United States Patent [19]
Cox

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[54] BONE SPLINT

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[21] Appl. No.: 151,089

[52] U.S. Cl. .......... 128/92 BC
[51] Int. Cl. .......... A61f 5/04
[58] Field of Search .......... 128/92 BC, 92 BB, 128/92 D

[56] References Cited

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,105,105 | 7/1914 | Sherman | 128/92 D |
| 3,103,926 | 9/1963 | Cochran et al. | 128/92 BB |
| 3,244,170 | 4/1966 | McElvenny | 128/92 D |
| 2,406,832 | 9/1946 | Hardinge | 128/92 D |
| 2,443,363 | 6/1948 | Townsend et al. | 128/92 D |
| 2,821,979 | 2/1958 | Cameron | 128/92 BC |
| 3,094,120 | 6/1963 | Blosser | 128/92 BB |

FOREIGN PATENTS OR APPLICATIONS

| | | | |
|---|---|---|---|
| 742,618 | 1/1933 | France | 128/92 D |
| 67,552 | 11/1942 | Norway | 128/92 D |
| 1,505,513 | 11/1967 | France | 128/92 D |

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[57] ABSTRACT

An intramedullary splint possesses a longitudinal slot whose opposite edges are formed to engage with the threads of screws securely anywhere along the length of the slot. The splint element is transversely arcuate for engagement inside of the bone canal. The interaction of the screws and slot allow the splint to be drawn up firmly against the concave wall of the bone for greatest support. The placement of metallic parts inside of the bone rather than on the outside reduces interference with muscle attachments and reduces tissue trauma.

1 Claim, 7 Drawing Figures

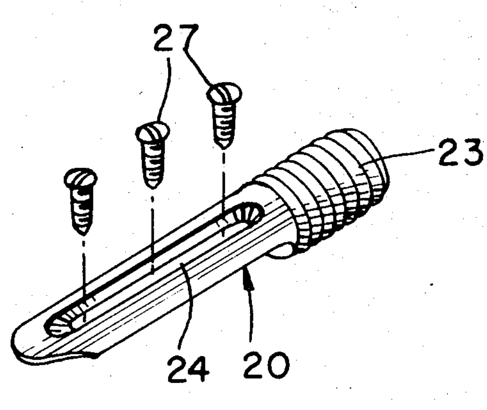

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FIG. 1.

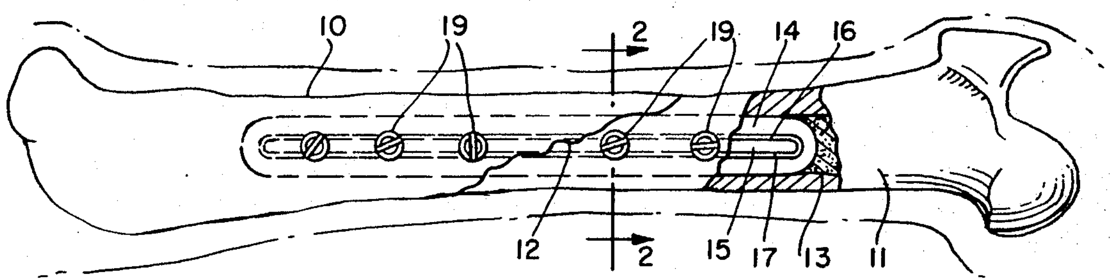



FIG. 2.

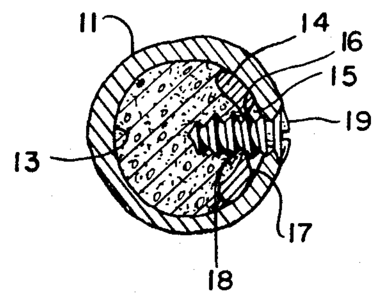



FIG. 3.

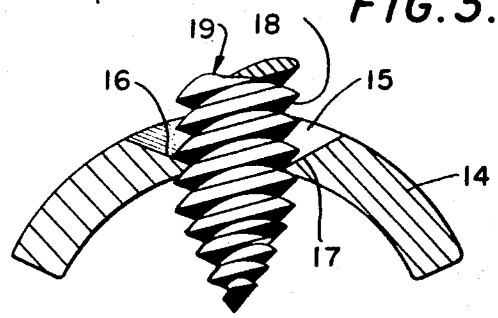



FIG. 4.

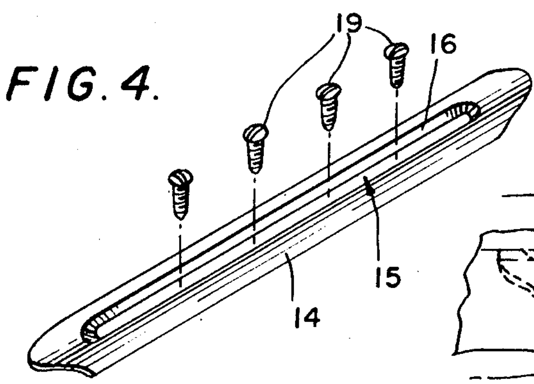



FIG. 5.

