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Splint with adjustable collars

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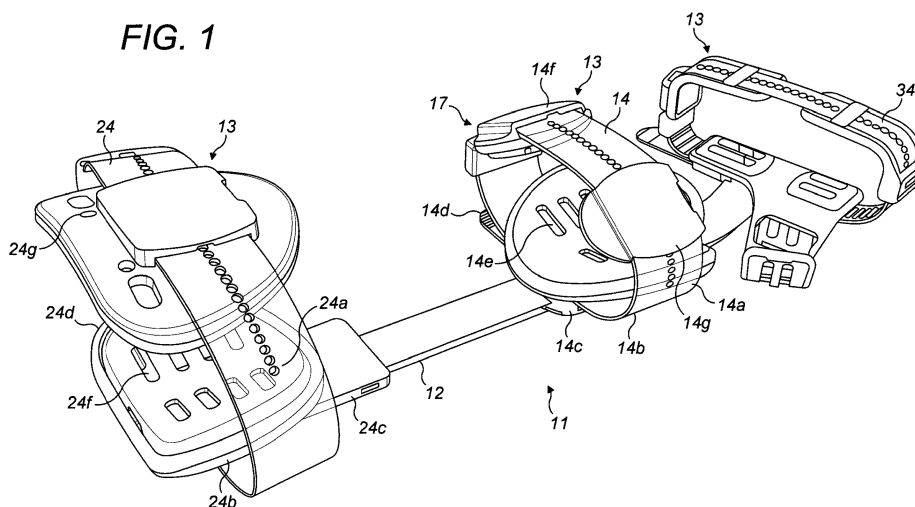
(56) Documents Cited:
US 5601597 A US 3776225 A
US 20070032756 A1

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(54) Title of the Invention: **Splint**
Abstract Title: **Splint with adjustable collars**

(57) A splint 11 for the stabilisation of limb fractures comprising a spine 12, location means 13 adapted to locate the spine 12 in alignment with a limb, and an adjustable collar 14, 24, 34. The collar 14, 24, 34 is located on the spine 12 and is adapted to exert pressure on the limb, capable of being applied and adjusted by a clinician. Pressure indicators may give a visible indication of the pressure exerted on the limb, enabling adjustment to avoid excess pressure or looseness. Preferably a plurality of adjustable collars 14, 24, 34 is provided on the spine. Each collar 14, 24, 34 may be lockable to prevent tampering. The splint 11 may be used in conjunction with a base unit (Figure 4). Also disclosed is a splint comprising a splint spine interface pad.

