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SAFETY SYRINGE WITH EXTERNALLY CONNECTABLE AND INTERNALLY RETRACTABLE SELF-BIASED NEEDLE

The present invention relates to a safety syringe.

U. S. Patent No. 5,232,458 to Long-Hsiung Chen disclosed a safety syringe including a hollow needle having a needle head portion formed on a rear portion of the needle, and a plunger slidably held in the syringe having a biasing socket recessed in a front portion of the plunger engageable with the needle head portion for biasing the needle obliquely within the syringe when retracting the plunger and the needle into the syringe to prevent an outward protruding of the retracted needle for preventing its injury or infectious contamination to the surroundings.

However, such a conventional safety syringe may have the following drawbacks:

1. When mounting the needle device (2) on the syringe (1), the needle device (2) should be inserted through the plug (13) in the sleeve portion (12) of the syringe (1) to thereby cause inconvenience.

2. It can not be replaced with needles of different sizes outside the syringe.

3. A plug (13) is embedded in a front portion within the syringe cylinder (11) to possibly increase the assembly difficulty and production cost.

The present inventor has found the drawbacks of the conventional safety syringe and invented the present safety syringe with externally connectable needle.

According to the present invention, there is provided a safety syringe including: a hollow needle assembly having a

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hollow needle portion detachably coupled to a shank portion embedded in a sleeve portion of a syringe and having a needle head portion on a rear portion of the shank portion, and a plunger slidably held in the syringe and having a biasing socket recessed in the plunger for engaging the needle head portion of the needle assembly for a coupling of the needle assembly with the plunger for retraction into the syringe for obliquely biasing the needle portion for preventing a re-protrusion of the needle outwardly, whereby a variety of needles of different sizes can be replaceably mounted on the shank portion outside the syringe for a convenient mounting of the needle on the syringe.

The present invention will be further described with reference to the accompanying drawings, in which:

Figure 1 is a sectional drawing showing all parts in construction of the present invention;

Figure 2 is a perspective view of the hollow needle assembly of the present invention;

Figure 3 is a sectional drawing showing a practical application of the present invention for injection;

Figure 4 is a sectional drawing of the present invention showing a finished condition after the injection;

Figure 5 is an illustration showing a self-biased needle when retracted in the syringe cylinder in accordance with the present invention; and

Figure 6 is an illustration showing a bent needle in a syringe for preventing its outward re-protrusion in accordance with the present invention.

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As shown in Figures 1 - 6, the present invention comprises: a syringe means 1, a hollow needle assembly 2 mounted on the syringe means 1, and a plunger means 3 slidably held in the syringe means 1.

The syringe means 1 includes: a syringe cylinder 11 having a hollow bore portion 10 formed in the syringe cylinder 11 for filling liquid medicine 4 therein and a syringe axis 100 longitudinally defined in a central portion of the syringe cylinder 11, a sleeve portion 12 formed in a front portion of the cylinder 11 contracted and tapered forwardly from the cylinder 11, a shoulder portion 13a formed in a front portion of the cylinder 11 between the cylinder 11 and the sleeve portion 12, and a syringe handle 14 formed on a rear end portion of the cylinder 11.

The sleeve portion 12 includes: a sheath opening 121 formed in a front end portion of the sleeve portion 12, a ring groove 122 annularly recessed in an inside wall of the sheath opening 121, a truncated-cone-shaped socket 123 tapered forwardly from a cylindrical socket 124 recessed forwardly from the shoulder portion 13a of the syringe means 1 and communicating with the sheath opening 121, with the cylindrical socket 124 having an inside diameter larger than an inside diameter of a rear end portion of the truncated-cone-shaped socket 123, and the sheath opening 121 having an inside diameter equal to an inside diameter of a front end portion of the truncated-cone-shaped socket 123, thereby forming a tapered through hole 12a (Figure 5) in the sleeve portion 12 as gradationally tapered forwardly from the shoulder portion 13a in the syringe means 1, the cylindrical

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socket 124, the truncated-cone-shaped socket 123, the ring groove 122 and the sheath opening 121.

