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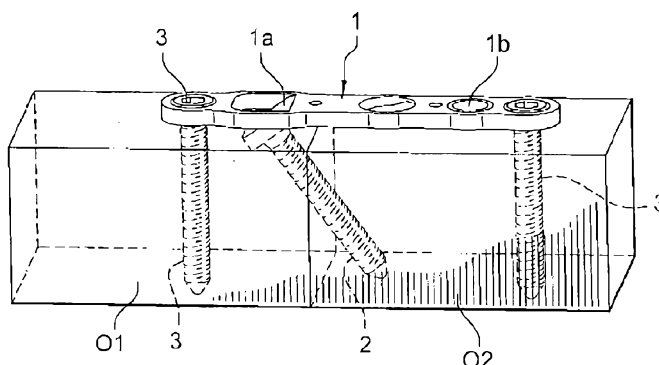


Fig. 3

(57) Abstract : The invention relates to a plate (1) fixed between two bone parts by means of screws engaged in holes (1b) formed in the thickness of said plate. The plate (1) comprises a rib which is inclined according to an angle of between 30° and 60° in relation to the plane defined by the plate and has a hole (1a) for engaging a screw (2). Said rib is located in the central part of the width, over a determined part of the length of the plate so that the screw (2) brings the two bone parts into the compressive position.

(57) Abrégé : La plaque (1) est fixée entre deux parties d'os au moyen de vis engagées dans des trous (1b) formés dans l'épaisseur de ladite plaque. La plaque (1) présente une nervure inclinée selon un angle compris entre 30° et 60° par rapport au plan défini par ladite plaque, et présentant un trou (1a)

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pour l'engagement d'une vis (2), ladite nervure étant située dans la partie médiane, en largeur, sur une partie déterminée de la longueur de la plaque pour que la vis (2) assure la mise en compression des deux parties d'os.

ORTHOPEDIC IMPLANT IN THE FORM OF A PLATE TO BE FIXED
BETWEEN TWO BONE PARTS

Field

5 The present disclosure relates to the technical field of
orthopedic implants.

More particularly, the present disclosure relates to a plate
for arthrodesis or osteosynthesis, which plate is to be
10 fixed between two bone parts.

Background

In a manner entirely familiar to a person skilled in the
art, a plate for arthrodesis or osteosynthesis, which is to
15 be fixed between two bone parts, generally comprises holes
for the engagement of screws for performing arthrodesis
between two bones or osteosynthesis between two bone
fragments. This is the case, for example, for the bones of
the hand or of the foot, without this excluding other uses,
20 particularly in the area of the spine. Depending on the
pathological condition that is to be treated, these plates
can have a generally rectilinear shape or can have other
geometric shapes.

25 Definition

In the specification, including the appended claims, the
term "comprising" shall be understood to have a broad
meaning similar to the term "including" and will be
understood to imply the inclusion of a stated integer or
30 step or group of integers or steps but not the exclusion of
any other integer or step or group of integers or steps.

This definition also applies to variations on the term "comprising" such as "comprise" and "comprises".

Summary

5 It would be desirable if at least preferred embodiments in accordance with the present disclosure could be used to improve, in a reliable and effective manner, the compression between the bone parts secured to a plate and in a precise direction, or at least provide a useful alternative to known
10 implants.

According to a first aspect of the present disclosure, there is provided an implant for compressing together first and second bone parts separated by a joint, the implant
15 comprising: a plate having a top surface, a bottom bone-contacting surface, and a plurality of holes formed through the top and bottom surfaces, wherein a first of the plurality of holes is arrangeable on a first side of the joint, and a second of the plurality of holes is arrangeable
20 on a second side of the joint, each of the first and second holes being locking holes adapted to receive first and second fixation members, respectively, a central axis of the first hole being directed into the first but not the second bone, and a central axis of the second hole being directed
25 into the second but not the first bone; and an angled member recessed below the top surface of the plate and extending downward at an angle with respect to the bottom bone-contacting surface, the angled member including a third of the plurality of holes situated between the first and second
30 holes, and a stop surface for engaging with a head of a third fixation member, a central axis of the third hole being angled with respect to a longitudinal axis of the

plate, such that when the third fixation member is inserted through the third hole, it is arranged to extend into the first bone, across the joint, and into the second bone, wherein the angled member is situated between and extends
5 below adjacent sides of the plate, such that the angled member is receivable in a cavity formed in at least one of the first and second bones.