FIG. 1



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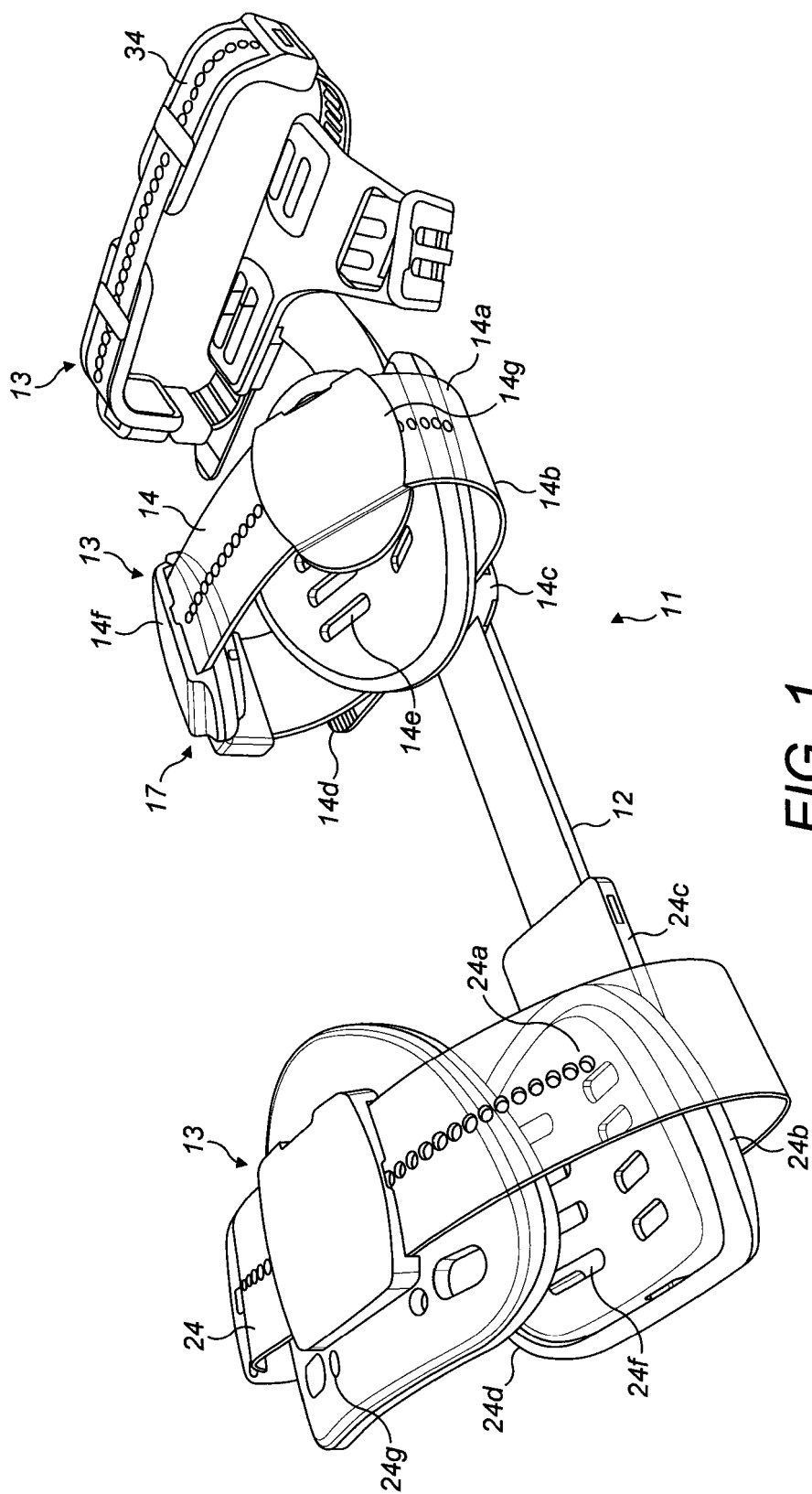


