Safety Guard for Syringe Needle

Technical Field

This invention relates generally to a safety guard for a syringe needle and more particularly, though not exclusively, to a safety guard for hypodermic needle assemblies able to shield a tip of the needle before, during and after use.

Background

Medical care of individuals requires the widespread use of needles for taking blood samples, intravenous drug delivery, and the introduction or removal of other fluids via canula, needles, or syringes. In the current context, the use of hypodermic needles to deliver plasma, anaesthetics, or other medications has become commonplace in medicine, science, veterinary medicine, and biotechnology. The use of a hypodermic needle typically involves first inserting a needle into the patient, injecting a substance or withdrawing a substance as required, and then removing the needle from the patient. In most applications, the withdrawn and contaminated needle must be handled very carefully during disposal to avoid 'needle stick' injury.

To help prevent health care workers from being injured, guards have been developed to block the tips of these needles after use. Needle stick protection for medical professionals has become of particular importance in recent years because of the prevalence of potentially fatal infectious diseases, such as Acquired Immune Deficiency Syndrome (AIDS) and hepatitis, and that can be transmitted by the exchange of bodily fluids through inadvertent wounds caused by accidental needle tip pricks after

withdrawal from infected patients. Accordingly, many kinds of needle protection devices are available for providing post injection needle stick protection.

Devices with integrated safety features which have been introduced to provide protection against punctures by hypodermic needles fall into three basic categories: those which withdraw the needle into the barrel of the syringe after use; those with a hinged needle guard which rotates into position over the needle; and those with a sliding shield which moves along the needle shaft and covers its tip. The guards may be manually moved into position by the user or given mechanical assistance such as, for example, by the use of springs or suction.

A key problem with manually activated designs is that they require the user to either slide or apply the needle shield to the tip of the needle by hand, significantly raising the risk of unintentional contact with the needle tip. In addition, many of these needle guards interfere with the ability to use the syringe with single hand so a powered device is desirable.

Even amongst powered devices, a pervasive problem with most existing designs is that they provide no integrated facility for covering the needle tip before and during loading of the drug such as, for example, from a vial. The safety features are only activated following use. This increases the likelihood of needle stick injury. To solve this issue, additional safety caps are often provided but these increase the cost of the devices and introduce an additional user action – removal of the safety cap – where accidental puncturing of the skin can occur.

There are a few designs which have attempted to provide protection before and after use. These are generally operated manually or are spring biased to extend a tubular shield and enclose the needle canula. These systems mainly include spiral or complicated channels cut into the shield which guide it during extension and lock it in the extended position. A problem with these designs is that the track systems may not always be reliable.

Also, trigger-based systems may be activated unintentionally. This may happen in circumstances such as, for example, if the needle contacts a bone in the patient. This leads to discomfort for the patient and potentially serious danger from air bubbles being introduced into the blood stream due to cavitation. Furthermore, the activation of the trigger-based system is often unintuitive for users, leading to potential errors in operation.

Summary

According to an exemplary aspect there is provided a safety guard for a needle of a syringe. The safety guard comprises a hub for engagement with the syringe and having a distal end for engagement with a proximal end of a traveller. The traveller is for limited rotational and longitudinal movement relative to the hub and has at least one external key for slideable engagement therewith of at least one U-shaped keyway in a frame, the slideable engagement being for rotational and axial movement. The frame is for sliding engagement with the traveller and has at a distal end thereof a cap, and has a

resilient member extending between the traveller and a cap. The cap is secured to the frame and comprises a central passageway for receiving therein a tip of the needle.

According to another exemplary aspect there is provided a safety guard for a needle of a syringe, the safety guard comprising a hub for engagement with the syringe and having a distal end with a first saw-tooth formation for engagement with a second saw-tooth formation of a traveller. The traveller is for limited rotational and longitudinal movement relative to the hub for engagement and disengagement of the first saw-tooth formation and the second saw-tooth formation. The traveller has at least one external key for slideable engagement therewith of angled ridges of at least one keyway in a frame, the slideable engagement being for rotational and axial movement. The frame has a resilient member extending between the traveller and a cap. The rotational movement of the traveller relative to the hub is able to be induced by the effect of the resilient member on the interaction of: the at least one external key and the angled ridges, and the first saw-tooth formation with the second saw-tooth formation.