According to a further aspect there is provided an implant
10 for compressing together first and second bone parts separated by a joint, the implant comprising: a plate having a top surface, a bottom bone-contacting surface, and a plurality of holes formed through the top and bottom surfaces, wherein a first of the plurality of holes is
15 arrangeable on a first side of the joint, and a second of the plurality of holes is arrangeable on a second side of the joint, the first and second holes being adapted to receive first and second fixation members, respectively, a central axis of the first hole extending into the first but
20 not the second bone, and a central axis of the second hole extending into the second but not the first bone; and an angled member recessed below the top surface of the plate and extending downward at an angle with respect to the bottom bone-contacting surface, the angled member including
25 a third of the plurality of holes situated between the first and second holes, the third hole being adapted to receive a third fixation member, a central axis of the third hole being angled with respect to a longitudinal axis of the plate, such that when the third fixation member is inserted
30 through the third hole, it is arranged to extend into the first bone, across the joint, and into the second bone, wherein the angled member is situated below a guide slot

formed in the plate, the guide slot being adapted to allow insertion of the third fixation member through the guide slot and into the third hole.

- 5 In embodiments of the above aspects the central axis of the third hole may extend at an angle of between about 30° and 60° with respect to the longitudinal axis of the plate.

According to a further aspect there is provided an implant
10 adapted to span and fuse first and second bone parts, the implant comprising: a plate having a top surface, a bottom bone-contacting surface, and a plurality of holes formed through the top and bottom surfaces, at least a first and a second of the plurality of holes being situated on a side of
15 the plate corresponding to the first bone part, each of the first and second holes adapted to receive first and second fixation members, respectively; and an angled member recessed below the top surface of the plate and extending downward at an angle with respect to the bottom bone-
20 contacting surface, the angled member including a third of the plurality of holes, the third hole being adapted to receive a third fixation member and being arranged below a guide slot formed in the plate, the guide slot being bounded by side walls extending through the top and bottom surfaces
25 of the plate, wherein the side walls are dimensioned to allow insertion of the third fixation member through the guide slot and into the third hole, and wherein a central axis of the third hole is angled with respect to a longitudinal axis of the plate, such that when the third
30 fixation member is inserted through the third hole, it is arranged to extend from the first bone part and into the second bone part.

The angled member may be angled at between about 30° and 60° with respect to the longitudinal axis of the plate.

5 According to a further aspect there is provided a plate for fixing together, and providing pressure between, two bone parts, the plate comprising at least one feature allowing at least one screw to be positioned in an inclined manner with respect to the plane defined by said plate at an angle of
10 between about 30° and 60°.

In an embodiment, the feature is formed by an area inclined at an angle of between 30° and 60° and having a hole for the engagement of the screw. The inclined area results from
15 cutting and deforming part of the plate.

In an embodiment, the feature is formed by a hole inclined at the angle of between 30° and 60° for the engagement of the screw.

20

The feature may be located over a defined part of the length of the plate, such that the screw provides the compression of the two bone parts.

25 Brief Description of the Drawings

The invention is explained in more detail below with reference embodiments, described by way of example only with reference to the attached drawings, in which:

- Figure 1 is a perspective view of an embodiment of an
30 implant comprising a plate in accordance with the present disclosure;

- Figure 2 is a profile view of the plate of Figure 1;

- Figures 3 and 4 are perspective views showing the fitting of the plate between two bone parts and the composition of these bone parts, by means of the plate according to the embodiment, the bone parts being shown schematically.