FIG. 1

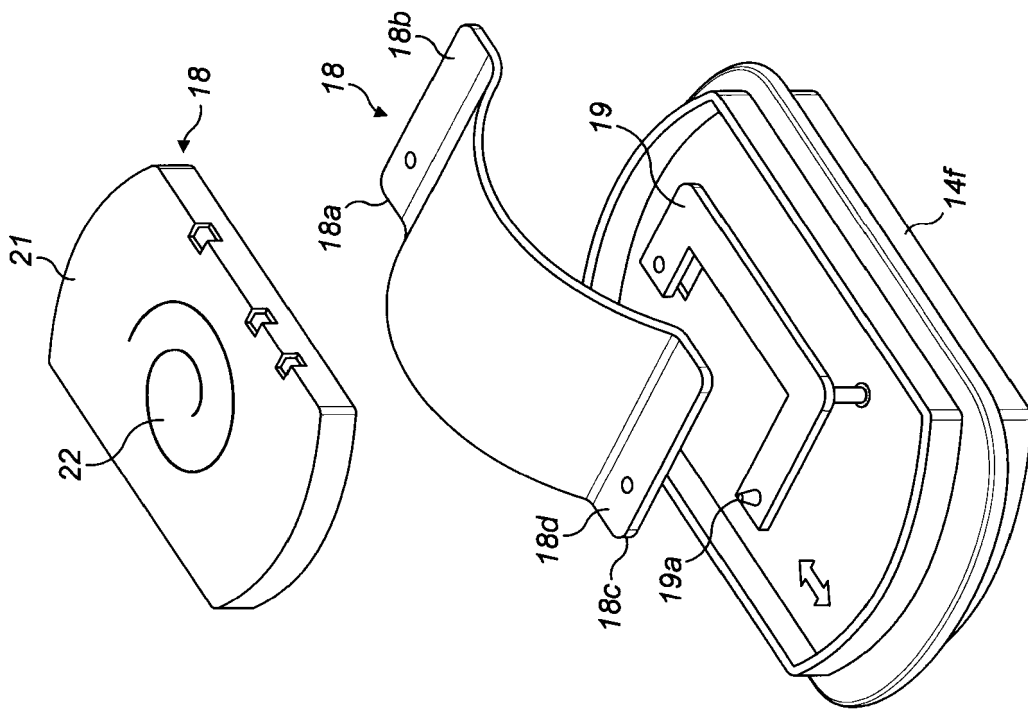


FIG. 2

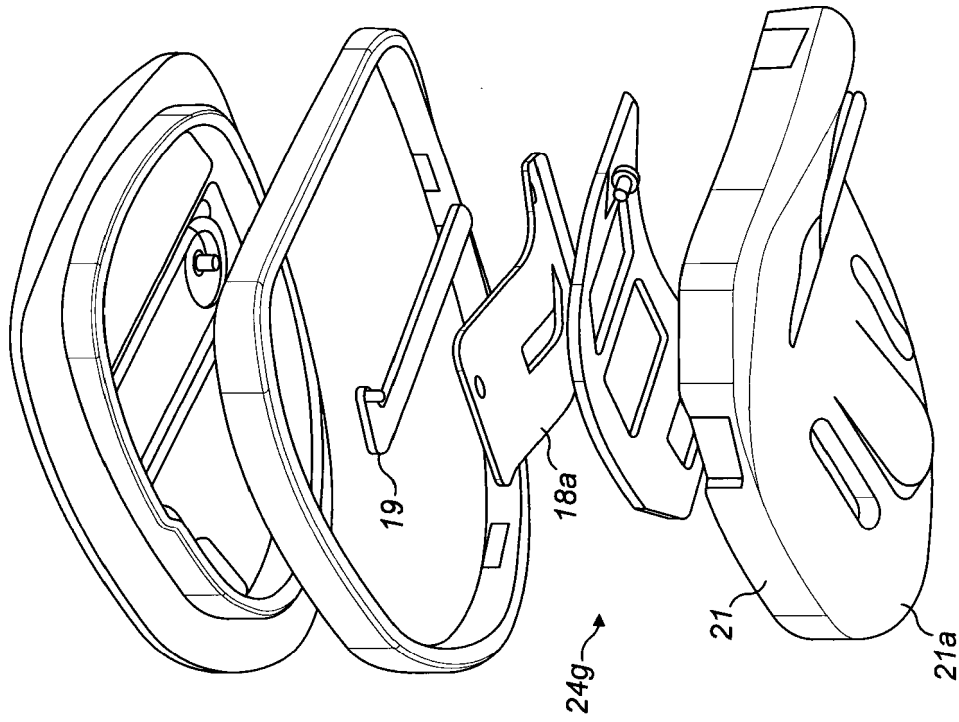


FIG. 3

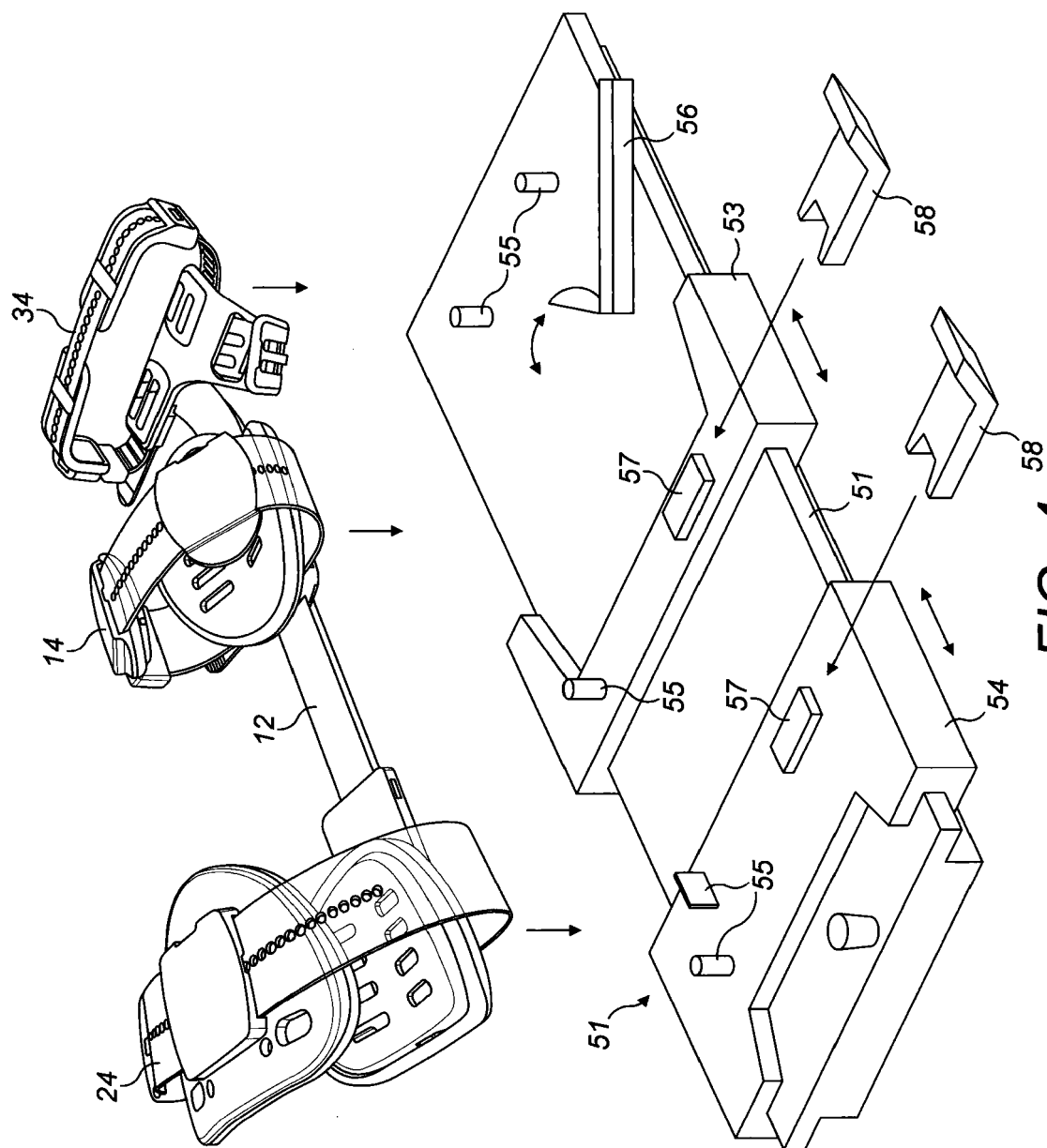


