159159

Patent Application of

Teng Jun Piao

For

SAFETY BLOOD COLLECTOR

1. TECHNICAL FIELD OF THE INVENTION

The present invention relates in general to devices and methods that are useful for collecting fluids. More particularly, the present invention pertains to devices and methods for collecting blood from a patient. The present invention is particularly useful for retracting the spent needle automatically into its barrel after use by assorted means of spring tension, atmospheric pressure, and vacuum pressure respectively.

2: BACKGROUND OF THE INVENTION

This invention relates to medical equipment, and more particularly to a safety blood collector designed to prevent accidental needle stick injuries by medical personnel, for example during drawing of a blood specimen of a patient.

The ever increasing spread of diseases transmitted by blood and other bodily fluids, such as Acquired Immune Deficiency Syndrome and Hepatitis B creates a real threat to medical personnel of accidental, inadvertent puncturing of the skin by a blood collecting needle which has been in contact with an infected patient and of the transmittal of the often fatal disease to the unfortunate medical attendant. Despite educational programs carried by many hospitals, accidents continue to happen with an unfortunate effect of medical personnel being infected through coming in contact with bodily fluids of a patient.

Various attempts have been made to resolve this problem by proposing to use a protective needle guard, which would cover the needle when the blood collecting device is not in use and prevent the needle from being exposed during those

times, However, such devices either are expensive to manufacture or difficult to use requiring several steps in preparation of the blood collecting device for utilization and, so far, have not found wide acceptance in the medical profession. USA-5,921,964 dated July 13, 1999 and USA-6,869,415 dated March 22, 2005 disclose the different designs of safety blood collecting device which mainly includes the needle guard to cover the needle by means of springy component, but not by way of retraction procedures.

The present invention contemplates elimination of drawbacks associated with prior art and provision of an improved safety blood collecting device particularly adapted for drawing blood from a patient and which is easy to use and inexpensive to manufacture.

3. SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the present invention to provide a safety blood collector by assorted means of spring tension, atmospheric pressure, and vacuum pressure respectively, with which the user has no chance to make close contact with the needle tip so as to avoid from being injured by the needle in either ways during the process of blood collection from A to Z.

According to the most general aspect of the present invention there is provided a safety blood collector comprising: (a) a hollow elongated barrel means with a small distal opening at one end and a bigger proximal opening at other end; ;(b) a hollow penetration means which is adapted to detachably engage with distal end of the barrel means enabling to penetrating into human body for collecting fluid (usually is blood), which can be retracted into the hollow barrel means after use in order to prevent needle stick injuries; (c) force generating means which is adapted to fit within and move axially in the hollow barrel means; particularly in the present invention, there are three different designs of force generating means generating either sufficient tension force or atmospheric pressure or vacuum

pressure respectively to retract the penetration means into the hollow barrel means when after use; (d) interlocking means which is adapted in association with the force generating means sliding within the hollow barrel means for fixing the force generating means in order to effect the workable force function; (e) releasing means which is mounted onto the hollow barrel means externally adapted to kick off the protective cap of the penetration means without necessary to risk touching closely to the tip when preparing to use, and to release the tension force or pressure existing within the force generating means, so as to retract the penetration means into the hollow barrel means for preventing possible needle stick injuries; (f) a blood collecting reservoir is removable positioned within the hollow barrel means co-alignment with the penetration means, so as to allow collection of the blood sample from a patient and detachment of the reservoir once the necessary amount has been collected.

Preferably, a hollow barrel means comprising: a small distal opening at one end and a bigger proximal opening with a finger flange at other end, lying one or a plurality of circular rim-like catches and one or a plurality of opposite lateral holes at midway internally therein.

Preferably, a hollow penetration means is a needle assembly comprising: an elongated hollow needle with both sharp distal and proximal tips at opposite ends, and a securing portion which comprises an external male threaded part and a needle holder located at midway therein; the proximal part of the needle including its tip is enclosed by an elastic elongated hollow cylindrical rubber sheath therein; both distal and proximal parts of needle are covered with two protective caps respectively when not in use.

Preferably, three different designs of force generating means in the present invention including: (1) spring means comprising a compression tension spring is aligned between central base area and a circular disk-shaped platform within the

hollow barrel; the circular platform comprising two opposite lateral latches on one side, and a distal protruding nose on other side with a central hole penetrating through the platform; the protruding nose at the distal opening end has an internal female threaded part therein; upon assembling, the spring attached with the platform is compressed downwardly until stopping at a location where the latches can hook against the lateral holes within the hollow barrel means, so that the spring will generate tension force to raise up the platform when the latches are released. (2) atmospheric means comprising a piece of thin circular shaped rubber stopper fixed snugly above the central base area within the hollow barrel; another rubber stopper with mid-hole fixed snugly against the distal protruding nose of the platform on one side where the male threaded part of the needle assembly which proximal part of needle penetrated through the central hole of the platform is screwed tightly against the female threaded part within the platform therein ; upon assembling, the platform aligned with the rubber stopper and the needle assembly within the hollow barrel is compressed violently towards the rubber stopper at the central area until stopping at a location where the latches can hook against the lateral holes, so that the air between both rubber stoppers within the hollow barrel will be compressed, such that the air compression will expand to raise up the platform together with the needle assembly until stopping at its original position when the latches are released. (3) vacuum pressure means comprising a primary disk-shaped platform with distal and proximal protruding noses on both sides where female threaded part is fixed at the distal hole therein; a disk-shaped rubber stopper at its mid-hole is mounted snugly against the proximal protruding nose thereon; a secondary disk-shaped platform with distal and proximal protruding noses on both sides where a secondary disk-shaped rubber stopper at its mid-hole is mounted snugly against the proximal protruding nose thereon; a soft tiny elongated rubber tube with both distal hub and proximal hub is aligned between both platforms at the respective protruding noses therein;

a secondary hollow needle in majority includes a sharp proximal tip is enclosed by an elastic elongated hollow cylindrical rubber sheath, and its flat distal tip at other end is exposed through the rubber holder thereof; a hollow elongated assembling protective cap is mounted against the rubber holder thereon for dual purposes of assemble and protective as well when not in use; upon assembling, at the first step, by means of an elongated cylindrical shaped stick acting as a tool which is headed with an external male threaded part can be screwed detachably into the female threaded part of the primary platform, and then insert its distal end through the mid-hole of the base within the hollow barrel, so as to fix the primary platform snugly at the hollow barrel's secondary rim-like catch position; at the second step, by means of the assembling protective cap acting as a tool which distal end attached against the secondary platform within the hollow barrel is pushed until the secondary platform is located snugly at the primary rim-like catch position within the hollow barrel; at the third step, also by pulling the cylindrical shaped stick further violently until the lateral latch of the primary platform is hooked against the lateral hole within the hollow barrel, so that the room between both rubber stoppers of the respective primary and secondary platforms will generate a vacuum room, such that it generates a sucking force to return the primary platform back to its original position at the secondary catch position when the latch is released.

Preferably, interlocking means is one or a plurality of opposite lateral latches fixed on either side of the platform.