Detailed Description of Embodiments

According to the present disclosure, an embodiment of an implant comprises a plate 1 which has at least one feature 1a allowing at least one screw 2 to be positioned in an inclined manner at an angle α of between 30° and 60° with respect to the plane defined by said plate (Figure 2).

In one embodiment, the feature 1a is formed by an inclined area that results from cutting and deforming part of the plate. For example, the deforming takes place subsequent to a cutting/punching operation. This inclined area constitutes a rib, which has a hole 1a1 for the engagement of the screw 2. The inclined rib 1a is formed over a defined part of the length of the plate, such that, after engagement, the screw 2 ensures the compression of the two bone parts, as will be explained in the description below.

In one embodiment, in order to permit an angular orientation of the screw 2 at an angle of between about 30° and 60° , the feature 1a can be formed by an inclined hole. It will be noted that the rib 1a allows the angle to be adapted depending on the pathological condition that is to be treated, given that it is possible to deform this rib at will. In other words, the angle can be adjusted directly by the surgeon by a few degrees in the operating theater with a suitable instrument.

Reference is made to Figures 3 and 4, which show the positioning of the plate 1 between two bone parts O1 and O2:

- 5 • After the osteotomies, a model of the plate, which model does not have ribs, allows the position of this rib to be determined.
- 10 • Having determined the position of the rib, the surgeon creates a corresponding recess, with a suitable rasp.
- 15 • After the plate with the rib has been placed in position, the surgeon fits one or two screws 3, on the osteosynthesis site of the arthrodesis to the side of the rib. A pin for temporary fixation can optionally be positioned in a suitable hole.
- 20 • The screw 2 is then engaged in the hole 1a1 of the rib 1a in order to compress the fracture site.
- Once the compression has been obtained, the surgeon can screw one or more other fixing screws 3 and remove the temporary holding pin.
- 25 In a known manner, this plate 1 has smooth and/or threaded holes 1b for engagement of the fixing screws 3 that are screwed into the bone parts O1 and O2, as can be seen from Figures 3 and 4.
- 30 Likewise, the plate 1 can have at least one recess 1c for the insertion of a pin for ensuring temporary fixation of said plate 1. The plate 1 can advantageously have a recess

1c for the insertion of a pin into one of the bone parts 01 and another recess 1d for the insertion of another pin into the other bone part 02.

5 In light of the desired compression effect, as indicated above, the recess 1c is formed by a circular hole, of which the diameter corresponds substantially to that of the pin 4, while the other recess 1d can be formed by an oblong slot.

10 These arrangements therefore allow the bone to slide under the plate 1 during screwing, while at the same time they ensure compression in a precise direction, generally along the axis of the plate. The pins are of any known and suitable type familiar to a person skilled in the art.

15

The plate 1 can have different geometric shapes, such that the holes 1a in particular can be aligned or can be arranged, in whole or in part, along the vertices of a triangle or of a trapezium. These arrangements of the screws
20 in a triangle or trapezium improve the stability of the fixture.

It will also be noted that the plate 1, irrespective of its geometric shape, can be bent longitudinally in order to fit
25 the curvature of the bone, thereby allowing the screws 2 to form an angle between each other.

The advantages are clear from the description.

30 Modifications and improvements may be incorporated without departing from the scope of the invention disclosed herein.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An implant for compressing together first and second bone parts separated by a joint, the implant comprising:

a plate having a top surface, a bottom bone-contacting surface, and a plurality of holes formed through the top and bottom surfaces, wherein a first of the plurality of holes is arrangeable on a first side of the joint, and a second of the plurality of holes is arrangeable on a second side of the joint, each of the first and second holes being locking holes adapted to receive first and second fixation members, respectively, a central axis of the first hole being directed into the first but not the second bone, and a central axis of the second hole being directed into the second but not the first bone; and

an angled member recessed below the top surface of the plate and extending downward at an angle with respect to the bottom bone-contacting surface, the angled member including a third of the plurality of holes situated between the first and second holes, and a stop surface for engaging with a head of a third fixation member, a central axis of the third hole being angled with respect to a longitudinal axis of the plate, such that when the third fixation member is inserted through the third hole, it is arranged to extend into the first bone, across the joint, and into the second bone,

wherein the angled member is situated between and extends below adjacent sides of the plate, such that the angled member is receivable in a cavity formed in at least one of the first and second bones.