FIG. 4

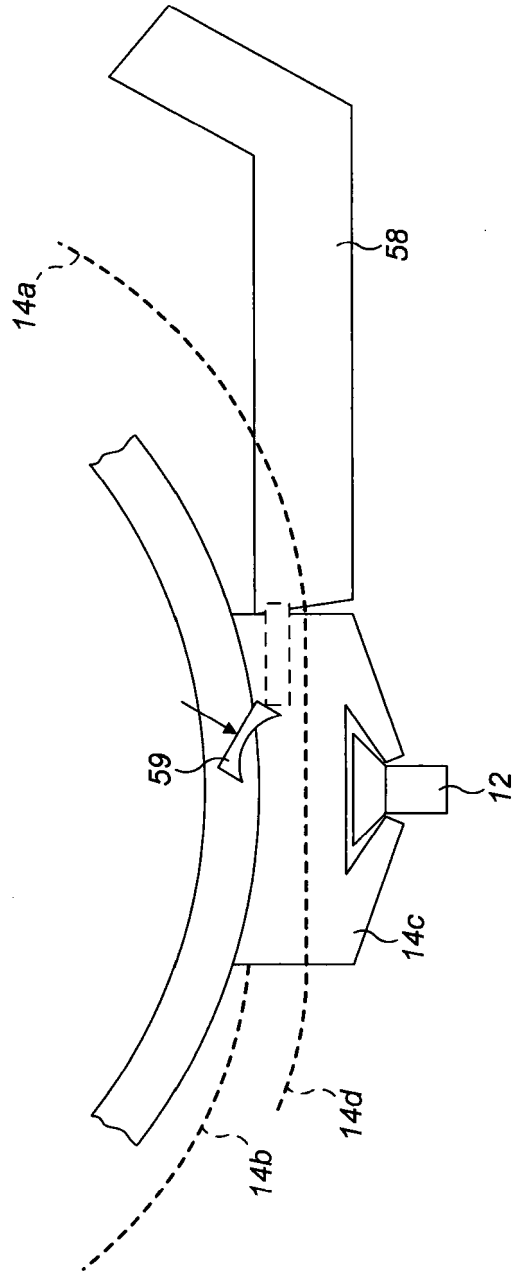


FIG. 5

Splint

This invention relates to splints for the stabilisation of limb fractures.