Preferably, releasing means is a ring-shaped holder comprising: either (1) a guideway structure on top of the holder together with a lateral button on opposite surface of the holder, and an elongated plate-like structure with a bigger plate head at its distal end penetrating through the guideway; or (2) only fixed with one or a plurality of opposite lateral buttons thereon.

Preferably, blood collecting reservoir is a vacuum tube sealed at proximal end, and the other distal end thereof is sealed with a tight cap, in which the opening is fixed a layer of rubber septum allowing only the proximal needle tip except the related rubber sheath therein to penetrate through for fluid communication between the sharp distal end of the needle and the interior chamber of the tube.

4. BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings which illustrate specific embodiments of the invention, but which should not be construed as restricting the spirit or scope of the invention in any way:

FIGS. 1a – 1c are perspective views illustrating the dismantled parts of the needle assembly which includes the distal protective cap, the main member and the proximal protective cap respectively, to be associated with a first embodiment of a safety blood collector.

FIG. 1d is a perspective view illustrating the hollow cylindrical shaped barrel of the first embodiment of the safety blood collector.

FIG. 1e is a perspective view illustrating the coil spring of the first embodiment of the safety blood collector.

FIG. 1f is a perspective view illustrating the primary platform of the first embodiment of the safety blood collector.

FIG. 1g and 1h are perspective views illustrating a set of releasing means which includes a ring-shaped holder and a tow plate mounted within the first embodiment of the safety blood collector.

FIG. 1i is an perspective views illustrating the vacuum blood collecting reservoir.

FIG. 2a is a cross-sectional view illustrating the hollow cylindrical shaped barrel of the first embodiment of the safety blood collector.

FIG. 2b is a cross-sectional view illustrating the coil spring of the first embodiment of the safety blood collector.

FIG. 2c is a cross-sectional view illustrating the ring shaped holder of the first embodiment of the safety blood collector.

FIG. 2c1 is an end sectional view illustrating the FIG. 2c.

FIG. 2d is a cross-sectional view illustrating the primary platform of the first embodiment of the safety blood collector.

FIG. 2d1 is an end sectional view illustrating the FIG. 2d.

FIG. 2e is a cross-sectional view illustrating the tow plate of the first embodiment of the safety blood collector.

FIG. 2e1 is a top view illustrating the FIG. 2e.

FIG. 2e2 is a partial end sectional view illustrating the portion of the runner and the thumb press of the tow plate as shown on the FIG. 2e.

FIG. 2e3 is a partial end sectional view illustrating the portion of the runner and the middle part of the tow plate as shown on the FIG. 2e.

FIG. 2e4 is a partial end sectional view illustrating the portion of the runner and the plate head part of the tow plate as shown on the FIG. 2e.

FIG. 2f – 2h are the cross-sectional views illustrating the dismantled parts of the needle assembly which includes the distal protective cap, the main member and the proximal protective cap respectively.

FIG. 2i is a cross-sectional view illustrating the vacuum blood collecting reservoir.

FIG. 3 is a cross-sectional view illustrating a semi assembled safety blood collector of the first embodiment.

FIG. 4 is a cross-sectional view illustrating the needle assembly is being inserted into the finished assembled safety blood collector of the first embodiment.

FIG. 5 is a cross-sectional view illustrating the needle assembly has been inserted into the assembled safety blood collector of the first embodiment when preparing to use.

FIG. 6 is a cross-sectional view illustrating the distal protective cap of the needle assembly is being kicked off by the plate head of the releasing means when ready for using the assembled safety blood collector of the first embodiment.

FIG. 7 is a cross-sectional view illustrating the operation manner of the total assembled safety blood collector of the first embodiment when drawing blood, wherein the vacuum blood collecting tube is fixed and the distal tip of the needle assembly is penetrated into the human skin.

FIG. 8 is a cross-sectional view illustrating the safety blood collector of the first embodiment when after drawing blood, wherein the vacuum blood collecting tube is released and at the same time, the lateral latches of the primary platform within the hollow barrel is pushed downward by the lateral buttons of the external ring-shaped holder, so that the compressed spring to be released.

FIG. 9 is a cross-sectional view illustrating the safety blood collector of the first embodiment when the compressed spring is released, wherein the spring returns the primary platform back to its original position, so that the needle is fully retracted into the hollow barrel.

FIG. 10a is a perspective view illustrating the hollow cylindrical shaped barrel of a second embodiment of the safety blood collector.

FIG. 10b is a perspective view illustrating the plain rubber stopper of the second embodiment of the safety blood collector.

FIG. 10c is a perspective view illustrating the distal protective cap of the needle assembly, to be associated with the second embodiment of the safety blood collector.

FIG. 10d is a perspective view illustrating the main member of the needle assembly, to be associated with the second embodiment of the safety blood collector.

FIG. 10e is a perspective view illustrating the primary rubber stopper with mid-hole of the second embodiment of the safety blood collector.

FIG. 10f is a perspective view illustrating the primary circular shaped platform of the second embodiment of the safety blood collector.

FIG. 10g is a perspective view illustrating the secondary ring-shaped holder of the second embodiment of the safety blood collector.

FIG. 10h and 10i are the perspective views illustrating the releasing means of the second embodiment of the safety blood collector which includes a primary ring-shaped holder to be fitted with a tow plate therein.

FIG. 11 is a cross-sectional view illustrating a semi-assembled manner of the second embodiment of the safety blood collector.

FIG. 12 is a cross-sectional view illustrating another half-assembled manner of the second embodiment of the safety blood collector wherein the needle assembly is fixed with the primary platform co-aligning the assembling protective cap therewith.

FIG. 13 is a cross-sectional view illustrating the final assembled step of the second embodiment of the safety blood collector wherein the distal tip of the needle assembly is penetrating through the plain rubber stopper.

FIG. 14 is a cross-sectional view illustrating the finished assembled manner of the second embodiment of the safety blood collector when ready for use.

FIG. 15 is a cross-sectional view illustrating the second embodiment of the safety blood collector wherein the distal protective cap of the needle assembly is being kicked off by the plate head of the releasing means and the assembling protective cap is taken away when preparing to use.

FIG. 16 is a cross-sectional view illustrating the operation manner of the second embodiment of the safety blood collector when drawing blood, wherein the vacuum blood collecting tube is fixed and the distal tip of the needle assembly is penetrated into the human skin.

FIG. 17 is a cross-sectional view illustrating the safety blood collector of the second embodiment when after drawing blood, wherein the vacuum blood

collecting tube is released and at the same time, the lateral latches of the primary platform within the hollow barrel is pushed downward by the lateral buttons of the external secondary ring-shaped holder, so that the compressed air to be released.

FIG. 18 is a cross-sectional view illustrating the safety blood collector of the second embodiment when the compressed air is released, wherein the air expansion returns the primary platform back to its original position, so that the needle is fully retracted into the hollow barrel.

FIGS. 19a – 19c are perspective views illustrating the dismantled parts of the needle assembly which includes the distal protective cap, the main member and the proximal protective cap respectively, to be associated with a third embodiment of a safety blood collector.

FIGS. 19d is a perspective view illustrating the hollow cylindrical shaped barrel of the third embodiment of the safety blood collector.