For the other exemplary aspect the at least one keyway may be U-shaped; and the cap may be at a distal end of the frame. The cap may be secured to the frame and may comprise a central passageway for receiving therein a tip of the needle.

For both aspects the at least one U-shaped keyway may have a first portion for axial movement of the frame relative to the traveller, a second portion for relative rotational and axial movement of the frame and the traveller, and third portion for relative axial

movement of the frame and the traveller; the angled ridges being a part of the second portion.

The third portion may comprise a lock for engaging the at least one external key to lock the tip of the needle within the central passageway. The cap may comprise an end projection having a flared distal end. The hub may be integral with a body of the needle and may comprise a generally cylindrical body with a hollow interior, and at least one recess with a cut-out formed therein.

For the first aspect a distal end of the hub may have a first saw tooth formation thereon comprising a plurality of first teeth. The traveller may have a distal end with a proximal edge comprising a second saw tooth formation comprising a plurality of second teeth for releasable engagement with the plurality of first teeth of the first saw tooth formation.

For the other aspect the traveller may be cylindrically shaped and may have has a proximal end to engage within the hub, and the distal end may be of a diameter greater than the proximal end diameter; the proximal end having a proximal end wall for engagement thereon of the resilient member.

The traveller may comprise a tab for engagement with the cut out to limit the longitudinal and rotational movement of the traveller relative to the hub.

The at least one external key may extend longitudinally and may be radially outwardly directed of the traveller; and may have cylindrical outer faces and an angled proximal end.

The frame may be hollow and may comprise a cylindrical base and a plurality of columns extending longitudinally outwardly from the cylindrical base. There may be a gap between adjacent columns of the plurality of columns. Each of the plurality of columns may be shaped as a segment of a cylinder. The safety guard may further comprise a finger-grippable collar extending radially outwardly and longitudinally inwardly of the cylindrical base.

The hub may comprise at least one radially-outwardly extending key extending longitudinally of the hub of for engagement with at least one further keyway of the frame. The engagement may be for axial but not rotational movement.

The first and third portions of the at least one keyway may extend longitudinally of the frame. The second portion of the at least one U-shaped keyway may extend laterally of and connect the first and third portions of the at least one keyway. The first portion of the at least one keyway may be coincident with the at least one further keyway.

The cap may further comprise a cylindrical skirt and an end wall, the end wall being for engagement therewith by the resilient member. The end wall may be the maximum extent of axial movement of the traveller. The resilient member may be within the traveller at the maximum extent of axial movement.

The frame may be moveable relative to the needle between an extended position where the tip of the needle is within the passageway, and at least one retracted position where the tip of the needle extends beyond the passageway and the cap. When the at least one external key is in the first portion the frame may be moveable between the extended position and a first retracted position. The second portion may comprise a step contactable by the at least one external key for releasably retaining the frame in a second retracted position. The second portion may further comprise a second ridge over which the at least one external key must pass to enter the third portion. When the at least one external key is in the third portion a distal end of the at least one external key may engage a tab in the third portion to retain the frame in the extended position.

The resilient member may be at least one of: mounted within the frame, and built in to the frame.

Brief Description of the Drawings

In order that the invention may be fully understood and readily put into practical effect there shall now be described by way of non-limitative example only preferred embodiments of the present invention, the description being with reference to the accompanying illustrative drawings.