US6197800 discloses a splint, particularly for holding a Colles fracture of the wrist in reduction, comprising first and second collars pivotally supported on a body member and adjustable so as to adjust the internal dimensions of the splint. Spaced resilient pads are provided internally so as to exert pressure on the limb held in the splint while allowing vascular flow. Pressure sensors, such as electronic sensors, diaphragms and liquid reservoirs expressing liquid into a visible chamber can warn of undesired pressure build-up so that the splint may be adjusted.

The present invention provides further improved splint arrangements.

The invention comprises, in one aspect, a splint for the stabilisation of limb fractures, comprising a spine, location means adapted to locate the spine in alignment with a limb, and collar means on and adjustable along the spine adapted to surround and exert adjustable pressure on the limb at the fracture site.

Pressure may be applied through a pad comprising the skin-splint interface at the fracture site. The pad may contact a spring arrangement that moves a pointer to indicate the pressure. The spring arrangement may comprise a bowed leaf spring that flattens under pressure and has a fixed end and a free end that determines the position of a pointer depending on the degree of flattening.

The pointer may indicate a pressure in a range centred on a pressure equivalent to 28mm Hg, which corresponds to a pressure at which blood flow will not be undesirably restricted.

The pressure indicator may be used to adjust the collar during application of the splint and to indicate the need for tightening or relaxing as healing progresses. Swelling may reduce, for example, so that the fracture will not be stabilised properly. Swelling, on the other hand, may increase, restricting blood flow.

Desirably, the collar may be locked so as to preclude tampering, releasable by means of a key available to the clinician. The pressure indication may, however, be visible to the patient alerting to the need to have the splint adjusted.

The pad may comprise a textile material, and the splint including the pad may be made of such material that it can be immersed in water and will dry off rapidly, permitting bathing or showering.

The invention comprises, in another aspect, a splint for the stabilisation of limb fractures comprising a spine, location means adapted to locate the spine in alignment with a limb, and a first adjustable collar on the spine adapted to immobilise and exert pressure at the

fracture site, in which said location means comprise a second adjustable collar on the spine adapted to hold the spine to the limb.

- 5 At least one of the collars may be adjustable lengthways of the spine. The collar or collars may be slidable along the spine, which may comprise a ratchet into which a pawl of the collar sits releasably for locking. The pawl may be released by a key.

- 10 A third adjustable collar may be provided, which may serve to prevent the splint moving distally along a limb. For a Colles fracture splint, the third collar may comprise a hand support carriage, which may be located adjacent the first collar, remote from the second collar, and which may be fixed to the spine. The spine may be curved between the first and third collars correspondingly to the shape of the arm. Right arm and left arm splints will be different of course.

- 15 The collars may be in the form of straps. The straps may locate in slots and be lockable therein by a ratchet mechanism, the straps having ratchet perforations that can be slid over a sprung detent on the spine on tightening, but held thereby against retraction. The sprung detent may be released for adjustment or removal of the straps.

- 20 The splint may be used in conjunction with a base unit, to which it may be clamped for application and adjustment of the splint. The base unit may comprise a base plate with at least one sliding carriage that may be attached to an adjustable collar. On such attachment, the adjustable collar may be released to be movable along the spine, as by use of a key as aforementioned, which may also serve to release the strap on the collar, as
25 by releasing the sprung detent, again as aforementioned.

- Such an arrangement may be adapted for single-handed operation by a clinician, insertion of a collar key both releasing the collar for sliding along the spine and releasing the collar strap. This leaves the clinician's other hand free for traction of the limb. This, in turn,
30 means that clinical staff may be used more effectively and efficiently. Treatment of a fracture is swifter and less traumatic for a patient.

- In another aspect, the invention comprises a skin/splint interface pad for a splint comprising a pad component for direct contact with the skin that allows liquid and vapour
35 phase water to escape from the skin. The pad component may comprise a small mesh textile outer component and a larger mesh substrate. The textile may be on a moulded support that has vents for escaping water. The pad may have an edge region that is curved in profile whereby to avoid pinch shear of the underlying tissues.

- 40 In another aspect, the invention comprises a splint for the stabilisation of limb fractures comprising a skin/splint interface pad adapted to be located at the fracture site, and the splint including the pad is made of material that can be immersed in water and will dry off rapidly, permitting bathing or showering.