FIGS. 19e is a perspective view illustrating the primary platform of the third embodiment of the safety blood collector.

FIGS. 19f is a perspective view illustrating the primary rubber stopper of the third embodiment of the safety blood collector.

FIGS. 19g is a perspective view illustrating a soft elongated hollow rubber tube of the third embodiment of the safety blood collector.

FIGS. 19h and 19i are the perspective views illustrating the releasing means of the third embodiment of the safety blood collector which includes a primary ring-shaped holder to be fitted with a tow plate therein.

FIGS. 19j is a perspective view illustrating the secondary platform of the third embodiment of the safety blood collector.

FIGS. 19k is a perspective view illustrating the secondary rubber stopper of the third embodiment of the safety blood collector.

FIGS. 19l is a perspective view illustrating a secondary hollow needle with a rubber sheath thereon of the third embodiment of the safety blood collector.

FIGS. 19m is a perspective view illustrating an assembling protective cap of the third embodiment of the safety blood collector.

FIGS. 20a is a cross-sectional view illustrating a hollow cylindrical shaped barrel of the third embodiment of the safety blood collector.

FIGS. 20b is a cross-sectional view illustrating the primary platform fitted with the primary rubber stopper of the third embodiment of the safety blood collector.

FIG. 20b1 is an end sectional view illustrating the FIG. 20b.

FIGS. 20c is a cross-sectional view illustrating a primary ring-shaped holder of the third embodiment of the safety blood collector.

FIG. 20c1 is an end sectional view illustrating the FIG. 20c.

FIGS. 20d is a cross-sectional view illustrating a secondary platform fitted with a secondary rubber stopper of the third embodiment of the safety blood collector.

FIGS. 20e is a cross-sectional view illustrating a secondary hollow needle covered with a rubber sheath thereon of the third embodiment of the safety blood collector.

FIGS. 20f is a cross-sectional view illustrating a soft elongated hollow rubber tube of the third embodiment of the safety blood collector.

FIG. 20g is a cross-sectional view illustrating the tow plate of the third embodiment of the safety blood collector.

FIG. 20g1 is a top view illustrating the FIG. 20g.

FIG. 20g2 is a partial end sectional view illustrating the portion of the runner and the thumb press of the tow plate as shown on the FIG. 20g.

FIG. 20g3 is a partial end sectional view illustrating the portion of the runner and the middle part of the tow plate as shown on the FIG. 20g.

FIG. 20g4 is a partial end sectional view illustrating the portion of the runner and the plate head of the tow plate as shown on the FIG. 20g.

FIGS. 21 is a cross-sectional view illustrating the 1st step of assembled manner of the third embodiment of the safety blood collector, wherein the assembling stick is going to screw into the primary platform which co-align with the primary rubber stopper, the rubber tube, the secondary platform, the secondary rubber stopper, the secondary hollow needle with the rubber sheath, and the assembling protective cap therein.

FIGS. 22 is a cross-sectional view illustrating the 2nd step of assembled manner of the third embodiment of the safety blood collector, wherein all associated components as mentioned on FIG. 21 are inserted into the hollow barrel by means of the assembling stick attached therewith.

FIGS. 23 is a cross-sectional view illustrating the 3rd step of assembled manner of the third embodiment of the safety blood collector, wherein by means of using the assembling stick as well as the assembling protective cap as the tools, the secondary platform fitted with secondary rubber stopper aligned together with the secondary hollow needle and its rubber sheath fixed snugly against the primary circular rim-like catch, and simultaneously the primary platform aligned together with the primary rubber stopper and the rubber tube which is connected with the secondary platform fixed snugly against the secondary rim-like catch within the hollow barrel therein.

FIGS. 24 is a cross-sectional view illustrating the 4th step of assembled manner of the third embodiment of the safety blood collector, wherein by means of continuously using the assembling stick as the tool, the primary platform aligned together with the primary rubber stopper and the rubber tube which is connected with the secondary platform is pulled violently downward, until locating the lateral latch of the primary platform hooked against the lateral hole which is close to the central base within the hollow barrel therein.

FIGS. 25 is a cross-sectional view illustrating the final step of assembled manner of the third embodiment of the safety blood collector, wherein the releasing

means comprising: the tow plate is inserted into the primary ring-shaped holder which includes the lateral buttons pointing against the lateral latch therein is mounted snugly on the hollow barrel externally.

FIGS. 26 is a cross-sectional view illustrating the needle assembly is being inserted into the assembled safety blood collector of the third embodiment.

FIGS. 27 is a cross-sectional view illustrating the needle assembly has been inserted into the assembled safety blood collector of the third embodiment.

FIG. 28 is a cross-sectional view illustrating the distal protective cap of the needle assembly is being kicked off by the plate head of the releasing means when ready for using the assembled safety blood collector of the third embodiment.

FIG. 29 is a cross-sectional view illustrating the operation manner of the total assembled safety blood collector of the third embodiment when drawing blood, wherein the vacuum blood collecting tube is fixed within the hollow barrel and the distal tip of the needle assembly is penetrated into the human skin.

FIG. 30 is a cross-sectional view illustrating the safety blood collector of the third embodiment when after drawing blood, wherein the vacuum blood collecting tube is released and simultaneously the lateral latch of the primary platform within the hollow barrel is pushed downward by the external lateral button of the ring-shaped holder, so that the primary platform can be released.

FIG. 31 is a cross-sectional view illustrating the safety blood collector of the third embodiment when the primary platform is released, wherein the vacuum room between both primary and secondary rubber stoppers will suck the primary platform back to its original position, so that the needle is fully retracted into the hollow barrel.

Reference Numerals In Drawings:

10 hollow cylindrical shaped barrel

11 finger flange

12 proximal opening end

13 primary circular rim-like catch

14 lateral hole

15 central base

16 distal opening end

17 protruding nose

18 plain rubber stopper

19 secondary rim-like catch

20 coil spring

20A distal end

20B proximal end

21 primary circular shaped platform

22 lateral latch

23 central hole

24 distal protruding nose

241 proximal protruding nose

25 female thread

26 primary rubber stopper with mid-hole

27 mid-hole of stopper

28 secondary rubber stopper with mid-hole

28A central hole

29 secondary platform

30 distal protruding nose

301 proximal protruding nose

302 central hole

31 primary ring-shaped holder

32 lateral button

33 guideway holder

34 guideway gap

35 guide catch

36 tow plate

37 runner

38 thumb press

39 plate head

40 secondary ring shaped holder

41 hollow needle

41A needle assembly

411 inner part of needle

42 distal tip

43 proximal tip

44 male thread

45 securing portion

45A plate

46 cylindrical rubber sheath

47 sheath holder

48 distal protective cap

48A proximal open end

48B distal sealed end

49 annular rim

49A projected flange

50 proximal protective cap

50A distal opening end

50B proximal sealed end

51 assembling protective cap

52 distal end of assembling protective cap

53 proximal closed end

54 opening end

61 vacuum blood collecting reservoir

62 proximal end

63 tube cap

64 distal hole

65 rubber septum

70 rubber tube

71 distal hub

72 proximal hub

80 secondary hollow needle

81 proximal tip

82 rubber sheath

83 sheath holder

84 distal tip

85 needle holder

90 assembling stick

91 proximal end

92 male thread

5. DETAILED DESCRIPTION OF THE DRAWINGS

Referring to the drawings, FIGS. 1a – 1i illustrate the perspective views of all dismantled components which make up a first embodiment of the novel safety blood collector comprising a needle assembly 41A, a hollow barrel 10, a coil of compression tension spring 20, a primary platform 21, a tow plate 36, a primary holder 31, and a vacuum blood collecting reservoir 61.

