

[72] Inventor **Bernd B. Kaute**
 87 Prinzegenten St., Berlin, 31, Germany
 [21] Appl. No. **792,449**
 [22] Filed **Jan. 21, 1969**
 [45] Patented **Aug. 3, 1971**

2,834,998 5/1958 Wilder..... 85/50 X
 3,171,518 3/1965 Bergmann 151/35 X
 3,298,270 1/1967 Launay..... 85/50 X

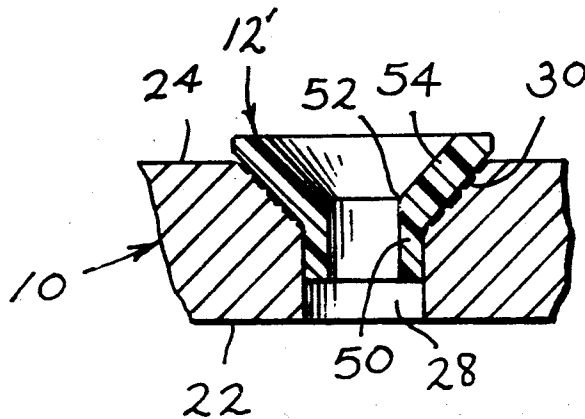
Primary Examiner—Richard A. Gaudet
 Assistant Examiner—J. Yasko
 Attorney—Oltsch & Knoblock

[54] **FRACTURE FIXATION DEVICE**
 1 Claim, 6 Drawing Figs.

[52] U.S. Cl..... **128/92,**
 85/50, 151/38
 [51] Int. Cl..... **A61F 5/04**
 [50] Field of Search..... **128/92**
 A—G; 85/50, 1 JP; 151/35, 38; 287/189.36 F

[56] **References Cited**
 UNITED STATES PATENTS
 2,621,653 12/1952 Briggs..... 128/92

ABSTRACT: A device for use in the fixation of bone fractures including a metal plate having front and back faces and having at least one bore therethrough with a countersunk portion in the front face of said plate. The backface of said plate is adapted for positioning against the bone. A nonmetallic frustoconical washer is seated in the countersunk portion of the plate bore. A metal pin is inserted through the washer and the plate bore. Said pin has a shank end part which is anchored into the bone and an enlarged head which engages the washer and which serves to hold the plate firmly against the bone.