In the drawings:

Figure 1 is a perspective of an exemplary embodiment assembled with a syringe in its initial state;

Figure 2 is a perspective view of the assembly of Figure 1 with the exemplary embodiment in its activated state;

Figure 3 is an exploded perspective view of the assembly of Figures 1 and 2;

Figure 4 is a cross-sectional view along the lines of and in the direction of arrows 4 – 4 on Figure 3;

Figure 5 is a front perspective view of a column as shown in Figures 3 and 4;

Figure 6 is a front elevation view of the exemplary embodiment of Figures 1 to 5 in a first use position;

Figure 7 is a front elevation view of the exemplary embodiment of Figures 1 to 5 in a second use position;

Figure 8 is a front elevation view of the exemplary embodiment of Figures 1 to 5 in a third use position;

Figure 9 is a front elevation view of the exemplary embodiment of Figures 1 to 5 in a fourth use position;

Figure 10 is a front elevation view of the exemplary embodiment of Figures 1 to 5 in a fifth use position;

Figure 11 is a front elevation view of the exemplary embodiment of Figures 1 to 5 in a sixth use position;

Figure 12 is a front elevation view of the exemplary embodiment of Figures 1 to 5 in a seventh use position;

Figure 13 is a front elevation view of the exemplary embodiment of Figures 1 to 5 in an eighth use position;

Figure 14 is a front elevation view of the exemplary embodiment of Figures 1 to 5 in a ninth use position; and

Figure 15 is a front elevation view of the exemplary embodiment of Figures 1 to 5 in a tenth use position.

Detailed Description of Exemplary Embodiments

The exemplary embodiment is safety guard for a needle of a syringe such that, when attached to the syringe, the sharp distal needle tip is shielded during the majority of typical user actions, yet remains under the full control of the user.

Typical user actions include the removal of the device from its packaging, attachment to a syringe, loading of medicament into the device, temporary storage while awaiting use, transportation to or from a patient, injection of medicament into a patient, withdrawal of fluid such as blood from a patient, temporary storage following use and permanent device disposal.

As shown in the drawings there is a guard 10 for releasable attachment to a body 14 of a typical syringe 12. This may be by the use of a standard attachment mechanism such as, for example, a Luer lock 20, as shown.

As shown, the guard 10 is integral with a needle assembly comprising a needle 16 with a body 17 for attachment to the syringe 12, the needle having a needle tip 18 distal from the body 17. However, the guard 10 may be a separate component from the needle assembly that is securely and non-releasably attachable to the needle assembly.

The guard 10 has a hub 22 that is integral with and co-axial with the body 14. The hub 22 is also co-axial with the needle 16 and surrounds the needle 16. The hub 22 is that part of the guard 10 that is attachable to the syringe 12. The hub 22 has a generally cylindrical body 24 and a hollow interior 32. On the outer surface of body 24 are two longitudinally-extending, diametrically opposed and radially-outwardly directed keys 25. On the outermost edge of body 24 there is provided a saw-tooth formation 26 having a plurality of teeth 27. The saw-tooth formation 26 may be continuous or, as illustrated, discontinuous. If discontinuous, there are two, diagonally opposed sets of at least two teeth 27 each. The teeth 27 have a pitch and height relevant for interaction with another formation, as is described below. At the innermost end, the body 24 has two diametrically opposed recesses 28, each recess 28 having a cut-out 30.

Also co-axial with the needle 16 and surrounding the needle 16 is a generally cylindrical and hollow traveller 34 that is sized such that its proximal end 38 can be located within the cylindrical body 24 of hub 22. The distal end 36 of traveller 34 is of a diameter that is greater than the diameter of the proximal end 38. The proximal end 38 has a proximal end wall 39 with a central opening 41 through which passes the needle 16.

The distal end 36 of the traveller 34 has an outer wall 40 that at its proximal edge 42 has a saw-tooth formation 44 with a plurality of teeth 45. The saw-tooth formation 44 may be continuous or, as illustrated, discontinuous. If discontinuous, there are two, diagonally opposed sets of at least two teeth 45 each. The formation 44 is complimentary with and adapted to releasably engage the formation 34. The teeth 45 may be angled from 10 to 80 degrees, but are preferably about 30 degrees.

When the traveller 34 is engaged with the hub 22 it is prevented from longitudinal movement relative to the hub 22 by a flexible tab 46 with a ridge 48 that engages the cut-out 30. The traveller 34 is free to rotate relative to hub 22 within the limits defined by the arcuate length of the cut-outs 30. The traveller 34 is able to move longitudinally relative to the hub 22 by a pre-determined distance defined by the axial length of the cut-outs 30. The longitudinal movement is preferably slightly greater then the height of each of the teeth 27, 45 to enable the teeth 27, 45 to be able to engage with each other and to disengage from each other.

