

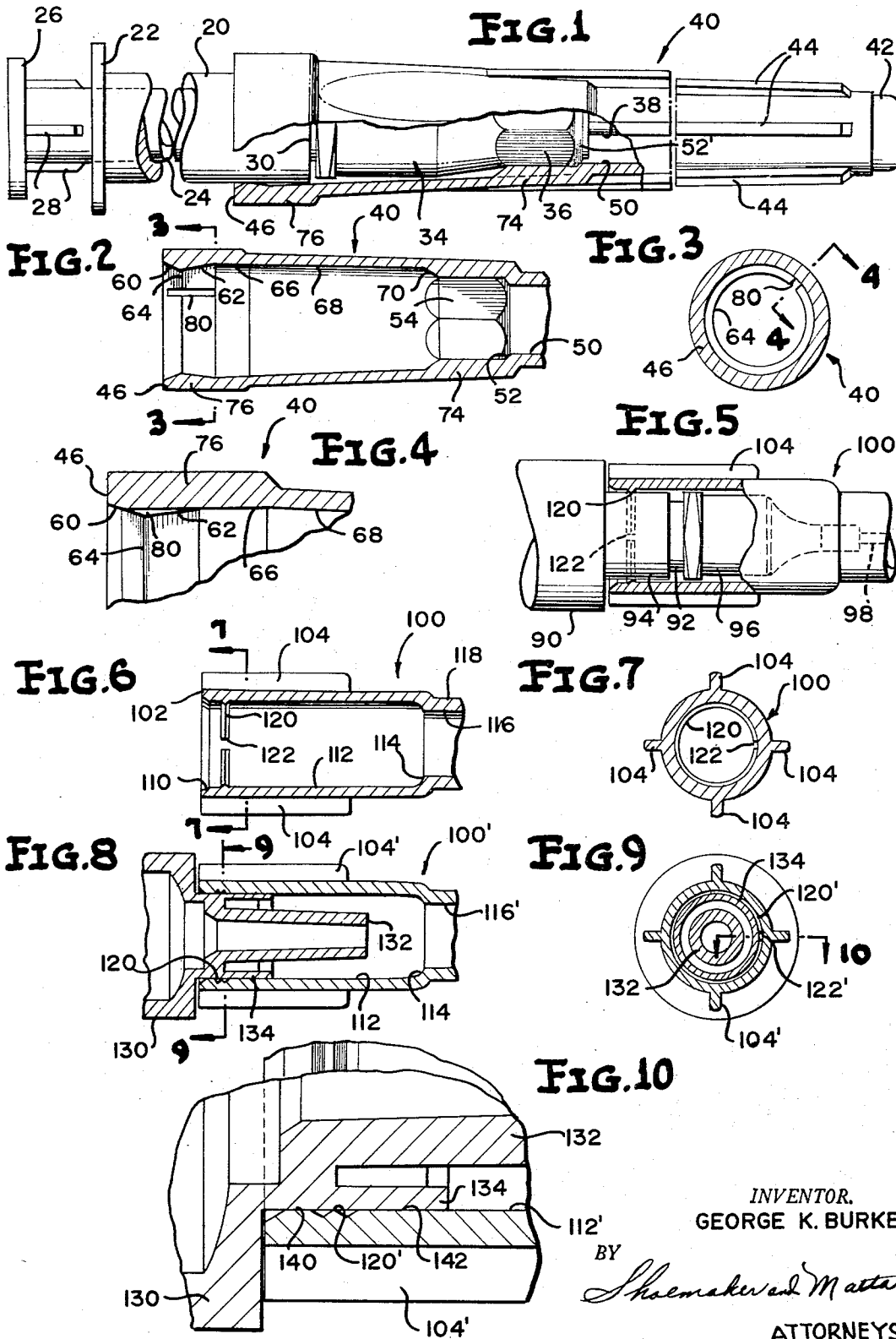
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HYPODERMIC NEEDLE GUARD

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1

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HYPODERMIC NEEDLE GUARD

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ABSTRACT OF THE DISCLOSURE

The hypodermic needle secured to a syringe is enclosed in a guard formed of resilient material which has a closed end and an open end. The open end telescopes over the syringe. The hub of the needle has flat surfaces defining a polygonal sectional configuration. The bore of the guard has a medial portion shaped to snugly fit the polygonal configuration of the hub of the needle. The bore at the open end of the guard has a peripheral transversely grooved sealing rib which contacts the syringe. The dimension of the groove is such as to permit suitable flow of gas during sterilization procedure but to restrict the flow of gas past the rib under normal atmospheric conditions.