FIGS. 1a – 1c illustrate needle assembly 41A (FIG.1b) which has an elongated sharp-ended needle 41 ended with a distal tip 42 and a proximal tip 43 oppositely, and a securing portion 45 which comprises an externally male threaded part 44 extending inwardly from a plate 45A. The opposite, inner part 411 of needle 41 is enclosed in a sheath 46 which includes a sheath holder 47 fixed adjacent male threaded part 44, can be made of rubber thin enough to be punctured by needle part 411 without application of any substantial force. A distal protective cap 48 (FIG.1a) is a hollow cylindrical body reducing in diameter from proximal opening end 48A towards distal sealed end 48B. Adjacent to proximal opening end 48A is disposed externally an annular projected flange 49A which projects out an annular rim 49 which has a specific function to be disclosed later. Detachably, cap 48 is used to attach onto securing portion 45 to cover needle 41 along its distal tip 42 when not in use. A proximal protective cap 50 (FIG.1c) is a hollow cylindrical body reducing in diameter from distal opening end 50A towards proximal sealed end 50B. Detachably also, cap 50 is used to attach onto proximal end 48A of distal protective cap 48 to cover proximal part of needle 41 along rubber sheath 46 which encloses proximal tip 43 underneath and male threaded part 44 when not in use. Barrel 10 (FIG. 1d) is a hollow elongated cylindrical shaped body having a smaller distal opening hole 16 disposed in the middle of base 15 at one end and a big proximal opening end 12 at other end adjacent to a projected finger flange 11 therein. About midway at the interior of barrel 10 lying a primary circular rim-like catch 13 and a pair of small lateral holes 14 are disposed oppositely not far away from base 15. Compression spring 20 (FIG.1e) is a coil of tension spring which diameter is smaller than internal diameter of barrel 10 with distal end 20A and proximal end 20B therein. Primary platform 21 (FIG.1f) is a thin flange in circular shaped which one side of proximal flat surface are fixed with a pair of lateral latches 22 extended outward therein, and at the center of other side of distal flat surface thereof is disposed

outwardly a hollow protruding nose 24 provided with a central hole 23 penetrating through platform 21 centrally therein. One end of hole 23 at the interior of nose 24 is fixed with a female threaded part 25 which to be seen on FIG. 2d later. A set of releasing means comprises a primary holder 31 (FIG.1h) and a tow plate 36 (FIG.1g). Primary holder 31 is a ring-shaped body on which top portion outwardly is a pair of opposite outward guide catches 35 underneath with a guideway gap 34 above a guideway holder 33 which extends outwardly a lateral button 32 on one side, and on the opposite bottom therein extending an another lateral button 32. Tow plate 36 has an inclined thumb press part 38 disposed upwardly at one end, and a block of plate head 39 disposed downwardly at other end, wherein a pair of runners 37 running along both opposite edges of plate 36 from thumb press 38 towards press head 39 therein. Upon assembling, plate 36 is inserted into guideway gap 34 of primary holder 31 by allowing both runners 37 to be run by both guide catches 35 therein, thereby pulling and pushing thumb press 38 to control tow plate 36 forward or backward accordingly. A vacuum blood collecting reservoir (tube) 61 (FIG.1i) is similar to conventional blood collecting tubes in that a vacuum is created in the chamber. One end 62 is made closed and another open end is sealed by a cap 63 which center is a hole 64 sealed closely with a layer of soft rubber septum 65 which is soft and elastic with plastic memory to let any sharp tip easy to penetrate through upon blood collection.

FIGS. 2a – 2i illustrate either cross-sectional views or end sectional view of all dismantled components exactly like previous FIGS 1a – 1i mentioned which make up a first embodiment of the novel safety blood collector.

FIG. 2a is a cross-sectional view illustrating hollow barrel 10 comprising: finger flange 11, opening end 12, primary catches 13, lateral holes 14, barrel base 15

and distal opening end 16 respectively. (Details refer to previous FIG. 1d's descriptions.)

FIG. 2b is a cross-sectional view illustrating compression spring 20 with distal end 20A and proximal end 20B respectively. (Details refer to previous FIG. 1e's descriptions.)

FIG. 2c is a cross-sectional view illustrating primary holder 31 comprising: lateral buttons 32, guideway holder 33, guideway gap 34 and guide catches 35 respectively. (Details refer to previous FIG. 1h's descriptions.)

FIG. 2c1 is an end sectional view illustrating FIG. 2c.

FIG. 2d is a cross-sectional view illustrating primary platform 21 comprising: lateral latches 22, central hole 23, distal protruding nose 24 and female thread 25 respectively. (Details refer to previous FIG. 1f's descriptions.)

FIG. 2d1 is an end sectional view illustrating FIG. 2d.

FIG. 2e is a cross-sectional view illustrating tow plate 36 comprising: runners 37, thumb press 38 and plate head 39 respectively. (Details refer to previous FIG. 1g's descriptions.)

FIG. 2e1 is a top view illustrating tow plate 36, thumb press 38 and plate head 39 respectively as shown on FIG. 2e.

FIG. 2e2 is a partial end sectional view illustrating the portion of runners 37 relating to thumb press 38 as shown on FIG. 2e.

FIG. 2e3 is a partial end sectional view illustrating the portion of runners 37 relating to middle part of tow plate 36 as shown on FIG. 2e.

FIG. 2e4 is a partial end sectional view illustrating the portion of runners 37 relating to plate head 39 as shown on FIG. 2e.

FIG. 2f – 2h are the cross-sectional views illustrating dismantled parts of needle assembly 41A in which FIG. 2f comprises distal protective cap 48 with distal ends 48B and proximal opening end 48A, projecting flange 49A and its rim 49 respectively, FIG. 2g comprises needle 41 and its inner portion 411, its distal tip

42 and proximal tip 43, male thread 44, securing portion 45 and its plate 45A, rubber sheath 46 and its holder 47 respectively. FIG. 2h comprises proximal protective cap 50 with distal opening end 50A and proximal sealed end 50B respectively. (Details refer to previous FIGS. 1a – 1c's descriptions.)
FIG. 2i is a cross-sectional view illustrating vacuum blood collecting reservoir (tube) 61 comprising: proximal sealed end 62, cap 63, distal opening end 64 and rubber septum 65 respectively. (Details refer to previous FIG. 1i's descriptions.)