Although the teeth 27, 45 and the formations 26, 44 are shown and described as saw-tooth, they may be of any other suitable shape and formation such as, for example, approximating a sine wave.

On the outer surface of wall 40 of the distal end 36 of the traveller 34 are longitudinally-extending, diametrically opposed and radially-outwardly directed keys 50. It is preferred that the keys 50 have cylindrical outer faces and angled proximal tips. The keys 50 are able to be rotationally offset from the keys 25 of hub 22 by up to a predetermined angle that is related to the chosen number and angle of the teeth. Thus the linear offset may be in the range 20% to 80% of the tooth length projected onto the hub 22 diameter, and is more preferably about 50% of the projected tooth length.

The traveller 34 is adapted to engage within a hollow frame 52 that is also co-axial with and at least partially surrounds the needle 16. The frame 52 has a cylindrical base 54

and a plurality of columns 58 extending longitudinally outwardly from the base 54 towards the distal tip 18 of the needle 16. Each column 58 is generally shaped as a segment of a cylinder. Extending radially outwardly and longitudinally inwardly from the base 54 is a collar 56 with an angled face such that it can be easily grasped by the fingers and thumb of a user. By having a plurality of columns 58, a gap 88 is created between adjacent columns 58 to enable the correct operation of the guard 52 to be observed. Any error in operation, or malfunction, can easily be seen through the gaps 88.

The hollow frame 52 may also comprise a single solid cylinder, preferably of a clear material to allow easy viewing of the device internals and the hub 22 for blood 'flashback'. The hollow frame 52 may also be fully cylindrical at the proximal and distal ends with gaps 88 fully contained within the axial portion of the frame 52.

Each of the columns 58 contains substantially linear, recessed keyways 60, 61 that are able to slideably engage the keys 25 of hub 22 and keys 50 of traveller 34 respectively. Each keyway 60 receives a key 25 therein for relative axial movement, but not relative rotational movement.

Each keyway 61 is to slideably receive a key 50 therein and is generally U-shaped and has three portions:

a first portion 61a,

a second portion 61b defined by angled ridges 62 at the distal end of the keyway 61 and which are able to be engaged by the proximal ends of keys 50 of traveller 34, and

a third portion 61c.

The first and third portions 61a and 61c extend longitudinally of the columns 58, whereas the second portion 61b extends generally laterally of and connects the first and third portions 61a and 61c. Preferably, the second portion 61b is inclined relative to the first portion 61a at an included angle of about 45° and to the third portion 61c at an included angle of about 45°. As shown, the first portion 61a is coincident with keyway 60, but they may be separate keyways if required or desired. When the keyways 60, 61a are coincident, they keys 25, 50 will be longitudinally aligned in the coincident keyway 60, 61a. When the keys 25, 50 are longitudinally aligned, the teeth 27 do not engage and the peaks of teeth 27 are longitudinally aligned with the peaks of the teeth 50. In this position, the tab 46 is at an end of the cut-out 30 and thus can travel in one rotational direction. Therefore, the traveller 34 can rotate relative to the hub 22 in one direction only.

Either or both of the keyways 60, 61, but preferably only the keyway 61, have flexible tabs 64 that are able to lockably engage with the distal ends of the relevant keys 25, 50, preferably the distal ends of the keys 50 of traveller 34. As is explained below, this is to lock the needle tip 18 in a safe and secure position. These tabs 64 may also be located in the body of the frame 52, projecting into one or more of the keyways 60, 61.

Keyways 60 are such that the keys 25 cannot leave the keyways 60 thereby permitting relative axial movement but preventing relative rotational movement.

