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(54) **POINT CONTACT BONE COMPRESSION PLATE**

(75) Inventors: **Stephan N. Perren**, Dorf (CH); **Fritz Straumann**, Waldenburg (CH); **Franz Sutter**, Niederdorf (CH); **Slobodan Tepic**, Davos (CH)

(73) Assignee: **Synthes (U.S.A.)**, Paoli, PA (US)

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(51) **Int. Cl.**

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A61B 17/58	(2006.01)
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(52) **U.S. Cl.** **606/69**; 606/71; 606/77

(58) **Field of Classification Search** ..... None
See application file for complete search history.

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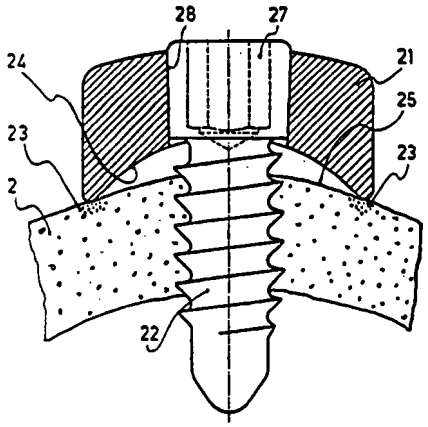
(Continued)

Primary Examiner—Beverly M. Flanagan

(57) **ABSTRACT**

A bone plate for use in osteosynthesis having a plurality of contact elements extending from its lower surface so that contact between plate and bone is reduced to the minimum contact needed during attachment of the plate to a bone.



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EX PARTE REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **7** and **15** is confirmed.

Claim **5** is cancelled.

Claims **1, 3, 4, 6, 8–14** are determined to be patentable as amended.

Claim **2**, dependent on an amended claim, is determined to be patentable.

New claims **16–58** are added and determined to be patentable.

1. A compression plate for osteosynthesis, said plate having a longitudinal axis, an upper surface, a lower surface and a plurality of screw holes spaced in the direction of the longitudinal axis, said lower surface being arched concavely transversely to the longitudinal axis of the plate, in combination with open sections along the side edges of the plate between the screw holes, said open sections, with the concave lower surface of the plate, forming studs along the side edges of the lower surface for contact with a bone, *wherein the studs for bone contact are less than 5% of the total area of the lower surface of the plate.*

3. A [bone] *compression* plate according to claim **2** wherein the taper of the conic section is in the range of 1:5 to 1:20.

4. A [bone] *compression* plate according to claim **1** wherein one screw hole is a self-compressing hole.

6. A [bone] *compression* plate according to claim **1** wherein the contact elements are less than 2% of the total area of the lower surface of the plate.

8. A [bone] *compression* plate according to claim **7** wherein the contact elements comprise studs made of material which is resorbable or dissolvable in body fluids.

9. A [bone] *compression* plate assembly comprising a compression bone plate and a plurality of bone screws for attaching said plate to a bone, said plate having a longitudinal axis, an upper surface, a lower surface and a plurality of screw holes for receiving said screws, spaced in the direction of the longitudinal axis, said lower surface being arched concavely transversely to the longitudinal axis of the plate, [in combination with] open sections along the side edges of the plate between the screw holes, *said open sections forming concavities in the lower surface of the plate, and* said open sections, *in combination* with the concave undersurface of the plate, forming studs for bone contact along the side edges of the lower surface of the plate, *wherein the studs for bone contact are less than 5% of the total area of the lower surface of the plate.*

10. A [bone] *compression* plate assembly according to claim **9** wherein the screws [the] *have* heads which are expandable by means of a body inserted into said head.

11. A [bone] *compression* plate assembly according to claim **9** and comprising a body fitted into the screw hole, said body being expandable by a conical screw head which has a cone angle smaller than the resulting friction angle.

12. A [bone] *compression* plate assembly according to claim **11** wherein the taper of the cone angle is in the range of 1:5 to 1:20.

13. A [bone] *compression* plate assembly according to claim **9** wherein said screws are of a length that permits engagement of the screw with only one side of the bone cortex.