FIG. 3 is a cross-sectional view illustrating assembled safety blood collector of first embodiment in which compression spring 20 firstly assembled into barrel 10, followed by primary platform 21 which nose 24 is inserted centrally into spring 20 secondly wherein both latches 22 lying snugly along inner wall of barrel 10. Simultaneously, the releasing means which comprises primary holder 31 assembled with tow plate 36 is mounted snugly onto left end of barrel 10 externally wherein plate head 39 leaning against distal opening end 16 of barrel 10 which can be pushed forward or pulled backward by thumb or finger manually by operating on thumb press 38 along its both runners 37 which are run smoothly by guide catches 35 within guideway gap 34 above guideway holder 33 therein, and both lateral buttons 32 of primary holder 31 pointing properly against both lateral holes 14 of barrel 10 respectively.

FIG. 4 is a cross-sectional view illustrating primary platform 21 with spring 20 underneath is compressed downward tightly until projecting a little bit of nose 24 of platform 21 out of distal opening end 16 of barrel 10, in that both lateral latches 22 of platform 21 hook against both lateral holes 14 of barrel 10 respectively, so that platform 21 is fixed steadily within barrel 10 therein being ready for use. Upon operating blood collection, needle assembly 41A is ready for use in that proximal protective cap 50 (not seen on FIG.4) firstly taken away,

exposing proximal rubber sheath 46 with inner part of needle 411 underneath is being inserted towards into distal opening end 16 of barrel 10 by holding distal protective cap 48 which encloses distal part of needle 41 of needle assembly 41A carefully.

FIG. 5 is a cross-sectional view illustrating proximal rubber sheath 46 with inner part of needle 411 underneath has been inserted into interior of barrel 10 wherein needle assembly 41A is interlocked with nose 24 of barrel 10 by screwing male threaded part 44 against interior female thread 25 of nose 24, thereafter manually pushing thumb press 38 of tow plate 36 forward, such that plate head 39 to be hit against projected rim 49 of distal protective cap 48 therein, so that distal protective cap 48 can be easily released away from needle assembly 41A without necessary to risk the human hand to do this job so as to avoid possible needle stick injuries.

FIG. 6 is a cross-sectional view illustrating further manner following FIG. 5, distal protective cap 48 of needle assembly 41A has been released away by plate head 39 of tow plate 36 exposing distal tip 42 of hollow needle 41 when ready for using assembled safety blood collector of first embodiment.

FIG. 7 is a cross-sectional view illustrating the operation manner of the total assembled safety blood collector of first embodiment when puncturing into human skin for drawing blood, wherein vacuum blood collecting reservoir (tube) 61 has been engaged with proximal part of needle 411 within barrel 10 in the manner that distal tip 43 of inner part of needle 411 punctures rubber septum 65 of collecting tube 61, thereby trapping whole cover of rubber sheath 46 crookedly beyond septum 65 which is made from a soft resilient material having plastic memory, then needle 41 forces its way into collecting tube 61 opening fluid

communication between distal tip 42 of needle 41 and the interior chamber of collecting tube 61.

FIG. 8 is a cross-sectional view illustrating safety blood collector of the first embodiment when after drawing a required amount of blood, wherein collecting tube 61 is released away from barrel 10, in that inner part of needle 411 is fully recovered by rubber sheath 46 automatically again due to its original plastic memory, and simultaneously, using fingers to press on both lateral buttons 32 of primary holder 31, such that both lateral latches 22 of primary platform 21 are pushed out of control by both lateral holes 14 of barrel 10 respectively, so that compressed spring 20 to be released and back to its original position.

FIG. 9 is a cross-sectional view illustrating safety blood collector of first embodiment when compressed spring 20 is released, wherein spring 20 returns back to its original position uplifting primary platform 21 with needle 41 together, thereby trapping whole needle assembly 41A into barrel 10 therein, thereafter, discard it properly, such that it takes no risk of needle stick injuries during the whole operation process from A to Z.

Referring to the drawings, FIGS. 10a – 10i illustrate the perspective views of all dismantled components which make up a second embodiment of the novel safety blood collector comprising a hollow barrel 10, a plain rubber stopper 18, a needle assembly 41A includes a distal protective cap 48, a primary rubber stopper 26, a primary platform 21, a secondary ring-shaped holder 40, a tow plate 36, a primary ring-shaped holder 31, and a vacuum blood collecting reservoir (tube) 61 (not seen on this FIG.) respectively.

Barrel 10 (FIG. 10a) is a hollow elongated cylindrical shaped body having a smaller distal opening hole 16 with a protruding nose 17 disposed in the centre of

base 15 at one end and a big proximal opening end 12 at other end adjacent to a projected finger flange 11 therein. About midway at the interior of barrel 10, a pair of small lateral holes 14 are disposed oppositely therein. Plain rubber stopper 18 (FIG. 10b) is a piece of rubber plate which is soft and elastic with plastic memory to let any sharp tip easy to penetrate through which diameter must be a little bigger than inner diameter of barrel 10 for avoiding air leaking purpose. Needle assembly 41A (FIGS.10c & 10d) which has an elongated sharp-ended needle 41 (FIG. 10d) ended with a sharp distal tip 42 and a sharp proximal tip 43 oppositely, and a securing portion 45 which comprises an externally male thread part 44 extending inwardly from a plate 45A. The opposite, inner part 411 of needle 41 is enclosed in a sheath 46 which includes a sheath holder 47 fixed adjacent to male threaded part 44, can be made of rubber thin enough to be punctured by needle part 411 without application of any substantial force. A distal protective cap 48 (FIG.10c) is a hollow cylindrical body reducing in diameter from proximal opening end 48A towards distal sealed end 48B. Adjacent to proximal opening end 48A is disposed externally an annular projected flange 49A which projects out an annular rim 49 which has a specific function to be disclosed later. Detachably, cap 48 is used to attach onto securing portion 45 to cover distal part of needle 41 along its distal tip 42 when not in use. Primary rubber stopper 26 (FIG. 10e) having a central hole 27 is also a soft elastic rubber plate which diameter must be a little bigger than inner diameter of barrel 10 like plain rubber stopper 18 does for avoiding air leaking purpose. Primary platform 21 (FIG.10f) is a thin flange in circular shaped which one side of proximal flat surface extended with a pair of lateral latches 22 outwardly therein, and at the center of other side of flat surface thereof is disposed outwardly a hollow protruding nose 24 provided with a central hole 23 penetrating through platform 21 centrally therein. One end of hole 23 at the interior of nose 24 is fixed with a female threaded part 25. Secondary holder 40 (FIG.10g) is a ring-shaped body on which

top portion oppositely extended outwardly a couple of lateral buttons 32 respectively. A set of releasing means comprises a primary holder 31 (FIG.10i) and a tow plate 36 (FIG.10h). Primary holder 31 is a ring-shaped body on which top portion outward is a pair of opposite outward guide catches 35 fixed with a guideway gap 34 above a guideway holder 33. Tow plate 36 has an inclined thumb press part 38 disposed upwardly at one end, and a block of plate head 39 disposed downwardly at other end, wherein a pair of runners 37 running along both opposite edges of plate 36 from thumb press 38 towards press head 39 therein. Upon assembling, plate 36 is inserted into guideway gap 34 of primary holder 31 by allowing both runners 37 to be run by both guide catches 35 therein, thereby pulling and pushing thumb press 38 to control tow plate 36 forward or backward accordingly.