Securely attachable to the distal end of the columns 58 is an end cap 66 with a central, cylindrical passageway 68 which is able to slideably engage with the needle 16. The cap 66 can be fixedly attached to the distal end of the columns 58 by any suitable attachment mechanism including, but not limited to, a buckle 70 engaging a clip 72. The cap 66 has an end projection 74 with a flared distal end 76. At the proximal end of the cap 66 is a substantially cylindrical skirt 78 and end wall 82. The skirt 78 engages the inner surface of the columns 58 to stabilise the frame 52, and the end wall 82 contains the traveller 34 within the columns 58.

A flexible, resilient member 80 such as, for example, a compression spring is co-axial with and surrounds the needle 16. The resilient member 80 may be of any other suitable form including, but not limited to, additional longitudinal columns of the frame 52, or foam. The spring 80 engages and extends between the end wall 39 of traveller 34 and end wall 82 of cap 66. The spring 80 provides an engaging force so the traveller 34 is forced towards the fixed hub 22, as well as a separating force to force the traveller 34 away from the cap 66.

The use of the safety guard 10 will now be described with reference to Figures 6 to 15.

To use the safety guard 10, the user removes it from its storage or packaging and, in the Luer lock form shown, attaches it to the syringe body 14 by grasping the frame 52,

placing the guard 10 with needle assembly in position and rotating until a seal is made between the syringe body 14 and the hub 22. This assembly will now be referred to as a hypodermic syringe. In the original position as shown in Figure 6, the needle tip 18 is within passageway 68 and does not extend beyond the fared distal end 76.

To charge the hypodermic syringe 10, 12 with medicament, the flared distal end 76 of cap 66 is pressed against the membrane 6 of a typical medicament vial 8 (Figure 7). The pressure of the membrane 6on the relatively large surface area of the flared distal end 76 causes the cap 66 and frame 52 to slide axially relative to the needle 16 towards the proximal end against the force of the spring 80, with the keyways 60, 61a sliding over the keys, 25, 50 respectively. This exposes the needle tip 18 to the membrane 6 and allows the needle tip 18 to penetrate the membrane 6. The maximum extent of movement is when the traveller 34 contacts the end wall 82. This will allow a large portion of the needle 16 to extend beyond the flared distal end 76 and thus be exposed. The thickness of the compressed spring 80 at the maximum extent of movement will be accommodated within the traveller 34 between the traveller end wall 39 and the end wall 82. The user then pulls back the syringe plunger 4(Figure 8), drawing fluid through the sealed inner passageway consisting of the needle 16 and hub 22 into the syringe 12. When fully charged (Figure 9), the hypodermic syringe 10, 12 is removed from the vial 8, and frame 52 with cap 66 return to their original position under the influence of the spring 80 to cover the needle tip 18 with the needle tip 18 being within passageway 68 and not extending beyond the fared distal end 76. The hypodermic syringe 10, 12 can then be transported to the patient or safely stored for a short period until the injection of

the medicament is required. The hypodermic syringe 10, 12 can be charged with multiple medicaments as the structure of the guard allows this.

When the injection is required (Figure 10), the collar 56 is grasped firmly and pulled axially inwardly (towards the syringe 12), fully exposing a significant portion of the needle 16, and the needle tip 18, until a stop is felt and an audible 'click' is heard. During this motion the keyways 60, 61a move over the keys 25 of hub 22, and keys 50 of traveller 34, respectively. When the keys 50 are clear of the keyway 61a the traveller 34 is able to rotate until the keys 50 are able to engage the angled ridges 62 of keyway portion 61b. This is because the pressure of the spring 80 on the teeth 45, 27 is able to rotate the traveller 34 about the longitudinal axis relative to the hub 22 until teeth 45 fully engage between teeth 27. The rotation to enable the teeth 27, 45 to engage moves the keys 50 to be over the second portion 61b. As mentioned above, when the keys 25, 50 are in the keyways 60, 61a, the keys 25, 50 are longitudinally aligned, the teeth 27, 45 are not engaged, and tab 46 is at one end of the cut-out 30. Therefore, traveller 34 can rotate relative to hub 22 in one direction only – to move the keys 50 over second portion 61b. Key 25 remains in keyway 60.