2. An implant for compressing together first and second bone parts separated by a joint, the implant comprising:

a plate having a top surface, a bottom bone-contacting surface, and a plurality of holes formed through the top and bottom surfaces, wherein a first of the plurality of holes is arrangeable on a first side of the joint, and a second of the

plurality of holes is arrangeable on a second side of the joint, the first and second holes being adapted to receive first and second fixation members, respectively, a central axis of the first hole extending into the first but not the second bone, and a central axis of the second hole extending into the second but not the first bone; and

an angled member recessed below the top surface of the plate and extending downward at an angle with respect to the bottom bone-contacting surface, the angled member including a third of the plurality of holes situated between the first and second holes, the third hole being adapted to receive a third fixation member, a central axis of the third hole being angled with respect to a longitudinal axis of the plate, such that when the third fixation member is inserted through the third hole, it is arranged to extend into the first bone, across the joint, and into the second bone,

wherein the angled member is situated below a guide slot formed in the plate, the guide slot being adapted to allow insertion of the third fixation member through the guide slot and into the third hole.

3. The implant of claim 1 or claim 2, wherein the angled member is a tab extending from the bottom bone-contacting surface of the plate.

4. The implant of any of claims 1 to 3, wherein the central axis of the third hole extends at an angle of between about 30° and 60° with respect to the longitudinal axis of the plate.

5. The implant of claim 1, wherein the angled member is situated below a guide slot formed in the plate, the guide slot being adapted to allow insertion of the third fixation member through the guide slot and into the third hole.

6. The implant of claim 2 or claim 5, wherein the guide slot is bounded by side walls extending through the top and bottom surfaces of the plate, the side walls being dimensioned to allow insertion of the third fixation member through the guide slot and into the third hole.

7. The implant of claim 2, wherein the first and second holes are locking holes.

8. The implant of claim 1 or claim 7, wherein the first and second holes include threading for engaging with the first and second fixation members.

9. The implant of any preceding claim, wherein the plate is curved so as to adapt to the curvature of the first and second bones, the curvature of the plate being configured to arrange at least two of the fixation members at an angle with respect to one another.

10. The implant of any preceding claim, wherein at least three of the plurality of holes are arranged according to the corners of a triangle, or at least four of the plurality of holes are arranged according to the corners of a quadrilateral.

11. The implant of claim 2, wherein the angled member is situated between and extends below adjacent sides of the plate, such that the angled member is receivable in a cavity formed in at least one of the first and second bones.

12. The implant of any preceding claim, wherein the third hole has a first diameter, and a head of the third fixation member has a second diameter, the second diameter being larger than the first diameter.

13. The implant of any preceding claim, further comprising at least one hole adapted to receive a fixation pin.

14. An implant adapted to span and fuse first and second bone parts, the implant comprising:

a plate having a top surface, a bottom bone-contacting surface, and a plurality of holes formed through the top and bottom surfaces, at least a first and a second of the plurality of holes being situated on a side of the plate corresponding to the first bone part, each of the first and second holes adapted to receive first and second fixation members, respectively; and

an angled member recessed below the top surface of the plate and extending downward at an angle with respect to the bottom bone-contacting surface, the angled member including a third of the plurality of holes, the third hole being adapted to receive a third fixation member and being arranged below a guide slot formed in the plate, the guide slot being bounded by side walls extending through the top and bottom surfaces of the plate, wherein the side walls are dimensioned to allow insertion of the third fixation member through the guide slot and into the third hole,

and wherein a central axis of the third hole is angled with respect to a longitudinal axis of the plate, such that when the third fixation member is inserted through the third hole, it is arranged to extend from the first bone part and into the second bone part.