A vacuum blood collecting reservoir (tube) 61 (as seen on FIG.1i) is similar to conventional blood collecting tubes in that a vacuum is created in the chamber. One end 62 is made closed and another open end is sealed by a cap 63 which center is a hole 64 sealed closely with a layer of soft rubber septum 65 which is very elastic to let sharp tip easy to penetrate through upon blood collection.

FIG. 11 is a cross-sectional view illustrating a half-assembled manner of second embodiment of safety blood collector, wherein firstly rubber stopper 18 is fixed snugly above base 15 within barrel 10, secondly secondary holder 40 is mounted snugly on exterior barrel 10 locating both lateral buttons 32 at the strategic positions pointing downwardly towards both opposite lateral holes 14 of barrel 10 respectively, thirdly the releasing means which comprises primary holder 31 assembled with tow plate 36 is mounted snugly onto left end of barrel 10 externally wherein plate head 39 leaning above nose 17 against distal opening end 16 of barrel 10, plate head 39 can be pushed forward or pulled backward by thumb or finger manually operating on thumb press 38 along its runners 37

which are run smoothly by guide catches 35 within guideway gap 34 above guideway holder 33 therein, then fourthly proximal open end 48A of distal protective cap 48 is inserted into interior of nose 17 where plate head 39 is able to hit against projected rim 49 therein.

FIG. 12 is a cross-sectional view illustrating another half-assembled manner of second embodiment of safety blood collector wherein firstly primary rubber stopper 26 is mounted closely onto nose 24 of primary platform 21 which extends a couple of lateral latches 22 outwardly on other side, secondly rubber sheath 46 underneath with proximal part of needle 411 is inserted through nose 24 wherein needle assembly 41A is interlocked with primary platform 21 internally by screwing male threaded part 44 therein against interior female thread 25 of nose 24, then thirdly an assembling protective cap 51 which is an elongated hollow cylindrical body reduced in diameter from its distal opening end 52 towards proximal closed end 53 to be fixed snugly by way of inserting proximal part of needle 411 with rubber sheath 46 into distal opening end 52 of cap 51 until distal opening end 52 is attached to primary platform 21 closely.

FIG. 13 is a cross-sectional view illustrating the final assembled step of second embodiment of safety blood collector wherein protective cap 51 working as a tool to push inserting all components as described on FIG. 12 into interior of barrel 10 which internally and externally have been assembled properly as described on FIG. 11, until primary rubber stopper 26 is attached snugly against both lateral holes 14 and distal tip 42 of needle assembly 41A reaching closely to plain rubber stopper 18, then stop.

FIG. 14 is a cross-sectional view illustrating the finished assembled manner of second embodiment of safety blood collector when ready for use, wherein

protective cap 51 is continuously pushed against primary platform 21 violently towards the interior end of barrel 10, in that distal tip 42 penetrates through plain rubber stopper 18 simultaneously until securing portion 45 of needle assembly 41A abutted at plain rubber stopper 18, and both lateral latches 22 of primary platform 21 hock against both opposite lateral holes 14 tightly, thereby pressing the air within the room between plain rubber stopper 18 and primary rubber stopper 26 to generate a strong atmospheric pressure therein.

FIG. 15 is a cross-sectional view illustrating second embodiment of safety blood collector when preparing to use, wherein by manually pushing against thumb press 38 which leads plate head 39 moving forward to hit against rim 49 of distal protective cap 48, thereby kicking off distal protective cap 48 without taking any risk to take it off by hand for avoiding possible needle stick injuries, and assembling protective cap 51 is taken away simultaneously.

FIG. 16 is a cross-sectional view illustrating the operation manner of second embodiment of safety blood collector when puncturing into human skin for drawing blood, wherein vacuum blood collecting reservoir (tube) 61 has been engaged with proximal part of needle 411 within barrel 10 in the manner that distal tip 43 of inner part of needle 411 punctures rubber septum 65 of collecting tube 61, thereby trapping whole cover of rubber sheath 46 crookedly beyond septum 65 which is made from a soft resilient material having plastic memory, then needle 41 forces its way into collecting tube 61 opening fluid communication between distal tip 42 of needle 41 and the interior chamber of collecting tube 61.

FIG. 17 is a cross-sectional view illustrating safety blood collector of second embodiment when after drawing a required amount of blood, wherein collecting

tube 61 is released away from barrel 10, such that inner part of needle 411 is automatically recovered fully by rubber sheath 46 due to its original plastic memory, and simultaneously, using fingers to press on both lateral buttons 32 of secondary holder 40, such that both lateral latches 22 of primary platform 21 are pushed out of control by both lateral holes 14 of barrel 10 respectively, so that the compressed air within the room between both rubber stoppers 18, 26 to be released to uplift platform 21 automatically.

FIG. 18 is a cross-sectional view illustrating safety blood collector of second embodiment when the compressed air is released, wherein the expansion force uplifts primary platform 21 with needle 41 together back to its original position at lateral holes 14 (see FIG.13), thereby trapping full needle assembly 41A into barrel 10 therein, thereafter, discard it properly, such that it takes no risk of needle stick injuries during the whole operation process from A to Z.

Referring to the drawings, FIGS. 19a – 19m illustrate the perspective views of all dismantled components which make up a third embodiment of the novel safety blood collector comprising a needle assembly 41A, a hollow barrel 10, a primary platform 21, a primary rubber stopper 26, a soft elongated rubber tube 70, a tow plate 36, a primary holder 31, a secondary platform 29, a secondary rubber stopper 28, a secondary hollow needle 80, an assembling protective cap 51, and a vacuum blood collecting reservoir (tube) 61 (seen on FIG.1i) respectively.
FIGS. 19a – 19c illustrate needle assembly 41A (FIG.19b) which has an elongated sharp-ended needle 41 ended with a distal sharp tip 42 and a proximal sharp tip 43 oppositely, and a securing portion 45 which comprises an externally male threaded part 44 extending inwardly from a plate 45A. The opposite, inner part 411 of needle 41 is enclosed in a rubber sheath 46 which includes a sheath

holder 47 fixed adjacent to male threaded part 44, can be made of rubber thin enough to be punctured by needle part 411 without application of any substantial force. A distal protective cap 48 (FIG.19a) is a hollow cylindrical body reducing in diameter from proximal opening end 48A towards distal sealed end 48B. Adjacent to proximal opening end 48A is disposed externally an annular projected flange 49A which projects out an annular rim 49 which has a specific function to be disclosed later. Detachably, cap 48 is used to attach onto securing portion 45 to cover distal tip 42 along needle 41 when not in use. A proximal protective cap 50 (FIG.19c) is a hollow cylindrical body reducing in diameter from distal opening end 50A towards proximal sealed end 50B. Detachably also, cap 50 is used to attach onto proximal end 48A of distal protective cap 48 to cover proximal part of needle 41 along rubber sheath 46 which encloses proximal tip 43 and male threaded part 44 when not in use. Barrel 10 (FIG. 19d) is a hollow elongated cylindrical shaped body having a smaller distal opening hole 16 disposed in the middle of base 15 at one end and a big proximal opening end 12 at other end adjacent to a projected finger flange 11 therein. About midway at the interior of barrel 10 lying a primary circular rim-like catch 13 in parallel with an another secondary circular rim-like catch 19 separately and a small lateral holes 14 are disposed not far away from base 15. Primary platform 21 (FIG.19e) is a thin flange in circular shaped in which one side of proximal flat surface is disposed a hollow proximal protruding nose 241 and another side of flat surface is fixed with a lateral latch 22 extended outwardly therein, and at the center thereof is disposed outwardly a hollow distal protruding nose 24 provided with a central hole 23 penetrating through platform 21 centrally till proximal nose 241 therein. Hole 23 at the interior of nose 24 is fixed with a female threaded part 25 which to be seen on FIG. 20b later. Primary rubber stopper 26 (FIG. 19f) having a central hole 27 is a soft elastic circular shaped rubber plate which diameter must be a little bigger than inner diameter of barrel 10 for avoiding air leaking purpose.