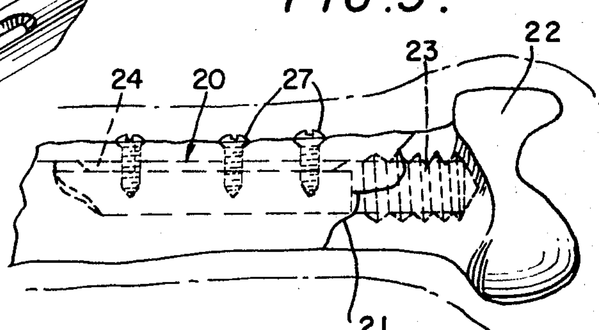



FIG. 6.

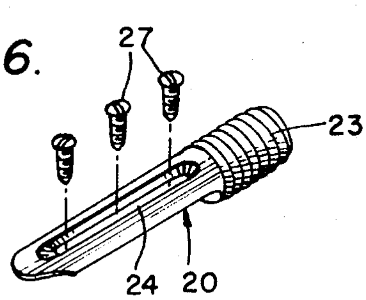
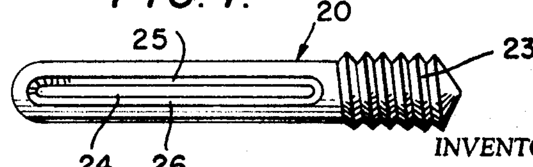



FIG. 7.

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# BONE SPLINT

## BACKGROUND OF THE INVENTION

Both external bone splints and intramedullary splints are known in the prior art and each possesses certain inherent advantages and disadvantages. Any metal hardware attached to the outside of a bone will naturally interfere with muscle attachments and other surrounding living tissue. From the standpoint of the bone surgeon, the exterior bone splint is more easily viewed during the actual surgery and therefore in some cases the technique of applying the splint to the outside of the bone is simpler than the application of an internal splint. The obvious advantage of the internal bone splint over the external type resides in the placement of metallic parts away from muscle attachments and tissue surrounding the bone, thereby resulting in a reduced degree of trauma caused by the surgery or the repair of a fracture. A further advantage of the intramedullary splint is that the threads of attaching screws may be engaged with a metal part inside of the bone canal and reliance on threaded engagement with the bone itself is dispensed with. Nevertheless, in the prior art, the internal type splint or pin has not gained wide acceptance because of the fact that the splint element is hidden inside of the bone and the drilling of the bone at precise locations to allow screws to be accepted by threaded openings in the metal splint is exceedingly difficult.

With the above in mind, the objective of this invention is to provide a bone splint of the internal type with all of the inherent advantages associated with that type and to a great extent eliminating the above-discussed prior art difficulties which have prevented wider acceptance of the internal splint up to the present time. In accordance with the present invention, an intramedullary splint is provided in the form of an elongated plate member which is arcuate in cross section so as to conform to the natural transverse curvature of the bone canal. The splint has an elongated slot extending for the major portion of its length and the opposing edges of this slot are feathered at proper elevations to receive the screw-threads of fastener screws at any point along the splint or slot. The arrangement is such that with the internal splint positioned within the bone canal so as to bridge the fracture, the surgeon can drill through the bone at a number of points along the splint and can be assured that the threaded fasteners will properly engage with the splint due to the fact that the feathered edge slot forms a continuous thread-engaging element, and there is no necessity for tedious alignment of drilled bone openings with preformed threaded openings in the splint. Additionally, the arrangement enables the metal fastener screws to have their threads securely engaged with the splint element and without reliance on rather precarious engagement with threads formed in the bone structure. When the screws are tightened, the splint element will be drawn up snugly against the interior surface of the bone wall where it can give the greatest possible support, without interference with muscle attachments or surrounding tissue. Only the small heads of the screws remain exposed on the exterior of the bone and, in some instances, these heads may be partly recessed or countersunk into the bone wall.

Other objects and advantages of the invention will be apparent during the course of the following description.



## BRIEF DESCRIPTION OF DRAWING FIGURES

FIG. 1 is a plan view, partly in section, of a fractured bone having the intramedullary splint of the invention applied thereto.

FIG. 2 is an enlarged vertical section taken on line 2—2 of FIG. 1.

FIG. 3 is a greatly enlarged cross section through the splint element showing the engagement of a threaded fastener with the opposing edges of a slot in the splint element.

FIG. 4 is an exploded perspective view of the splint element and threaded fasteners.

FIG. 5 is a side elevational view of a fractured bone with a modified form of splint to accommodate fractures close to a bone joint.

FIG. 6 is an exploded perspective view of the modified splint element and threaded fasteners.