The present invention relates to a new and novel hypodermic needle guard, and more particularly to a needle guard adapted to be employed with a hypodermic syringe.

The needle guard of the present invention is especially adapted for use with hypodermic syringes of the disposable type which are discarded after a single use thereof. The needle guard is of course provided principally for the purpose of protecting the needle from physical damage and also to maintain sterility of the needle and associated syringe portions.

Since the needle guard is especially suited for use with a disposable type syringe, the needle guard should be of such a construction that it can be manufactured at a minimum cost. At the same time, it is essential to provide sufficient strength and rigidity to the needle guard so that it will adequately protect a hypodermic needle disposed therewithin when the needle guard is mounted upon a hypodermic syringe.

This type of needle guard is generally mounted in position simply by slipping it over a portion of the syringe whereupon means provided on the needle guard itself will ensure that the needle guard remains securely in operative position. This means in the present invention takes the form of an internal rib formed adjacent the open end of the needle guard and which is adapted to snugly engage an outer surface portion of an associated syringe.

When the hypodermic needle has been mounted upon the hypodermic syringe and the needle guard mounted in operative position, the entire assembly is sterilized. The needle guard of the present invention incorporates a unique construction which permits sterilization of the assembly to take place while the guard is in operative position on the syringe, and furthermore wherein sterility is maintained by the needle guard under normal atmospheric conditions until the needle guard is removed from the associated syringe.

In order to provide these desired results, the internal rib formed adjacent the open end of the needle guard is provided with a longitudinally extending cutout or space which permits flow of gas past the rib. This cutout or

2

space enables suitable flow of gas during the sterilizing procedure, and yet at the same time is of such a dimension as to restrict flow of gas past the rib under normal atmospheric conditions.

In order to understand the nature of the operation of the rib and the cutout provided therein, it should be understood that the over-all assembly is normally sterilized by utilizing a sterilizing gas such as a combination of carbon dioxide and ethylene oxide which may be used either in the proportions of 90% carbon dioxide, 10% ethylene oxide, or 80% carbon dioxide, 20% ethylene oxide. In the sterilization procedure, the assembly is first subjected to a vacuum cycle wherein the air trapped within the needle guard is drawn outwardly therefrom, the cutout provided in the rib permitting free passage of air therethrough during the vacuum cycle.

After completion of the vacuum cycle, the sterilizing gas is forced back into the hollow needle guard through the aforesaid passage during the pressurizing cycle of the procedure. This sterilizing gas will then substantially fill the needle guard and the associated hypodermic assembly, and the cutout portion is of such a small dimension that when the pressure within the needle guard is equalized with the ambient pressure, there will be no further flow of gas in either direction through the cutout portion so that the sterilizing gas will remain within the hollow needle guard and maintain the sterile condition of the hypodermic needle.

It is evident that the tight fit of the rib formed on the needle guard with an outer surface portion of the syringe will serve to maintain this sterile condition, and in some instances, a surface-to-surface sealing area may be provided between the outer surface of the syringe and portions of the bore wall of the needle guard on either side of the rib formed thereon. This surface-to-surface contact may substantially increase the sealing area so as to further ensure a sterile seal.

It is also noted that the needle guard is formed of a relatively flexible material such as polyethylene, and the polyethylene material is sufficiently flexible so as to permit gas or air to pass between the contacting surfaces of the needle guard and the syringe during the sterilizing procedure when sufficient pressure differential exists. This action may take place when the pressure differential applied is such that the gas or air cannot pass through the cutout portion formed in the rib with sufficient rapidity.

An object of the present invention is to provide a new and novel hypodermic needle guard which is adapted to fit over a portion of a hypodermic syringe and physically protect the hypodermic needle associated therewith.

Another object of the invention is the provision of a hypodermic needle guard including means for securely maintaining the needle guard in operative position.

A further object of the invention is to provide a hypodermic needle guard which will provide a sterile seal with the associated syringe.

Still another object of the invention is the provision of a hypodermic needle guard including means which enables sterilization of the assembly while the needle guard is in operative position and wherein such means also will function to retain the sterile condition under normal atmospheric conditions.