Rubber tube 70 (FIG. 19g) is a piece of tiny elastic hollow elongated tube made of rubber which is in a coil manner when not stretched, and its length should be sufficient to extend about two-third of barrel 10 in length, wherein a distal hub 71 and a proximal hub 72 are disposed at both opposite ends of tube 70 respectively. A set of releasing means comprises a primary holder 31 (FIG.19i) and a tow plate 36 (FIG.19h). Primary holder 31 is a ring-shaped body on which top portion outward is a pair of opposite outward guide catches 35 underneath with a guideway gap 34 above a guideway holder 33 and on the opposite at bottom therein extending outwardly a lateral button 32 on one side. Tow plate 36 has an inclined thumb press part 38 disposed upwardly at one end, and a block of plate head 39 disposed downwardly at other end, wherein a pair of runners 37 running along both opposite edges of plate 36 from thumb press 38 towards press head 39 therein. Upon assembling, plate 36 is inserted into guideway gap 34 of primary holder 31 by allowing both runners 37 to be run by both guide catches 35 therein, thereby pulling and pushing thumb press 38 to control tow plate 36 forward or backward accordingly. Secondary platform 29 (FIG.19j) is a thin flange in circular shaped in which one side of proximal flat surface is disposed a hollow proximal protruding nose 301 and another side of distal flat surface is disposed outwardly a hollow distal protruding nose 30 provided with a central hole 302 penetrating through platform 29 centrally ending at proximal nose 301 therein. Secondary rubber stopper 28 (FIG. 19k) having a central hole 28A is a soft elastic circular shaped rubber plate which diameter must be a little bigger than inner diameter of barrel 10 for avoiding air leaking purpose. Secondary needle 80 (FIG.19l) is an elongated hollow needle exposing a flat round distal tip 84 at one end, and an inner part of needle 80 including a proximal sharp tip 81 on other end which is enclosed in a sheath 82 headed with an opening sheath holder 83. Sheath 82 can be made of rubber thin enough to be punctured by needle tip 81 without application of any substantial force. Assembling protective cap 51 (FIG.19m) is a

hollow cylindrical body reducing in diameter from distal end 52 with an opening 54 towards proximal sealed end 53.

A vacuum blood collecting reservoir 61 (FIG.1i) is similar to conventional blood collecting tubes in that a vacuum is created in the chamber. One end 62 is made closed and another open end is sealed by a cap 63 which center is a hole 64 sealed closely with a layer of soft rubber septum 65 which is very elastic to let sharp tip easy to penetrate through upon blood collection.

FIGS. 20a – 20g4 illustrate either cross-sectional views or end sectional view of all dismantled components exactly like previous FIGS 19a – 19m mentioned which make up third embodiment of the novel safety blood collector.

FIG. 20a is a cross-sectional view illustrating hollow barrel 10 comprising: finger flange 11, opening end 12, primary catches 13, secondary catches 19, lateral hole 14, barrel base 15 and distal opening end 16 respectively. (Details refer to previous FIG. 19d's descriptions.)

FIG. 20b is a cross-sectional view illustrating primary platform 21 comprising: lateral latches 22, central hole 23, distal protruding nose 24, female thread 25 therein, and primary rubber stopper 26 mounted snugly onto proximal protruding nose 241 respectively. (Details refer to previous FIGS. 19e & 19f's descriptions.)

FIG. 20b1 is an end sectional view illustrating FIG. 20b.

FIG. 20c is a cross-sectional view illustrating primary holder 31 comprising: lateral buttons 32, guideway holder 33, guideway gap 34 and guide catches 35 respectively. (Details refer to previous FIG. 19i's descriptions.)

FIG. 20c1 is an end sectional view illustrating FIG. 20c.

FIG. 20d is a cross-sectional view illustrating secondary rubber stopper 28 is mounted snugly onto proximal protruding nose 301 of secondary platform 29 having distal protruding nose 30 on other side which central portion is hollow. (Details refer to previous FIGS. 19j & 19k's descriptions.)

FIG. 20e is a cross-sectional view illustrating secondary hollow needle 80 comprising proximal sharp tip 81, rubber sheath 82, sheath holder 83 and flat distal tip 84 respectively. (Details refer to previous FIG. 19l's descriptions.)

FIG. 20f is a cross-sectional view illustrating soft rubber hollow tube 70 comprising distal hub 71 and proximal hub 72 respectively. (Details refer to previous FIG. 19g's descriptions.)

FIG. 20g is a cross-sectional view illustrating tow plate 36 comprising: runners 37, thumb press 38 and plate head 39 respectively. (Details refer to previous FIG. 19h's descriptions.)

FIG. 20g1 is a top view illustrating the FIG. 20g.

FIG. 20g2 is a partial end sectional view illustrating the portion of runners 37 relating to thumb press 38 as shown on FIG. 20g.

FIG. 20g3 is a partial end sectional view illustrating the portion of runners 37 relating to middle part of tow plate 36 as shown on FIG. 20g.

FIG. 20g4 is a partial end sectional view illustrating the portion of runners 37 relating to plate head 39 as shown on FIG. 20g.

FIG. 21 is a cross-sectional view illustrating the 1st step of assembled manner of third embodiment of safety blood collector, wherein firstly primary rubber stopper 26 is mounted closely onto proximal nose 241 of primary platform 21 which then plug into distal cap 71 of rubber tube 70; secondly secondary rubber stopper 28 is also mounted closely onto proximal nose 301 of secondary platform 29; thirdly distal flat tip 84 of secondary hollow needle 80 is inserted into central hole of nose 301 exposing the part of rubber sheath 82 enclosed with inner part of needle 80 and its sharp tip 81 beyond proximal nose 301, which then insert into distal opening end 52 of assembling protective cap 51; fourthly distal nose 30 of secondary platform 29 plug into proximal cap 72 of rubber tube 70; fifthly an assembling stick 90 which is a long rigid specific tool headed with a male

threaded part 92 at proximal end 91 is screwed along female threaded part 25 into central hole 23 of nose 24 of primary platform 21.