FIG. 7 is a plan view of the modified splint element.

## DETAILED DESCRIPTION

Referring initially to FIGS. 1 through 4 of the drawings, wherein like numerals designate like parts throughout, the numerals **10** and **11** designate sections of a bone having a generally diagonal fracture indicated at **12.** The roughly cylindrical bone canal is designated by the numeral **13** in FIGS. 1 and 2.

The intramedullary splint forming the subject matter of the invention consists of an elongated pin or plate element **14** formed of stainless steel or the like and being arcuate in cross section, as shown, to conform approximately to the cross sectional curvature of the bone canal **13.** The length of the splint element **14,** its radius of curvature and its wall thickness will be determined generally by the size of the bone to be mended and the drawing in this regard is illustrative only.

The splint element **14** is provided at its transverse center and throughout the major portion of its length with a straight longitudinal slot **15** having opposed parallel beveled or feathered edges **16** and **17.** These two opposing edges of the slot **15** are offset in the radial direction, FIG. 3, by a distance equal to the pitch of screw-threads **18** on threaded fasteners **19** which are employed to anchor the splint element to the wall of the bone. The angularity of the approximately V-shaped opposing edges of the slot **15** is such that the edges will constitute a single thread for smooth engagement with the helical screw-thread **18** of each fastener **19.** The arrangement is such that a fastener or fasteners **19** of proper size may be received by the slot **15** at any point along its length and this greatly simplifies the procedure of mending the fracture in comparison to the tedious task of aligning screws with small threaded openings in a splint element.

In mending the fracture **12,** the splint element **14** is introduced into the bone canal **13,** following known surgical techniques, and the bone sections **10** and **11** are brought together until there is abutment along the line of the fracture **12.** The bone wall is suitably drilled and the threaded fasteners **19** in whatever numbers are required are introduced through the bone openings and are received threadedly by the slot **15** at any necessary points along its length and without further adjustment. When the fasteners **19** are tightened, the interengagement of the screw-threads **18** with the opposing feathered edges **16** and **17** will draw the splint element **14** firmly up against the interior surface of the bone wall where the splint will give the greatest degree of support. The splint element **14** will extend on opposite sides of the fracture **12**, as shown in FIG. **1**. The arcuate cross sectional shape of the splint element renders the same extremely rigid and resistant to bending.

Since the only metal parts of the splint on the exterior of the bone are the small heads of the fasteners **19**, there is practically no interference with muscle attachments and other tissue in the immediate vicinity of the fractured bone. The provision of the long slot **15** in the splint element greatly simplifies the bone surgeon's task in repairing the fracture with an internal type splint where much of the latter is hidden from view. The continuous slot as compared to individual small threaded openings makes it much easier to apply the fasteners **19** than would otherwise be the case were the slot not employed. Another great advantage of the invention resides in the fact that the fastener threads **18** are firmly engaged with the metal thread formed by the slot edges **16** and **17**, and there need not be reliance on threaded engagement between the fasteners and the bone wall itself. The metallic thread engagement allows the splint element **14** to be clamped very tightly against the bone wall for maximum rigidity and complete immobilization of the fracture during the knitting process.

FIGS. **5** through **7** show a modified splint element **20** for mending a fracture **21** occurring very close to a bone end **22**. In such cases, there is insufficient length of bone on the short side of the fracture **21** to anchor the splint element **14**. Instead of this element, the modified element **20** has a threaded pin extension **23** on one end thereof for direct engagement inside of the short terminal end of the fractured bone. The remainder of the splint element **20** contains a longitudinal slot **24** with feathered offset opposed edges **25** and **26** identical to the edges **16** and **17** in the prior embodiment. The slot **24** receives screws **27** which may be identical to the previously-described screws **19**. On theside of the fracture **21** remote from the bone end **22**, the splint element **20** functions inside of the bone in the identical manner shown and described in connection with the preceding embodiment of the invention, and further description should not be required for a full understanding of the invention by anyone skilled in the art.

It is to be understood that the forms of the invention herewith shown and described are to be taken as preferred examples of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or scope of the subjoined claims.

I claim:

**1.** An intramedullary splint comprising an elongated unitary splint body portion in the form of a plate element which is uniformly arcuate in cross section for ready engagement with the interior surface of the intramedullary cavity and with said body portion adapted to extend on opposite sides of a fracture, said body portion having a longitudinal slot formed therethrough and said slot being continuous along the major portion of the length of said body portion, the opposing longitudinal edges of said slot being parallel and beveled to a uniform V-shaped cross section along the slot in laterally opposed relationship for ready engagement with screws introduced at any desired points along the slot, said longitudinal edges of the slot lying substantially in the concave plane defined by the interior face of the splint body portion, and a relatively short integral screw-threaded extension on one end of the elongated splint body portion for engagement with the intramedullary cavity of a short bone portion on one side of a fracture.

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