- 45 In yet another aspect, the invention comprises a splint for the stabilisation of limb fractures, comprising a spine with lockable collar means adapted to secure the spine to

the limb, and a base adapted to receive the spine during fitting and adjustment procedures and comprising locking/unlocking means for the collar means. The collar means may comprise two or more collars and said locking/unlocking means may be operable to lock/unlock the collars simultaneously.

5

The splint may be made substantially if not entirely out of recyclable or disposable material. A splint of polypropylene may be incinerated after use, avoiding the risk of passing on infection. The increased cost of the splint as compared to conventional plaster casts is more than offset by the clinician time saved in application and the facility for adjustment affords both clinical and financial benefits.

10

One embodiment of a splint for the stabilisation of limb fractures according to the invention will now be described with reference to the accompanying drawings, in which:

15

Figure 1 is a perspective view of a splint for stabilisation of a Colles fracture;

Figure 2 is an exploded view of a pressure pad arrangement, with a pressure indicator, of the splint of Figure 1;

20

Figure 3 is an exploded view of another pressure pad arrangement, with a pressure indicator, of the splint of Figure 1;

Figure 4 is a perspective view of a base on which the splint of Figure 1 is located for application and adjustment of the splint, showing the splint prior to location; and

25

Figure 5 is a partial end view of the splint showing a locking arrangement.

30

The drawings illustrate a splint 11 for the stabilisation of limb fractures, more specifically for Colles fractures, that is to say, fractures of the radius close to the wrist, comprising a spine 12, and location means 13 adapted to locate the spine 12 in alignment with a limb, comprising three adjustable collars 14, 24, 34 mounted on the spine 12.

35

A Colles fracture is a fracture of the radius close to the wrist, and adjustable collar 14 is adapted to exert pressure at the fracture site, and comprises a pressure indicator 17 giving a visible indication that the pressure exerted in relation to a reference pressure. In a Colles fracture there is posterior displacement and angulation of the wrist and hand, which is reduced by traction on the hand and pressure at the fracture site, typically about 25mm from the radio-carpal joint. A typical Colles fracture is illustrated in US6197800

40

The collar 14 comprises a strap 14a anchored at one end 14b in a base 14c slidable along the spine 12 and, at its other end 14d, inserted in a slot on the base 14c. The base 14c comprises a cushioned pad 14e beneath the fracture site.

45

Pressure is applied at that site through pads 14f, 14g on the strap 14a by tightening the strap 14a. The pad 14f, shown in inverted, exploded view in Figure 2, acts as the indicator 17 of the collar/skin pressure and comprises a spring arrangement 18 that moves a pivoted pointer 19 to indicate the pressure. The spring arrangement comprises a bowed leaf spring 18a that flattens under pressure and has an end 18b fixed in the pad 14f and a free end 18c with a slot 18d that engages a pin 19a on the pointer and determines the position of the pointer 19 depending on the degree of flattening. The leaf spring 18a is depressed by a spiral spring 22 formed in a cover plate 21, which is the collar/skin interface.

The pointer 19 is viewed through a small window, not indicated on the drawing, in the pad 14f and appears centrally thereof at a pressure of 28mm Hg, which corresponds to a pressure at which blood flow will not be undesirably restricted.

The pressure indicator is used to adjust the collar during application of the splint and to indicate the need for tightening or relaxing as healing progresses. Swelling may reduce, for example, so that the collar will become loose and the fracture will not be stabilised properly. Swelling, on the other hand, may increase, effectively tightening the collar and restricting blood flow.

The collar 14 is locked to the spine 12, and the strap 14a locked in the base 14c after application, and after any subsequent adjustment, so as to preclude tampering, especially by the wearer, and releasable, by means of a key available to the clinician, as will be further explained below. The pointer 18 is, however, visible to the patient, alerting to the need to have the splint adjusted.

The pad 16 comprises a textile material, and the splint 11 including the pad 16 is made of such material that all or any part of it can be immersed in water and will dry off rapidly, permitting bathing or showering.

A second adjustable collar 24 is provided on the spine 12, adapted to hold the spine 12 aligned to the limb and keep the first collar 14 in correct position. The second collar 24 is similar to the first collar 14, but larger, fitting the forearm closer to the elbow, and comprises a strap 24a anchored at one end 24b in a base 24c slidable along the spine 12 and, at its other end 24d, inserted in a slot on the carriage 24c. The base 24d comprises a cushioned pad 24f.