15. The implant of claim 14, wherein the angled member includes a stop surface for engaging with a head of the third fixation member, the stop surface acting to prevent over-insertion of the third fixation member through the third hole.

16. The implant of claim 15, wherein the stop surface is situated below the guide slot.

17. The implant of any of claims 14 to 16, wherein a central axis of each of the first and second holes extends into the first bone part but not the second bone part.

18. The implant of any of claims 14 to 17, wherein the angled member is situated between and extends below adjacent sides of the plate, such that the angled member is receivable in a cavity formed in at least one of the first and second bone parts.

19. The implant of any of claims 14 to 18, wherein some of the plurality of holes are arranged according to the corners of a triangle or a quadrilateral.

20. The implant of any of claims 14 to 19, wherein each of the first and second holes are locking holes.

21. The implant of any of claims 14 to 20, wherein the central axis of the third hole diverges from a central axis of at least one of the plurality of holes.

22. The implant of claim 21, wherein the at least one of the plurality of holes is a locking hole.

23. The implant of any of claims 14 to 22, wherein a portion of the implant is insertable in a cavity formed in at least one of the first and second bone parts.

24. The implant of any of claims 14 to 23, wherein the angled member is angled at between about 30° and 60° with respect to the longitudinal axis of the plate.

25. A system including the implant of any preceding claim in which the system further comprises screws for insertion into the plurality of holes of the implant.

26. The system of claim 25, further comprising a template of the plate for use in determining the positioning of the angled member against bone.

27. The system of claim 26, wherein the template does not include an angled member.

28. A system including the implant of any of claims 1 to 24 in which the system further comprises at least first, second and third fixation members for insertion into respective first, second and third holes of the plurality of holes of the implant, and wherein the third hole has a first diameter, and a head of the third fixation member has a second diameter, the second diameter being larger than the first diameter.

29. An implant substantially as hereinbefore described in the Detailed Description of Embodiments section with reference to, and/or as shown in, any one or more of the accompanying drawings.