14. A compression plate for osteosynthesis, said plate having a longitudinal axis, an upper surface, a lower surface and a plurality of screw holes spaced in the direction of the longitudinal axis, said lower surface being arched concavely, transversely to the longitudinal axis of the plate, [in combination with] arcuate cut out sections between the holes, *said arcuate cut out sections forming concavities in the lower surface of the plate, and* the intersection of surfaces formed by said cut out sections and the concave lower surface of the plate forming studs for bone contact, *wherein the studs for bone contact are less than 5% of the total area of the lower surface of the plate.*

16. A compression plate comprising:
a longitudinal axis;
an upper surface;
a lower surface arched concavely transversely to the longitudinal axis;
a plurality of screw holes spaced apart in the direction of the longitudinal axis;
side walls joining the upper and lower surfaces, the side walls including open sections between the screw holes, the open sections extending transversely and forming undercuts in at least a portion of the concave lower surface of the plate,
wherein the undercuts, in combination with the transverse concave arching of the lower surface of the plate, form studs for bone contact which comprise less than 5% of the total area of the lower surface of the plate.

17. The compression plate of claim 16, wherein the studs for bone contact are less than 2% of the total area of the lower surface of the plate.

18. The compression plate of claim 16, further comprising the side walls being substantially planar.

19. The compression plate of claim 16, further comprising at least one of the open sections having an arcuate shape.

20. The compression plate of claim 16, wherein the two screw holes are elongated screw holes.

21. The compression plate of claim 20, wherein the elongated screw holes are self-compressing holes.

22. The compression plate of claim 16, wherein at least one of the open sections extends from one side wall to the other side wall.

23. The compression plate of claim 22, wherein further all of the open sections extend from one side wall to the other side wall.

24. The compression plate of claim 16, wherein at least one open section does not intersect the upper surface of the plate.

25. The compression plate of claim 24, wherein further none of the open sections intersects the upper surface of the plate.

26. A compression plate comprising:

a longitudinal axis;

an upper surface;

a lower surface arched concavely transversely to the longitudinal axis;

a plurality of self-compressing screw holes spaced apart in the direction of the longitudinal axis;

side walls joining the upper and lower surfaces, the side walls including open sections extending transversely therethrough, forming undercuts in at least a portion of the concave lower surface of the plate, the position of the open sections in the direction of the longitudinal axis being between self-compression screw holes;

wherein the undercuts, in combination with the transversely concavely arched lower surface of the plate, form studs for bone contact which comprises less than 5% of the total area of the lower surface of the plate.

27. The compression plate of claim 26, wherein the studs for bone contact are less than about 2% of the total area of the lower surface of the plate.

28. The compression plate of claim 26, further comprising the side walls being substantially planar.

29. The compression plate of claim 26, further comprising at least one of the open sections having an arcuate shape.

30. The compression plate of claim 26, wherein a portion of the at least one of the open sections is located along the longitudinal axis.

31. The compression plate of claim 26, wherein at least one of the open sections extends from one side wall to the other side wall.

32. The compression plate of claim 31, wherein further all of the open sections extend from one side wall to the other side wall.

33. The compression plate of claim 26, wherein at least one open section does not intersect the upper surface of the plate.

34. The compression plate of claim 33, wherein further none of the open sections intersects the upper surface of the plate.

35. A compression plate comprising:

a longitudinal axis;

an upper surface;

a lower surface arched concavely transversely to the longitudinal axis;

a plurality of elongated screw holes spaced apart in the direction of the longitudinal axis;

side walls joining the upper and lower surfaces, the side walls including open sections extending transversely therethrough, forming undercuts in at least a portion of the concave lower surface of the plate, the open sections lying between elongated screw holes when the compression plate if viewed in a direction looking toward one of the side walls;

wherein the undercuts, in combination with the concave arching of the lower surface of the plate, form studs for bone contact extending downwards from the lower surface of the plate and below the side walls, and wherein the studs for bone contact have a bone contact area less than 5% of the total area of the lower surface of the plate.

36. The compression plate of claim 35, wherein the studs for bone contact have a bone contact area less than about 2% of the total area of the lower surface of the plate.

37. The compression plate of claim 35, further comprising the side walls being substantially planar.

38. The compression plate of claim 35, further comprising at least one of the open sections having an arcuate shape.

39. The compression plate of claim 35, wherein a portion of the at least one of the open sections is located along the longitudinal axis.

40. The compression plate of claim 35, wherein the elongated screw holes are self-compressing holes.

41. The compression plate of claim 35, wherein at least one of the open sections extends from one side wall to the other side wall.

42. The compression plate of claim 41, wherein further all of the open sections extend from one side wall to the other side wall.