Pressure is applied at that site through an adjustable pad 24g on the strap 24a by tightening the strap 24a in similar fashion to that of the collar 14. The pad 24g, shown in greater detail in exploded view in Figure 3, incorporates a pressure indicator similar to that of collar 14, with a pointer 19 moved by a leaf spring 18a that reacts to pressure from a spring interface 21.

Collar 24 is locked to the spine 12 and the strap 24a locked in the base 24c in like manner to collar 14.

At the other end of the spine 12 is provided a third adjustable collar 34, a hand support carriage, adapted to constrain the patient's hand, the spine 12 being cranked appropriately - there will, of course, be right and left hand models. This third collar 34 need not be adjustable lengthwise of the splint, as the other two collars can be correctly positioned with respect to it. It serves, of course, to prevent movement of the entire splint along the patient's arm.

While the splint described with reference to Figures 1, 2 and 3 is clearly useful on a stand-alone basis, it is designed to be used in conjunction with a base unit 51, as illustrated in Figure 4, to which it may be clamped for application and adjustment of the splint. The base unit 51 comprises a base plate 52 with sliding (as indicated by the double arrows) carriages 53, 54 that are each attached to an adjustable collar, carriage 53 to collar 14, and carriage 54 to collar 24.

The carriages 53, 54 have locating posts 55 corresponding to recesses in the undersides of the collars 14, 24. Like posts 55 are on the base plate 52 to receive the collar 34. A lever 56 on the base plate 52 serves to lock the spine 12 to the base unit 51 for application and adjustment.

Keyguides 57 are provided on carriages 52, 53 to receive keys 58 that engage sprung detents or pawls 59 in the bases 14a, 24a. One such pawl 50 is seen in Figure 5 normally biased to engage the serrations in the strap 14a to allow it to be tightened but not relaxed. When the key 58 is inserted, the pawl is held out of engagement so that the strap 14a can be relaxed.

Insertion of the key 58 can also unlock the collar 14, 24 from the spine 12 so that it is capable of axial movement along the spine. However, simply placing the spine 12 on the base unit 51 may also unlock the collars 14, 24 for axial movement.

Using the base unit 51 facilitates single-handed operation by a clinician. With the collars 14, 24 free to move along the spine 12 and the straps 14a, 24a free, the clinician can place the collars appropriately and place the patient's arm with the straps loose. The straps can now be tightened using just one hand, leaving the clinician's other hand free for traction of the limb particularly while tightening strap 14a and observing the pressure. This, in turn, means that clinical staff may be used more effectively and efficiently. Treatment of a fracture is swifter and less traumatic for a patient.

As already mentioned, the skin/splint interface pad comprises a textile material, not shown, that allows liquid and vapour phase water to escape from the skin. The pad component comprises a small mesh textile outer component and a larger mesh substrate. The textile covers a moulded support that has vents for escaping water. The pad has an edge region 21a, Figure 3, that is curved in profile whereby to avoid pinch shear of the underlying tissues. The splint as a whole is made of material that can be immersed in water with no ill effect, so that patients may bathe.

While the splint has been described with particular reference to a Colles fracture splint, it is clear that splints may be designed on like principles for other fractures of human or animal limbs and even for spinal fractures.

- 5 Though fairly complex in design, the splint and base unit can be inexpensively fabricated in inexpensive disposable or recyclable materials such as polypropylene, avoiding the possibility of cross infection through reuse.

Claims:

- 5 1 A splint for the stabilisation of limb fractures comprising a spine, location means adapted to locate the spine in alignment with a limb, and collar means on and adjustable along the spine adapted to surround and exert adjustable pressure on the limb at the fracture site.
- 10 2 A splint according to claim 1, in which pressure is applied through a pad comprising the skin-splint interface at the fracture site.
- 3 A splint according to claim 2, in which the pad contacts a spring arrangement that moves a pointer to indicate the pressure.
- 15 4 A splint according to claim 4, in which the spring arrangement comprises a bowed leaf spring that flattens under pressure and has a fixed end and a free end that determines the position of a pointer depending on the degree of flattening.
- 20 5 A splint according to claim 5, in which the pointer indicates a pressure in a range centred on a pressure equivalent to 28mm Hg, which corresponds to a pressure at which blood flow will not be undesirably restricted.
- 25 6 A splint according to any one of claims 1 to 5, in which the collar can be locked so as to preclude tampering.
- 7 A splint according to any one of claims 1 to 6, in which the pad comprises a textile material, and the splint including the pad are made of such material that it can be immersed in water and will dry off rapidly, permitting bathing or showering.
- 30 8 A splint for the stabilisation of limb fractures comprising a spine, location means adapted to locate the spine in alignment with a limb, and a first adjustable collar on the spine adapted to immobilise and exert pressure at the fracture site, in which said location means comprise a second adjustable collar on the spine adapted to hold the spine to the
- 35 limb.
- 9 A splint according to claim 8, in which at least one of the collars is adjustable lengthways of the spine.
- 40 10 A splint according to claim 9, in which at least one collar is slidable along the spine.
- 11 A splint according to claim 9 or claim 10, in which the collar lockable against movement along the spine.