A still further object of the invention is the provision of a hypodermic needle guard which is quite simple and

inexpensive in construction, and yet which at the same time is quite effective and reliable in use.

Other objects and many attendant advantages of the invention will become more apparent when considered in connection with the specification and accompanying drawings, wherein:

FIG. 1 is a view partly broken away illustrating a first form of the needle guard of the present invention in assembled relationship with a hypodermic syringe and needle;

FIG. 2 is a sectional view through a portion of the needle guard shown in FIG. 1;

FIG. 3 is a sectional view taken substantially along line 3—3 of FIG. 2 looking in the direction of the arrows;

FIG. 4 is a sectional view taken substantially along line 4—4 of FIG. 3 looking in the direction of the arrows;

FIG. 5 is a view partly broken away illustrating a modified form of needle guard mounted on a hypodermic syringe having a hypodermic needle therein;

FIG. 6 is a vertical section through the needle guard shown in FIG. 5;

FIG. 7 is a sectional view taken substantially along line 7—7 of FIG. 6 looking in the direction of the arrows;

FIG. 8 is longitudinal section illustrating a needle guard such as shown in FIGS. 5 through 7 mounted upon a modified form of hypodermic syringe;

FIG. 9 is a sectional view taken substantially along line 9—9 of FIG. 8 looking in the direction of the arrows; and

FIG. 10 is an enlarged view of a portion of the structure shown in FIG. 8.

Referring now to the drawings wherein like reference characters designate corresponding parts throughout the several views, a first modification of the invention is illustrated in FIGS. 1 through 4 inclusive. As seen particularly in FIG. 1, a hypodermic syringe includes a barrel 20 which is formed of a material such as polypropylene or the like having desired characteristics for use in this type of application. The barrel is provided with an integral laterally extending flange 22 at one end thereof, this flange serving as an area for gripping by the fingers of an operator and also preventing rolling of the syringe by having opposite flat sides formed thereon.

A plunger is slidably disposed within the barrel and includes a main elongated substantially cylindrical portion 24 having an enlarged end portion 26 at one end thereof which is adapted to be manually engaged by the thumb or the like for operating the plunger in the usual manner. The plunger is preferably formed of a material such as high impact styrene or a similar material. A plurality of laterally extending and angularly spaced ribs 28 are provided adjacent the enlarged end of the plunger for reinforcing and rigidifying this manually engageable end portion. It will be understood that a suitable resilient piston means is mounted at the opposite end of the plunger in the usual manner.

A boss 30 projects longitudinally from the opposite end of the barrel, this boss being indicated by reference numeral 30 and being of less cross sectional dimension than the barrel. The boss may be provided with an outer tapered surface which may comprise a Luer taper of well known construction for receiving the hub portion of a hypodermic needle having the cooperating taper for retaining the hypodermic needle thereon. A conventional hypodermic needle is provided, the needle including a hub portion indicated generally by reference numeral 34 which may be formed of anodized aluminum alloy or a plastic substance if desired, the hub having an internal taper complementary to the taper formed on boss 30 for retaining the needle in position. The hub portion also includes a polygonal outer surface 36 which in the instant case may be hexagonal in configuration, this type of construction being conventional in the art. The needle also includes a cannula portion 38 of hollow elongated configuration which terminates in a sharp point, this latter

portion being formed of stainless steel or a similar substance.

The needle guard itself is indicated generally by reference numeral 40 and comprises a one-piece homogeneous body means formed of a suitable resilient material such as polyethylene or the like. The needle guard body means includes a first end portion 42 which is closed, and a plurality of longitudinally extending outwardly projecting ribs 44 are provided, these ribs being equally angularly spaced about the outer periphery of the body means and in a typical example being six in number.

The body means is provided with a bore formed therein, the bore extending from a point adjacent the closed end portion 42 of the body means completely throughout the length of the body means and opening through the opposite enlarged end portion 46 of the needle guard. As seen most clearly in FIG. 2, the bore portion extending from a point adjacent the closed end portion of the needle guard is indicated by reference numeral 50, this portion being slightly tapered to a smaller dimension in a direction extending to the right as seen in this figure. Bore portion 50 joins with an internal shoulder portion 52, which in turn joins with a polygonal- or hexagonal-shaped internal bore portion 54. The portion 54 is adapted to snugly receive the portion 36 of the associated needle, these surfaces 54 and 36 being complementary to one another, and the internal shoulder 52 is adapted to engage a shoulder portion 52' formed on the needle hub as shown in FIG. 1, the interengagement between surfaces 52 and 52' serving to limit movement of the needle into the needle guard so that the pointed end of the needle will not come into contact with the closed end portion of the needle guard whereby the sharp end of the needle will not in any way be blunted.