43. The compression plate of claim 35, wherein at least one open section does not intersect the upper surface of the plate.

44. The compression plate of claim 43, wherein further none of the open sections intersects the upper surface of the plate.

45. A compression plate comprising:

a longitudinal axis;

an upper surface;

a lower surface archec concavely transversely to the longitudinal axis;

a plurality of self-compressing screw holes spaced apart in the direction of the longitudinal axis;

side walls joining the upper and lower surfaces, the side walls including open sections between the screw holes, the open sections extending transversely and forming undercuts in at least a portion of the concave lower surface of the plate;

wherein the undercuts, in combination with the transverse concave arched lower surface of the plate, form studs for bone contact having a bone contact area less than 5% of the total area of the lower surface of the plate, extending downward from the lower surface of the plate and below the side walls.

46. The compression plate of claim 45, wherein the studs for bone contact have a bone contact area less than about 2% of the total area of the lower surface of the plate.

47. The compression plate of claim 45, further comprising the side walls being substantially planar.

48. The compression plate of claim 45, further comprising at least one of the open sections having an arcuate shape.

49. The compression plate of claim 45, wherein at least one of the open sections extends from one side wall to the other side wall.

50. The compression plate of claim 49, wherein further all of the open sections extend from one side wall to the other side wall.

51. The compression plate of claim 45, wherein at least one open section does not intersect the upper surface of the plate.

52. The compression plate of claim 51, wherein further none of the open sections intersects the upper surface of the plate.

53. A compression plate comprising:

a longitudinal axis;

an upper surface;

a lower surface arched concavely transversely to the longitudinal axis;

a plurality of self-compressing screw holes spaced apart in the direction of the longitudinal axis;

side walls joining the upper and lower surfaces, the side walls including open sections between the screw holes, the open sections being arched transversely to the longitudinal axis and forming undercuts in at least a portion of the concave lower surface of the plate, all of the open sections extending from one side wall to the other side wall and none of the open sections intersecting the upper surface of the plate;

wherein the undercuts in the concave lower surface of the plate form studs for bone contact extending downwards from the lower surface of the plate and below the side walls, and wherein the studs for bone contact comprise less than 5% of the total area of the lower surface of the plate.

54. The compression plate of claim 53, wherein the studs for bone contact are less than about 2% of the total area of the lower surface of the plate.

55. A compression plate comprising:

a longitudinal axis;

an upper surface having side edges;

a lower surface, having side edges and being arched concavely transversely to the longitudinal axis;

a vertical axis perpendicular to the longitudinal axis and in the direction from the lower surface towards the upper surface;

a plurality of self-compression screw holes spaced apart in the direction of the longitudinal axis;

side walls joining the upper and lower surfaces, the side walls having a height defined by the distance between the side edges of the upper and lower surfaces;

a widthwise axis perpendicular to the longitudinal axis and in the direction from one side wall to the other side wall;

wherein each side wall includes a plurality of open sections extending therethrough in the widthwise direction, the open sections extending vertically over a portion, but not all, of the height of the side walls, and the open sections further forming undercuts in at least a portion of the concave lower surface of the plate, each open section being between two self-compressed screw holes;

wherein the undercuts in the concave lower surface of the plate form studs for bone contact extending downwards from the lower surface of the plate and below the side walls, and wherein the studs for bone contact comprise less than 5% of the total area of the lower surface of the plate.

56. The compression plate of claim 55, wherein the studs for bone contact are less than about 2% of the total area of the lower surface of the plate.

57. A compression plate for osteosynthesis, said plate having a longitudinal axis, an upper surface, a lower surface and a plurality of screw holes spaced in the direction of the longitudinal axis, said lower surface being arched concavely transversely to the longitudinal axis of the plate, in combination with open sections aoong the side edges of the plate between the screw holes, said open sections, with the concave lower surface of the plate, forming studs along the side edges of the lower surface for contact with a bone, wherein the contact elements are less than 5% of the total area of the lower surface of the plate.

58. A compression plate for osteosynthesis, said plate having a longitudinal axis, an upper surface, a lower surface and a plurality of screw holes spaced in the direction of the longitudinal axis, said lower surface being arched concavely transversely to the longitudinal axis of the plate, in combination with open sections along the side edges of the plate between the screw holes, said open sections, with the concave lower surface of the plate, forming studs along the side edges of the lower surface for contact with a bone, wherein the contact elements are less than 2% of the total area of the lower surface of the plate.

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