The collar 56 is then released (Figure 11). The force provided by the helical spring 80 and the interaction at the proximal end of the keys 50 causes:

the guard 52 to move axially outwardly relative to the traveller 34 to allow keys 50 to engage keyway portion 61b, and

for traveller 34 to continue rotating about the longitudinal axis as the key 50 engages the second portion 61b due to the angled nature of the angled ridges 62 of

second portion 61b until the keys 50 reach the step 84 of the angled ridges 62. The force of the spring 80 firmly holds the frame 52 and cap 66 in position with the needle tip 18 exposed due to the keys 50 pressing on step 84. The injection or fluid sample withdrawal can then take place (Figure 12).

When the injection or fluid withdrawal has been completed and the needle 16 has been removed from the patient (Figure 13), the collar 56 is grasped and pulled axially towards the syringe 12 until a stop is felt and audible click is heard. During this motion:

the keys 50 are disengaged from the step 84 and are moved relative to the columns 58 axially beyond the step 84 towards the distal end of the columns 58,

the pressure of the spring 80 on the teeth 45, 27 rotates the traveller 34 about the longitudinal axis relative to the hub 22 until teeth 45 fully engage between teeth 27. This is the audible click that is heard. Keys 50 then pass over a second ridge 86 of angled ridges 62 towards the third keyway portion 61c.

The collar 56 can then be released (Figure 14). During the following motion, the interaction of the distal end of the keys 50 and the angle of the second ridge 86 as well as the nature of the angles of the teeth 27, 45 cause the traveller 34 to rotate about the longitudinal axis relative to hub 22 past the second ridge 86 as the teeth 27, 45 disengage such that the keys 50 align with the third keyway portions 61c.

The force of the spring 80 then causes the keyway portions 61c to move relative to the keys 50 until the keys 50 reach the proximal end of the frame 52 (Figure 15). The frame 52 and cap 66 are then prevented from sliding longitudinally towards the distal tip 18 by

the flexible tab 16 with a perpendicular face that securely engages with the distal edge of the keys 50. This is the final operational position of the safety guard 10. The needle tip 18 is within passageway 68 and does not extend beyond the fared distal end 76. The hypodermic syringe 10, 12 can then be stored and disposed of in accordance with known, correct procedures.

During the entire usage cycle a user's hands need approach no nearer to the distal tip than the collar 56. During fluid injection or withdrawal from the patient, there is a clear view of the needle tip 18, a substantial length of needle available for deep penetration, and a locking mechanism so the safety guard 10 should not be triggered accidentally.

Prior to fluid injection or extraction from the patient, the user is provided with a positive, intuitive action for uncovering the needle tip. This action is substantially similar to the action used during injection and therefore requires little or no training. Following injection, there is a similar positive, intuitive action for re-covering the needle tip 18 as already performed. This action is substantially similar to the action used prior to injection and therefore requires no additional training.

Once the final state is activated, the guard is locked in position, preventing re-use of the needle 16 as well as needle stick injury during disposal.

Whilst there has been described in the foregoing description exemplary embodiments of the present invention, it will be understood by those skilled in the technology concerned that many variations in details of design, construction and/or operation may be made

without departing from the present invention.

The Claims

1. A safety guard for a needle of a syringe, the safety guard comprising:

a hub for engagement with the syringe and having a distal end with a first saw-tooth formation for engagement with a second saw-tooth formation of a traveller;

the traveller being for limited rotational and longitudinal movement relative to the hub for engagement and disengagement of the first saw-tooth formation and the second saw-tooth formation, the traveller having at least one external key for slideable engagement therewith of angled ridges of at least one keyway in a frame, the slideable engagement being for rotational and axial movement; the at least one external key being discrete from the second saw-tooth formation;

the frame having a resilient member extending between the traveller and a cap; the frame at least partially surrounding the needle; and

the rotational movement of the traveller relative to the hub being able to be induced by the effect of the resilient member on the interaction of: the at least one external key and the angled ridges, and the first saw-tooth formation with the second saw-tooth formation.