Referring now to the open end portion 46 of the needle guard, the bore proceeding in a direction from the open end portion toward the closed end portion of the needle guard includes a first inwardly tapered surface 60 which tapers inwardly and intersects with an outwardly flared surface 62, the intersection between surfaces 60 and 62 defining a rib 64 which extends peripherally about the bore and of course is directed radially inwardly of the bore. Surface 62 in turn is joined with a second inwardly tapered surface 68 by an intermediate surface 66 which may be generally cylindrical. Inwardly tapered surface 68 in turn joins with a further inwardly tapered surface 70 which joins with the hexagonal bore portion 54 previously described.

It will be noted that the needle guard body means is provided with a first thickened wall portion 74 adjacent the bore portion 54, and a second thickened wall portion 76 is provided adjacent the open end portion of the body means. The thickened wall portion 74 serves to reinforce the body means at the point where the hub portion 36 of the needle is snugly received therein. The thickened portion 76 serves to reinforce the body means adjacent the point where the internal rib 64 is formed to ensure that an effective seal will be maintained between this rib and an associated syringe portion.

As seen especially in FIGS. 2, 3 and 4, the rib 64 has a longitudinally extending cutout or space 80 formed therein. This cutout is formed in this modification by forming a cutout portion in each of the surfaces 60 and 62, the two cutout portions being aligned with one another so as to define a groove as indicated by reference numeral 80. This cutout in the rib has a circumferential dimension or width which is only a very minor portion of the total circumferential dimension defined by the rib 64. In a typical example wherein the rib may define an internal diameter of approximately 0.242 inch, the cutout 80 may have a circumferential dimension or width of approximately 0.015 inch. The circumferential dimension of the cutout is accordingly no more than about 2% of the total inner circumferential dimension of the rib 64. It is important that the cutout have a relatively small

5

circumferential dimension compared with the inner circumferential dimension of the rib in order to retain the sterilizing gas within the needle guard after the complete assembly has been sterilized and then subjected to normal atmospheric conditions.

The needle guard is shown in assembled relationship relative to a hypodermic syringe and needle in FIG. 1 wherein it is apparent that the open end portion of the needle guard fits about the barrel of the syringe, and the internal rib 64 of the needle guard will be in tight sealing engagement with the outer surface of the barrel so as to hold the needle guard securely in operative position and further to ensure a sterile seal between the needle guard and the syringe.

In a typical example, surface 60 of the bore within the needle guard may define an angle of approximately 12 degrees with respect to a line extending parallel with the longitudinal axis of the needle guard. Surface 62 may define an angle of approximately 5 degrees with respect to a line extending parallel with the axis of the needle guard. Surface 70 may define an angle of approximately 30 degrees with respect to a line extending parallel with the longitudinal axis of the needle guard, and surface 52 may define an angle of approximately 60 degrees with respect to a line extending substantially parallel with the longitudinal axis of the needle guard.

Referring now to FIGS. 5 through 7 inclusive, a modified form of the invention is illustrated wherein a hypodermic syringe barrel is indicated by reference numeral 90, this syringe barrel having an integral boss 92 of similar dimension extending therefrom. A skirt portion 94 which is also formed integral with the barrel is disposed in surrounding relationship and spaced from the boss portion 92. A conventional hypodermic needle is provided including a hub portion 96 which fits upon the boss portion 92 in the manner previously described, the hypodermic needle also including a cannula portion 98 similar to that of the previously described needle.

The needle guard of this form of the invention is indicated generally by reference numeral 100 and as in the previous modification comprises a one-piece homogeneous body means formed of a resilient material such as polyethylene.

Needle guard 100 includes an open end portion 102 having four equally angularly spaced longitudinally extending ribs 104 formed on the outer surface thereof for rigidifying this end portion.