1/2

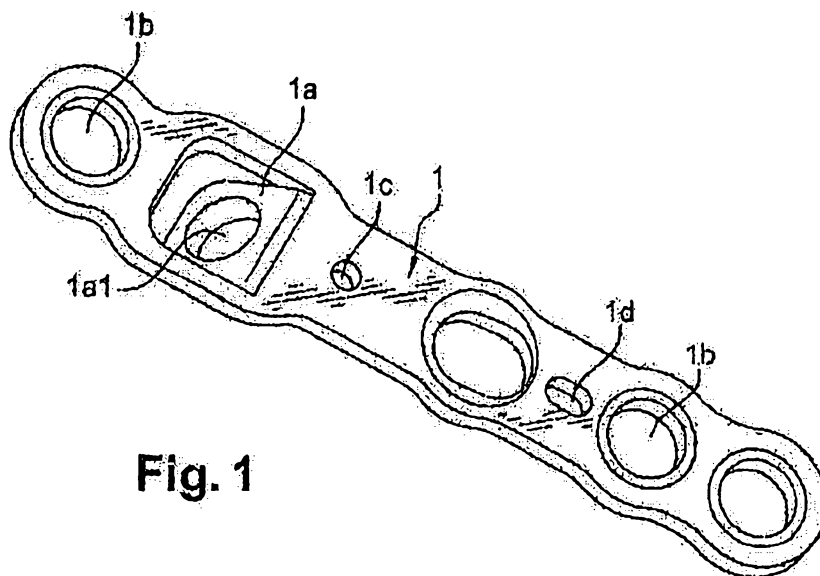


Fig. 1

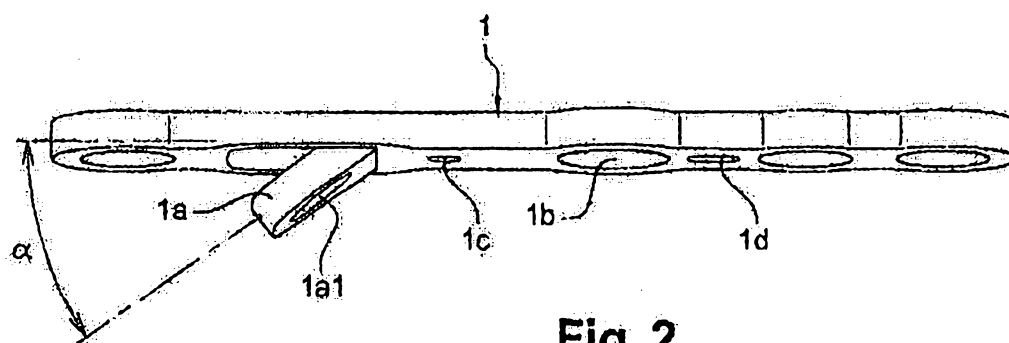


Fig. 2

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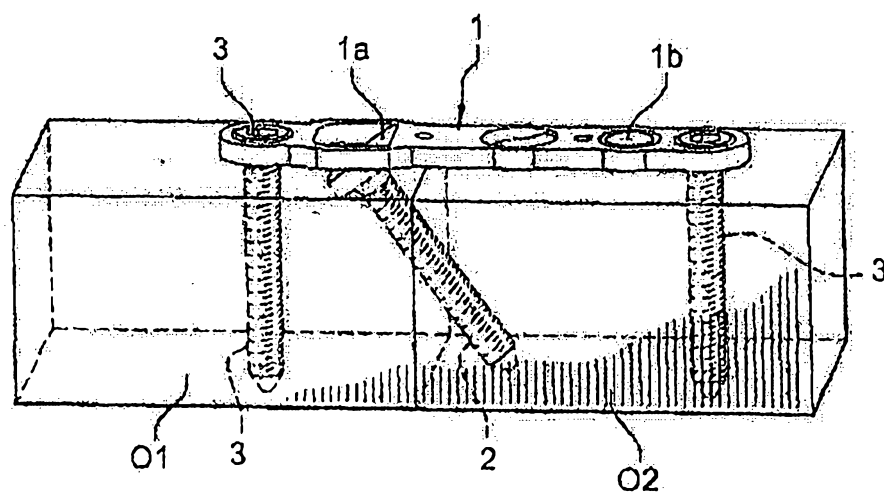


Fig. 3

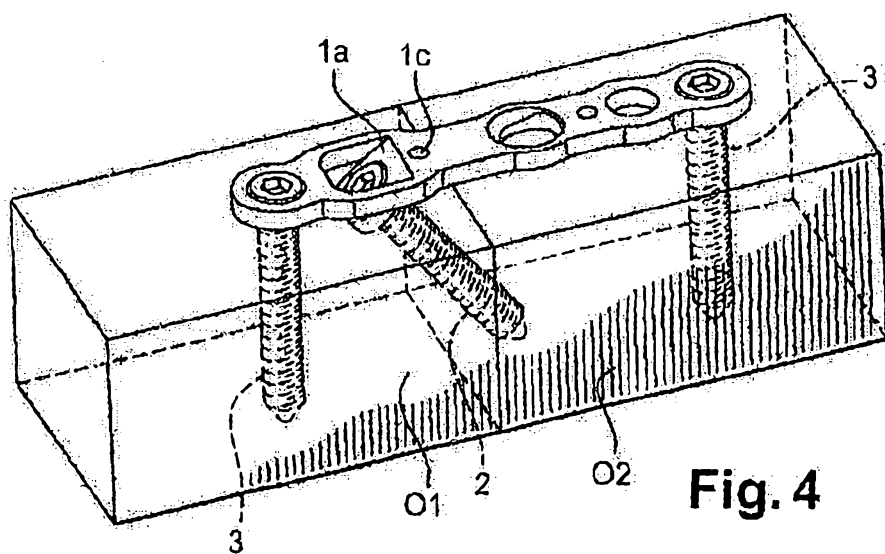


Fig. 4