11. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having Upper End of the Upper Strut located over the single end jointed upper strut (15) and connecting single end jointed upper strut (15) to upper ring (17).

12. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having the Hole (11) located over the plate (14) and where single end jointed struts (2, 20, 22) pass through grooved sticks and are fixed to plate (14).

13. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having the Middle Hole (12) located over the plate (14), where lower end (16) of the single end jointed upper strut (15) passes through and is fixed to the plate (14).

14. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having the Hole (13) located over the plate (14) and double ends jointed struts (1, 19, 21) grooved sticks pass through it and fixed to plate (14).

15. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having the Plate (14) connecting struts (1) to each other and having holes (11) and the Middle Hole (12) on it.

16. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having single end upper strut (15) connected to plate (14) by passing through middle hole (12) from its lower end (16) and to upper ring (17) from its upper end (10) carrying upper strut joint (9) upper end of the upper strut (10) and lower end of the upper strut (16) within its body.

17. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having Upper Strut Lower End (16) located under the single end jointed upper strut (15) and connecting the single end jointed upper strut to plate (14) by passing through the middle hole (12).

18. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having the upper ring (17) where the single end jointed upper strut (15) is connected from its upper end (10).

19. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having the lower ring (18) where double ends jointed struts (2) are connected from their lower end (8) and single end jointed struts (1) from their lower end (7).
20. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having double ends jointed strut (19) connected to lower ring (18) from its lower end (8), transforming circular movement into linear movement consisting of lower joint (3), upper joint (4) jointed upper end (6) and double ends jointed strut lower end (8).

21. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having single end jointed strut (2) connected to lower ring (18) from its lower end (7), arranging length of the bone which osteotomy is applied by elongating and shortening through rotating interior grooved stick, and having lower joint (3), upper end without joint (5) and single end jointed strut lower end (7) within its body.

22. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having double ends jointed strut (21) connected to lower ring (18) from its lower end (8), transforming circular movement into linear movement consisting of lower joint (3), upper joint (4) jointed upper end (6) and double ends jointed strut lower end (8).

23. The annular bone fixation system with nine legs and apparatus according to claim 1, wherein its specification is characterized by having single end jointed strut (22) connected to lower ring (18) from its lower end (7), arranging length of the bone which osteotomy is applied by elongating and shortening through rotating interior grooved stick, and having lower joint (3), upper end without joint (5) and single end jointed strut lower end (7) within its body.
**A. CLASSIFICATION OF SUBJECT MATTER**

INV. A61B17/62  A61B17/64

ADD.

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

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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

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*"Z"* document member of the same patent family

**Date of the actual completion of the international search**

28 June 2013

**Date of mailing of the international search report**

16/07/2013

**Name and mailing address of the ISA/Authorized officer**

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