As in the previous modification, the needle guard is provided with a bore formed therein, the bore defining in a direction proceeding from the open end portion toward the opposite closed end portion of the needle guard a first inwardly tapered surface 110 which joins with a second inwardly tapered surface 112 which joins with a radially inwardly curved surface 114 which forms an internal shoulder for limiting movement of a hypodermic needle into the needle guard. Surface 114 in turn joins with a surface 116 formed in a portion 118 of reduced cross sectional dimension of the needle guard, bore 116 extending to a point adjacent the closed end of the needle guard (not shown).

The needle guard is provided with an integral peripherally extending radially inwardly directed rib 120 adjacent the open end portion thereof, rib 120 having a cutout 122 extending longitudinally of the needle guard and as in the previous modification in a direction substantially parallel with the longitudinal axis of the needle guard. As in the previous modification, the space or cutout 122 in the rib should have a circumferential dimension of no more than approximately 2% of the inner circumferential dimension of the rib 120.

Referring now to FIGS. 8, 9 and 10, a needle guard is provided which is similar to that shown in FIGS. 5 through 7 inclusive, and similar parts have been given the same reference numerals primed.

6

In the modification shown in FIGS. 8 through 10 inclusive, the hypodermic syringe is of a slightly different construction, and includes a barrel 130, an integral boss portion 132 of reduced dimension extending therefrom and of generally frusto-conical shape, and a surrounding substantially cylindrical shaped skirt 134 which is spaced from the boss 132. Actually, the only differences in the modification shown in FIGS. 8 through 10 from that shown in FIGS. 5 through 7 is in the particular configuration of the boss portion which in the latter modification includes a boss which is generally frusto-conical throughout, while the boss portion illustrated in FIG. 5 may have a generally cylindrical portion which in turn flairs into a tapered portion.

FIGURES 8 and 10 illustrate the manner in which the needle guard 100' fits snugly about the outer surface of the skirt portion 134 of this form of the invention and in particular, FIG. 10 illustrates the cooperation between the outer surface of the boss and the inner bore portion of the needle guard.

As seen in FIG. 10, it is of course apparent that the internal rib portion 120' will be in tight sealing engagement with the outer surface of skirt portion 134. In addition, surface-to-surface contact is provided between the outer surface of boss portion 134 and the bore wall portion 112' as indicated by reference numerals 140 and 142 so that such surface-to-surface engagement occurs on both sides of the rib 120'. With this arrangement, the surface-to-surface interengagement ensures that a sterile seal will be maintained after the assembly is sterilized.

It is apparent from the foregoing that there is provided according to the present invention a new and novel hypodermic needle guard which is adapted to fit over a portion of a hypodermic syringe and to physically protect the needle associated therewith. The needle guard will be retained securely in operative position by the internal rib formed thereon, and in addition a sterile seal will be provided between the needle guard and the syringe. The cutout provided in the internal rib of the needle guard enables sterilization of the assembled components and at the same time ensures that this sterility will be retained under normal atmospheric conditions. The apparatus is quite simple and inexpensive in construction, and yet is at the same time quite effective and reliable in use.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claim, all changes that fall within the metes and bounds of claim or that form its functional as well as conjointly cooperative equivalents are therefore intended to be embraced by the claim.

I claim:

1. In combination, a hypodermic syringe, a hypodermic needle supported by said syringe, and a needle guard; said needle having a hub with a polygonal outer surface, said needle guard comprising an elongated body means formed of resilient material, one end of said body means being closed, said body means having an elongated bore extending from said closed end portion longitudinally of the body means and opening through the opposite end portion of the body means; said bore, intermediate said open end and said closed end, having a portion, polygonal in shape, snugly receiving said polygonal outer surface of said hub; said body means comprising a one-piece homogeneous body of material, said bore defining in a direction commencing from said open end toward the closed end of the body means a first inwardly tapered surface joining with an outwardly flared surface which in turn joins with a second inwardly tapered surface, said first inwardly tapered surface and said outwardly flared sur-

face intersecting one another to define a peripherally extending rib extending about said bore, said first inwardly tapered surface and outwardly flared surface having cutout portions joining with one another to define a groove extending through the rib, said open end portion of the needle guard fitting snugly about and engaging a portion of said syringe with said rib in contacting engagement with the associated syringe portion, and the dimension of said groove being such as to permit suitable flow of gas during sterilizing procedure but to restrict flow of gas past the rib under normal atmospheric conditions.

5

10

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