The hollow needle assembly 2 includes: a hollow needle portion 21 having a tip end 211 formed on a front end of the hollow needle portion 21, a coupling sheath 212 formed on a rear portion of the hollow needle portion 21 having a stem socket 213 recessed inwardly forwardly to communicate with a needle hole 210 longitudinally formed through the hollow needle portion 21 and a female groove 214 spirally recessed in the stem socket 213; a shank portion 22 having a hollow truncated-cone-portion 22a engageable with the truncated-cone-shaped socket 123 in the sleeve portion 12, a packing ring 221 embedded in an inner ring groove 221a annularly recessed in a front portion of the truncated cone portion 22a and engageable with the ring groove 122 in the sleeve portion 12, a hollow stem portion 222 protrduding forwardly from the truncated cone portion 22a having at least a male projection 223 circumferentially formed on the stem portion 222 to be engageable with the female groove 214 recessed in the coupling sheath 212 of the hollow needle portion 21 for detachably coupling the hollow needle portion 21 on the shank portion 22 secured on the syringe means 1 from outside the syringe cylinder 11 and an enlarged cylindrical portion 224 formed on a rear end portion of the shank portion 22 engageable with the cylindrical socket 124 in the sleeve portion 12; and a needle head portion 23 connected to the shank portion 22 by a hollow neck portion 24a and generally shaped as a circular disk having a rear arcuate surface of the needle head portion 23 and a

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central injection hole 231 formed therein to communicate with a venting slot 24 formed in the neck portion 24a to communicate with a central through hole 220 longitudinally formed through the shank portion 22 and communicating with the needle hole 210 when coupling the hollow needle portion 21 on the shank portion 22, and a needle axis 200 defined in a central portion of the hollow needle assembly 2 and normally aligned with the syringe axis 100 when mounting the needle assembly 2 on the syringe means 1 for normally injection use. The liquid medicine 4 flows through the central injection hole 231, the venting slot 24, the central through hole 220 and the needle hole 210 to be injected into a patient's body.

The plunger means 3 includes: a plunger 31 reciprocatively held in the syringe cylinder 11, a biasing socket 32 generally arcuate shaped and recessed rearwardly from a plunger front surface 310 of the plunger 31 having a longitudinal axis 321 defined at a center of the socket 32 to be deviated from the syringe axis 100 with an acute angle A, a guiding port 33 converging rearwardly from the plunger front surface 310 for communicating with the biasing socket 32 for slidably guiding the needle head portion 23 rearwardly through the guiding port 33 to be engaged into the biasing socket 32 for biasing the hollow needle portion 21 obliquely when retracting the needle assembly 2 within the hollow bore portion 10, a plunger rod 35 connected with the plunger 31 by coupling a coupling member 36 formed on a front end of the rod 35 with a recess 34 recessed in a rear portion of the plunger 31 and a rod handle 37 formed on a rear end of the rod 35 for grasping use, and a plunger axis 300

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longitudinally defined in a central portion of the plunger 31 and the rod 35 to be aligned with the needle axis 200 and syringe axis 100 when normally mounting the needle assembly 2 on the syringe means 1.

When using the present invention for injection use, the plunger 31 is pushed forwardly to drive the liquid medicine 4 into a patient's skin through the hollow needle portion 21 as shown in Figure 3. After the medicine 4 is exhausted, the needle head portion 23 will be engaged with the biasing socket 32 in the plunger 31 as shown in Figure 4 as urged (D) by the rod 35.

When retracting (R) the plunger 31 and the coupled needle portion 21, the needle portion 21 will be automatically biased as shown in Figure 5, and while re-protruding of the needle portion 21 forwardly (F) as shown in Figure 6, the tip end 211 will be bent, without being protruded outwardly for preventing pricking on the user, the cleaners, or medical personnels.

The present invention is superior to a conventional safety syringe of U. S. Patent 5,232,458 with the following advantages:

1. The hollow needle portion 21 may be detachably coupled to the shank portion 22 by rotating (T) the coupling sheath 212 to engage the female groove 214 in the sheath 212 with the projection 223 on the stem portion 222 of the shank portion 22 to conveniently install the needle portion 21 on the syringe means 1 outside the syringe means.

2. A variety of needles of different sizes may be replaceably mounted on the syringe means 1 for optional choices.

3. The structure is simplified to thereby reduce the

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production cost.

4. If the retracted needle 21 in the syringe cylinder 11 is not biased with a larger biasing angle, a further accidental re-protrusion of the needle outwardly may be prevented since the tip end 211 of the needle 21 may be retarded on plural locations, namely: the shoulder portion 13a, the cylindrical socket 124, and the annular groove 122, thereby absolutely ensuring a safety treatment of the retracted needle.