12 A splint according to claim 11, in which the collar is unlocked for movement by a key.

13 A splint according to any one of claims 1 to 12, comprising a third adjustable
5 collar serving to prevent the splint moving distally along a limb.

14 A splint according to claim 13, for a Colles fracture, in which the third collar comprises a hand support carriage, located adjacent the first collar, remote from the second collar.

10

15 A splint according to claim 14, in which the third collar is fixed to the spine.

16 A splint according to claim 13 or claim 14, in which the spine is curved between the first and third collars correspondingly to the shape of the arm.

15

17 A splint according to claim 14, produced in right arm and left arm models.

18 A splint according to any one of claims 1 to 17, in which the collars are in the form of straps.

20

19 A splint according to claim 18, in which the straps locate in slots and are lockable therein by a ratchet mechanism, the straps having ratchet perforations that can be slid over a sprung detent on the spine on tightening, but held thereby against retraction.

25

20 A splint according to claim 19, in which the sprung detent can be released for adjustment or removal of the straps.

21 A splint according to any one of claims 1 to 20, adapted to be used in conjunction with a base unit, to which it may be clamped for application and adjustment of the splint.

30

22 A splint according to claim 21, in which the base unit comprises a base plate with at least one sliding carriage that may be attached to an adjustable collar.

23 A splint according to claim 22, in which, when the splint is on the base unit, the adjustable collar is released to be movable along the spine.

35

24 A splint according to claim 22, in which the adjustable collar can be released for movement along the spine by use of a key.

40

25 A splint according to any one of claims 1 to 24, in which a skin/splint interface pad comprises a pad component for direct contact with the skin that allows liquid and vapour phase water to escape from the skin.

45

26 A splint according to claim 25, in which the pad component comprises a small mesh textile outer component and a larger mesh substrate.

27 A splint according to claim 25 or claim 26, in which the textile is on a moulded support that has vents for escaping water.

5 28 A splint according to any one of claims 25 to 27, in which the pad has an edge region that is curved in profile whereby to avoid in use pinch shear of underlying tissues.

10 29 A splint for the stabilisation of limb fractures comprising a skin/splint interface pad adapted to be located at the fracture site, and the splint including the pad is made of material that can be immersed in water and will dry off rapidly, permitting bathing or showering.

15 30 A splint according to claim 29, in which the pad comprises a pad component for direct contact with the skin that allows liquid and vapour phase water to escape from the skin.

31 A splint according to claim 30, in which the pad component is made of textile material.

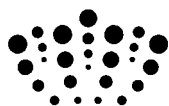
20 32 A splint according to claim 31, in which the pad component comprises a small mesh textile outer component and a larger mesh substrate.

25 33 A splint for the stabilisation of limb fractures, comprising a spine with lockable collar means adapted to secure the spine to the limb, and a base adapted to receive the spine during fitting and adjustment procedures and comprising locking/unlocking means for the collar means.

30 34 A splint according to claim 33, said collar means comprising two or more collars and said locking/unlocking means being operable to lock/unlock the collars simultaneously.

35 35 A splint according to any one of claims 1 to 34, made substantially or completely of recyclable or disposable material.

36 A splint according to claim 35, made of polypropylene.



Application No: GB1300713.3

Examiner: Emily Jones

Claims searched: 1-28

Date of search: 19 April 2013

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 2, 7-10, 13-20 and 25-28 at least	US 5601597 A (ARROWOOD et al) See whole document
X	1, 2, 7-10, 13-20 and 25-27 at least	US 3776225 A (LONARDO) See whole document
X	1, 2, 6, 8-11 and 13 at least	US 2007/032756 A1 (WIN) See whole document

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X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC

A61F

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
None		