2. A safety guard as claimed in claim 1, wherein the at least one keyway is U-shaped; and the cap is at a distal end of the frame, the cap being secured to the frame and comprising a central passageway for receiving therein a tip of the needle.

3. A safety guard as claimed in claim 2, wherein the at least one U-shaped keyway has a first portion for axial movement of the frame relative to the traveller, a second portion for relative rotational and axial movement of the frame and the traveller, and

third portion for relative axial movement of the frame and the traveller; the angled ridges being a part of the second portion.

4. A safety guard as claimed in claim 3, wherein the third portion comprises a lock for engaging the at least one external key to lock the tip of the needle within the central passageway.

5. A safety guard as claimed in any one of claims 1 to 4, wherein the cap comprises an end projection having a flared distal end.

6. A safety guard as claimed in any one of claims 1 to 5, wherein the hub is integral with a body of the needle and comprises a generally cylindrical body with a hollow interior, and at least one recess with a cut-out formed therein.

7. A safety guard as claimed in any one of claims 1 to 6, wherein the traveller is cylindrically shaped and has a proximal end to engage within the hub, and the distal end is of a diameter greater than the proximal end diameter; the proximal end having a proximal end wall for engagement thereon of the resilient member.

8. A safety guard as claimed in claim 6 or claim 7 when appended to claim 6, wherein the traveller comprises a tab for engagement with the cut out to limit the longitudinal and rotational movement of the traveller relative to the hub.

9. A safety guard as claimed in any one of claims 1 to 8, wherein the at least one external key extends longitudinally and is radially outwardly directed of the traveller; and has cylindrical outer faces and an angled proximal end.

10. A safety guard as claimed in any one of claims 1 to 13, wherein the frame is hollow and comprises a cylindrical base and a plurality of columns extending longitudinally outwardly from the cylindrical base, there being a gap between adjacent columns of the plurality of columns.

11. A safety guard as claimed in claim 10, wherein each of the plurality of columns is shaped as a segment of a cylinder.

12. A safety guard as claimed in claim 10 or claim 11 further comprising a finger-grippable collar extending radially outwardly and longitudinally inwardly of the cylindrical base.

13. A safety guard as claimed in any one of claims 1 to 12, wherein the hub comprises at least one radially-outwardly extending key extending longitudinally of the hub of for engagement with at least one further keyway of the frame, the engagement being for axial but not rotational movement.

14. A safety guard as claimed in claim 3, or any one of claims 4 to 13 when appended to claim 3, wherein the first and third portions of the at least one keyway extend longitudinally of the frame, and the second portion of the at least one U-shaped keyway extends laterally of and connects the first and third portions of the at least one keyway.

15. A safety guard as claimed in claim 14 when appended to claim 13, wherein the first portion of the at least one keyway is coincident with the at least one further keyway.

16. A safety guard as claimed in any one of claims 1 to 15, wherein the cap further comprises a cylindrical skirt and an end wall, the end wall being for engagement therewith by the resilient member.

17. A safety guard as claimed in claim 16, wherein the end wall is the maximum extent of axial movement of the traveller; the resilient member being within the traveller at the maximum extent of axial movement.

18. A safety guard as claimed any one of claims 2 to 17, wherein the frame is moveable relative to the needle between an extended position where the tip of the needle is

within the passageway, and at least one retracted position where the tip of the needle extends beyond the passageway and the cap.

19. A safety guard as claimed in claim 18, wherein when the at least one external key is in the first portion the frame is moveable between the extended position and a first retracted position.

20. A safety guard as claimed in claim 18 or claim 19, wherein the second portion comprises a step contactable by the at least one external key for releasably retaining the frame in a second retracted position.

21. A safety guard as claimed in any one of claims 18 to 20, wherein the second portion comprises a second ridge over which the at least one external key must pass to enter the third portion.

22. A safety guard as claimed in any one of claim 18 to 21, wherein when the at least one external key is in the third portion a distal end of the at least one external key engages a tab in the third portion to retain the frame in the extended position.

23. A safety guard as claimed in any one of claims 1 to 22, wherein the resilient member is as least one selected from the group consisting of: mounted within the frame, and built in to the frame.