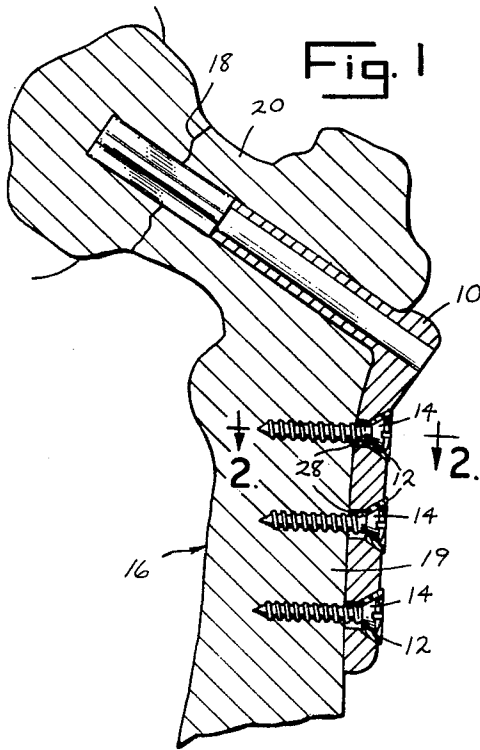


Fig. 2

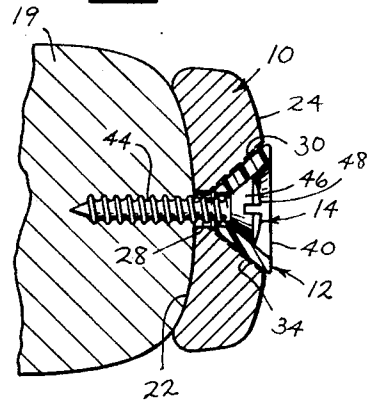


Fig. 4

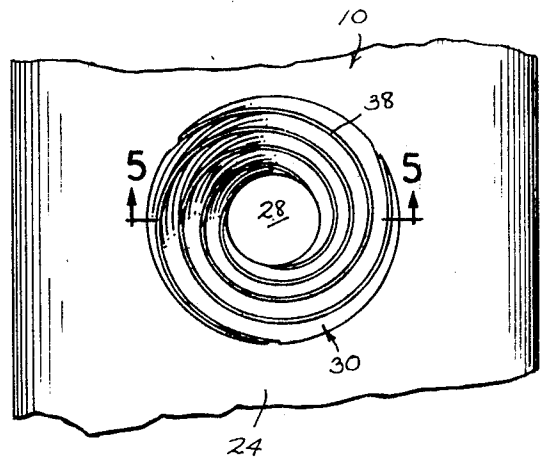


Fig. 3

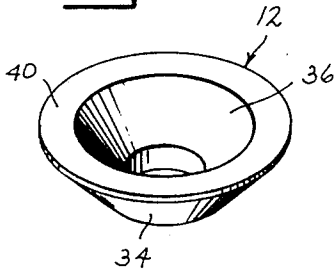


Fig. 5

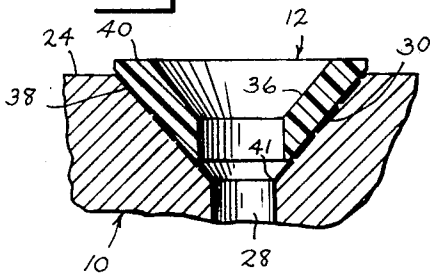
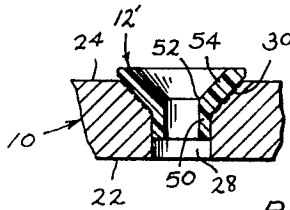


Fig. 6



INVENTOR.
BERND B. KAUTE

BY *Oltsch & Knoblock*

ATTORNEYS

FRACTURE FIXATION DEVICE

BACKGROUND OF THE INVENTION

This invention relates to a device for use in the fixation of a fracture of the bone.

In reducing or repairing a fracture of the bone, it is customary to reinforce the area adjacent the fracture with a metal plate which is attached to the bone by means of pins which generally consist of metal nails or screws. In a fracture such as the fracture of the femoral neck a plate is secured to the shaft of the femur by screws and serves to anchor an elongated nail which is inserted into the head and neck portions of the femur. This plate and the anchoring screws must be of high strength to adequately support the bone load and also be resistant to the corrosive action of body fluids. It is customary, therefore, to form fixation plates and pins from corrosive-resistant metals such as stainless steel or a cobalt-chromium-molybdenum alloy. But even with this precaution some corrosion has been found to occur about the area of plate—pin contact after placement of the plate within the body.

The cause for this corrosive effect is not fully understood, but it is believed that the anticorrosive feature of the metal forming the plate and pins is at least partially derived from a protective oxide film that is formed upon the exposed metal surfaces.

It is believed that during operative placement of the plate when the pins are caused to engage the plate to secure it to the bone the protective film upon the outer surfaces of the parts is scraped away at points of plate and pin contact thereby exposing the undermetal of the parts to body fluids. Due to a lack of oxygen within the body around the operative area, the protective film is not reformed upon the metal surfaces at these points of plate—pin contact and the exposed undermetal is therefore continuously subjected to the corrosive action of body fluids. Additionally, it has been found that after the plate and pins are anchored into position and a load is placed upon the bone through its use, there is a tendency for the parts to minutely shift relative to each other. It is believed that this minute relative movement between plate and pin gradually wears away the thin protective film upon the parts until the undermetal of the parts is exposed to the corrosive action of the body fluids.

Another cause for the corrosion of plate and pins is believed to be the establishment of an electrolytic reaction between parts. On occasion, a plate formed of one metal is used with pins formed of a different metal. By placing these dissimilar metal parts within the body in the presence of body fluids, an electrolytic reaction is created between parts and causes their corrosion.

SUMMARY OF THE INVENTION

This invention pertains to a device for reducing fractures and comprises a metal plate having front and back faces and having a bore therethrough which includes a countersunk portion in said front face of the plate. The backface of the plate is adapted for positioning against the bone. A nonmetal frustoconical washer is seated within the countersunk portion of the plate bore. A metal pin is inserted through the washer and the plate bore. Said pin has a shank end part which is anchored into the bone and an enlarged head which engages the washer and serves to hold or retain the plate firmly against the bone.

The washer which is inserted between the plate and the pin-head serves to prevent contact between the pin and the plate. The washer is formed of a material, such as a plastic, which does not scratch the outer surfaces of the pin and plate.

Any slight misalignment between the pin and the axis of the bore of the plate is compensated for by the washer so as to provide firm engagement between the pin and the plate. Additionally, the washer serves as a dielectric between the pin and the plate and thereby permits the pin and the plate to be constructed from dissimilar metals without creating an electrolytic reaction between the parts.

Accordingly, it is an object of this invention to provide a device for use in the fixation of a fracture of the bone in which metal-to-metal contact between component parts of the device is prevented.

It is another object of this invention to provide a device for use in the fixation of a fracture of the bone which includes a plate positionable against the bone adjacent the fracture and pins insertable through bores in said plate for anchoring said plate to said bone and in which misalignment of a pin relative to a plate bore is compensated for by a deformable washer inserted between each pin and the plate.

It is a further object of this invention to provide a device for use in the fixation of a fracture of the bone which includes a metal plate positionable against the bone and metal pins insertable through bores in the plate to anchor the plate to the bone and in which the plate and the pins may be of dissimilar metals.