5. The truncated-cone shaped shank portion 22 of the needle assembly 2 will enforce a stable engagement with the through hole 12a in the sleeve portion 12, helpful for a smooth injection when urged by the plunger 31 for boosting liquid medicine into a patient during the injection.

The present invention may be modified without departing from the spirit and scope of this invention

The shank portion 22 may be formed with at least a projection (not shown) thereon to be engageable with another projection (not shown) formed in the sleeve portion 12 for preventing a free rotation of the shank portion 22 in the sleeve portion 12 when coupling the hollow needle portion 21 on the shank portion 22.

The present invention may be used for hypodermic or intravenous injections.

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Claim:

1. A safety syringe comprising:

a syringe means (1) including: a syringe cylinder (1) for filling liquid medicine (4) therein, a syringe axis (100) longitudinally defined in a central portion of the syringe cylinder (11) , a sleeve portion (12) formed in a front portion of the cylinder (11) contracted and tapered forwardly from the cylinder (11), and a shoulder portion (13a) formed in a front portion of the cylinder (11) between the syringe cylinder (11) and the sleeve portion (12);

a hollow needle assembly (2) including a hollow needle portion (21) detachably connected with a shank portion (22) secured in the sleeve portion (12) of said syringe means (1), and a needle head portion (23) connected to the shank portion (22) by a hollow neck portion (24a), a central injection hole (231) formed in said needle head portion (23), and a venting slot (24) formed in the neck portion (24a), said central injection hole (231) and said venting slot (24) communicating with a central through hole (220) longitudinally formed through the shank portion (22) and communicating with the needle hole (210) formed in said hollow needle portion (21) when coupling the hollow needle portion (21) on said shank portion (22), and a needle axis (200) defined in a central portion of the hollow needle assembly (2) and normally aligned with the syringe axis (100) when mounting the needle assembly (2) on the syringe means (1) for normal injection use; and

a plunger means (3) including: a plunger (31) reciprocatively

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held in the syringe cylinder (11), a biasing socket (32) recessed rearwardly from a plunger front surface (310) of the plunger (31) having a longitudinal axis (321) defined at a center of the biasing socket (32) to be deviated from the syringe axis (100) with an acute angle (A), a guiding port (33) converging rearwardly from the plunger front surface (310) for communicating with the biasing socket (32) for slidably guiding the needle head portion (23) rearwardly through the guiding port (33) to be engaged into the biasing socket (32) for biasing the hollow needle portion (21) obliquely when retracting the needle assembly (2) within the syringe cylinder (11), and a plunger rod (35) connected with the plunger (31);

characterized in that:

said sleeve portion (12) includes: a sheath opening (121) formed in a front end portion of the sleeve portion (12), a ring groove (122) annularly recessed in an inside wall of the sheath opening (121), a truncated-cone-shaped socket (123) tapered forwardly from a cylindrical socket (124) recessed forwardly from the shoulder portion (13a) of the syringe means (1) and communicating with the sheath opening (121), with the cylindrical socket (124) having an inside diameter larger than an inside diameter of a rear end portion of the truncated-cone-shaped socket (123), and the sheath opening (121) having an inside diameter equal to an inside diameter of a front end portion of the truncated-cone-shaped socket (123) for forming a tapered through hole (12a) in the sleeve portion (12) as gradationally tapered forwardly from the shoulder portion (13a) towards the sheath opening (121); and

said hollow needle portion (21) having a coupling sheath (212)

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formed on a rear portion of the hollow needle portion (21) having a stem socket (213) recessed inwardly forwardly to communicate with the needle hole (210) longitudinally formed through the hollow needle portion (21) and a female groove (214) spirally recessed in the stem socket (213); said shank portion (22) having a hollow truncated-cone-portion (22a) engageable with the truncated-cone-shaped socket (123) in the sleeve portion (12), a packing ring (221) secured to a front portion of the truncated cone portion (22a) and engageable with the ring groove (122) in the sleeve portion (12) for retaining a front portion of the shank portion (22) in said sleeve portion (12), a hollow stem portion (222) protrduding forwardly from the truncated cone portion (22a) having at least a male projection (223) circumferentially formed on the stem portion (222) to be engageable with the female groove (214) recessed in the coupling sheath (212) of the hollow needle portion (21) for detachably coupling the hollow needle portion (21) on the shank portion (22) secured on the syringe means (1) from outside the syringe cylinder (11) and an enlarged cylindrical portion (224) formed on a rear end portion of the shank portion (22) engageable with the cylindrical socket (124) in the sleeve portion (12).