Other objects of this invention will become apparent upon a reading of the invention's description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical fragmentary sectional view of the upper end portion of the femur showing one embodiment of the fixation device of this invention secured thereto.

FIG. 2 is an enlarged detail sectional view taken along line 2-2 of FIG. 1.

FIG. 3 is a perspective view of the washer component of the fixation device illustrated in FIG. 1.

FIG. 4 is an enlarged fragmentary top plan view of the plate component of the fixation device illustrated in FIG. 1.

FIG. 5 is a fragmentary sectional view of the plate component taken along line 5-5 of FIG. 4 with the washer component seated therein.

FIG. 6 is a fragmentary sectional view of the plate component of FIG. 4 with a washer component of modified form seated therein.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments illustrated are not intended to be exhaustive or to limit the invention to the precise forms disclosed. They are chosen and described in order to best explain the principles of the invention and its application and practical use to thereby enable others skilled in the art to best utilize the invention.

One embodiment of the fixation device of this invention is illustrated in FIGS. 1-5 and includes a bone plate 10, washers 12, and pins 14. Plate 10 is illustrated as being anchored or attached to the upper end portion of a femur 16 serving to reduce a fracture 18 in the neck 20 of the femur. It is to be understood that plate 10 may assume any number of specific shapes depending upon the type and location of the fracture and the purpose of the plate. Plate 10 has a backface 22 which is preferably formed to complementally engage a selected outer portion of the bone, which for purposes of illustration is the shaft 19 of femur 16, and a front face 24. Plate 10 has a plurality of bores 28 which extend through faces 22 and 24. Each bore 28 includes a countersunk portion 30 which opens into front face 24 of the plate. Plate 10 is preferably constructed of stainless steel or a cobalt-chromium-molybdenum alloy and is highly polished.

A washer 12 having a frustoconical shape is complementally received within countersunk portion 30 of each plate bore 28. Each washer 12 includes an outer conical face 34 which has a taper similar to the taper of countersunk portion 30 of each bore and an inner conical face 36. Each washer 12 is preferably formed from a plastic material such as high density, high molecular weight polyethylene or a tetrafluoroethylene polymer. The large edge 40 of washer 12 is preferably flush with or projects slightly above front face 24 of plate 10 in use.

A pin 14 is inserted through each bore 28 and includes a shank 44 which preferably projects with clearance through bore 28 and is anchored into bone 16 and an enlarged head 46 which is tapered to complementally engage inner face 36 of

washer 12. Head 46 of each pin 14 is so sized relative to washer 12 and countersunk portion 30 of bore 28 that, with pin 14 anchored into femoral shaft 19 and serving to firmly hold plate 10 against the femur, tip 48 of head 46 is preferably slightly inset from outer edge 40 of the washer 12. Pins 14 are preferably formed from the same material as plate 10 and may comprise screws, as illustrated, or nails. When screws are utilized as pins 14, the countersunk portion 30 of each bore 28 preferably is interrupted, as by at least one helical rib or groove 38 formed therein. Each groove or rib 38 preferably extends from front face 24 of the plate to inner margin 41 of countersunk portion 30 and extends from its large dimension end to its small dimension end in the same direction as the direction of rotation of the engaging screw to seat the screw. Rib or groove 38 serves to engage outer face 34 of the washer to prevent the washer from turning relative to plate 10 as the screw is tightened against the plate.

Another embodiment of the fixation device of this invention is illustrated in FIG. 6 wherein the heretofore described dielectric washer 12 is modified to include a coaxial straight-sided tubular neck part 50 which extends from the inner part 52 of the frustoconical portion 54 of the washer. Neck part 50 terminates within bore 28 beyond the countersunk portion 30 and preferably terminates spaced from the backface 22 of the plate 10. Neck part 50 preferably has an outer diameter which

is slightly smaller than the diameter of bore 28 and an inner diameter which is slightly larger than the diameter of the shank of a pin 14. Neck part 50 of the washer serves as a guide for pin 14 and as a dielectric between the plate and the shank part of the pin to eliminate any electrolytic reaction between plate and pin.

What I claim is:

1. A device for use in the fixation of the fracture of the bone comprising a metal plate having front and back faces and having a bore therethrough, said bore defined by a straight wall portion and a countersunk portion located at said plate front face, said plate backface adapted to be positioned against said bone, a nonmetallic washer having a frustoconical portion and a preformed substantially coaxial tubular neck portion, the frustoconical portion of said washer seating within the countersunk portion of said bore, the neck portion of said washer extending into the straight wall portion of said bore and terminating inwardly spaced from the back face of said plate, a metal pin having a shank and an enlarged head, said washer encircling said pin, said pin shank extending through said plate bore with clearance and adapted to be anchored into said bone, said pin head engaging the frustoconical portion of said washer and being separated from contact with said plate.

30

35

40

45

50

55

60

65

70

75