FIG. 22 is a cross-sectional view illustrating the 2nd step of assembled manner of third embodiment of safety blood collector, wherein all associated components as mentioned on FIG. 21 are assembled into the interior of hollow barrel 10 by inserting distal end of assembling stick 90 therewith into distal opening end 16 of barrel 10 and then because male threaded part 92 at proximal end 91 of assembling stick 90 is screwed tightly against female threaded part 25 of primary platform 21, so that it can afford to pull primary platform 21 co-aligning with the rest of associated components along inner wall of barrel 10 smoothly therein.

FIG. 23 is a cross-sectional view illustrating the 3rd step of assembled manner of third embodiment of safety blood collector, wherein by means of using assembling stick 90 as the tool to pull primary platform 21 with rubber stopper 26 across primary catch 13 until stopping at secondary catch 19 within barrel 10, and then pushing assembling protective cap 51 to fix secondary platform 29 with rubber stopper 28 at primary catch 13 aligning rubber sheath 82 with inner part of secondary needle 80 therein. At this stage, rubber tube 70 is released and retrieves back to coil manner connected and stored in the room between both platforms 21 and 29 within barrel 10.

FIG. 24 is a cross-sectional view illustrating the 4th step of assembled manner of third embodiment of safety blood collector, wherein by means of continuously using assembling stick 90 as the tool to pull violently primary platform 21 with rubber stopper 26 aligned with rubber tube 70 which is connected with secondary platform 29 (which still remained situated at level of primary catch 13) downward, until locating lateral latch 22 of primary platform 21 hooked tightly

by lateral hole 14 which is close to base area 15 within hollow barrel 10 therein, such that nose 24 of platform 21 is a little bit exposes out of opening end 16 of barrel 10, thereby generating a vacuum room between both rubber stoppers 26 and 28.

FIG. 25 is a cross-sectional view illustrating the final step of assembled manner of third embodiment of safety blood collector, wherein releasing means which comprises primary holder 31 assembled with tow plate 36 is mounted snugly onto left end of barrel 10 externally wherein plate head 39 leaning against distal opening end 16 of barrel 10 can be pushed forward or pulled backward by thumb or finger manually operating on thumb press 38 along its runners 37 which are run smoothly by guide catches 35 within guideway gap 34 above guideway holder 33 therein, and lateral button 32 of primary holder 31 is located pointing properly against lateral hole 14 of barrel 10 respectively being ready for use.

FIGS. 26 is a cross-sectional view illustrating third embodiment of safety blood collector upon operating blood collection, needle assembly 41A is ready for use in that proximal protective cap 50 (not seen on FIG.) firstly taken away, exposing rubber sheath 46 enclosed with proximal part of needle 411 underneath is being inserted towards into central hole 23 of nose 24 through distal opening end 16 of barrel 10 by holding distal protective cap 48 of needle assembly 41A carefully.

FIGS. 27 is a cross-sectional view of safety blood collector of third embodiment, illustrating proximal part of needle 411 with rubber sheath 46 has been inserted into interior of barrel 10 in that sheath 46 is abutted in crookedly manner within a small central hole at nose 241 of primary platform 21, which only allows inner part of needle 41 with tip 43 go through therein, needle assembly 41A is interlocked with nose 24 of primary platform 21 within interior barrel 10 by

screwing male threaded part 44 against interior female thread 25 of nose 24, thereafter manually pushing thumb press 38 of tow plate 36 forward, such that plate head 39 is moved to hit against projected rim 49 of distal protective cap 48 therein, so that distal protective cap 48 can be easily released from needle assembly 41A without necessary to risk the human hand to do this job so as to avoid possible stick injuries.

FIG. 28 is a cross-sectional view illustrating further manner following FIG. 27, distal protective cap 48 of needle assembly 41A has been released away by plate head 39 of tow plate 36 exposing distal tip 42 of hollow needle 41 when ready for using assembled safety blood collector of third embodiment.

FIG. 29 is a cross-sectional view illustrating the operation manner of third embodiment of safety blood collector when puncturing into human skin for drawing blood, wherein vacuum blood collecting reservoir (tube) 61 has been engaged with proximal part of secondary needle 80 within barrel 10 in the manner that proximal tip 81 of inner part of needle 80 punctures rubber septum 65 of collecting tube 61, thereby trapping whole cover of rubber sheath 82 crookedly beyond septum 65 which is made from a soft resilient material having plastic memory, then needle 80 forces its way into collecting tube 61 opening fluid communication between distal tip 42 of hollow needle 41 through rubber tube 70 which is connected in between proximal tip 43 and distal tip 84 of both hollow needles 41 and 80 respectively, and the interior chamber of collecting tube 61 finally.

FIG. 30 is a cross-sectional view illustrating safety blood collector of third embodiment when after drawing a required amount of blood, wherein collecting tube 61 is released away from barrel 10, such that rubber sheath 82 retrieves

enclosing inner part of needle 80 fully due to its original plastic memory, and simultaneously, using fingers to press on lateral button 32 of primary holder 31, such that lateral latch 22 of primary platform 21 are pushed out of control by lateral hole 14 of barrel 10, so that the vacuum sucking force within the room between both rubber stoppers 26 and 28 to be released.

FIG. 31 is a cross-sectional view illustrating safety blood collector of third embodiment when the vacuum within the room between both rubber stoppers 26 and 28 is released, wherein the sucking force uplifts primary platform 21 with needle 41 together back to its original position at lateral catch 19 (see FIG.23), thereby trapping full part of needle assembly 41A into barrel 10 therein, thereafter, discard it properly, such that it takes no risk of needle stick injuries during the whole operation process from A to Z.

While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiments, it is to be understood that the invention is not to be limited to the disclosed embodiments, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope the appended claims.

CLAIMS

What is claimed is:

1. A safety blood collector comprising:

(a) a hollow, axially elongated base member comprises a distal opening with a base structure at one end and a proximal opening at other end, lying one or a plurality of abut structures and one or a plurality of retainable structures internally therein;

(b) a hollow penetration means comprises a distal sharp tip at one end and a proximal sharp tip enclosed by a rubber structure at opposite end with a male threaded structure located at midway, which is adapted to detachably engage with a needle mounting structure within said base member exposing said distal sharp tip at said distal end of said base member enabling to penetrate into human body for collecting fluid, which later can be retracted into interior of said base member after use, wherein said distal sharp tip and said proximal sharp tip when not in use are covered by a distal protective cap and a proximal cap at opposite ends respectively ;

(c) a force generating means comprises a springy element positioned between the interior base of said hollow base member and said needle mounting structure in association with one or a plurality of interlocking structures fitted therewith, adapted to fit within and move axially within said hollow base member, whereby said needle mounting structure engaged with said penetration means can be retracted into interior of said hollow base member when said springy element is released generating the tension force therefrom;

(d) a releasing means comprises an engagement structure detachably engaged with a protuberance structure which is allowed sliding axially to & fro therethrough, in association with one or a plurality of interlocking release

structures fitted therewith located at the identical place in response to said retainable structures, said engagement structure is mounted onto said hollow base member externally adapted to release away said protective cap of said penetration means by pushing said protuberance structure forward when preparing to use, and to release said interlocking structures by pushing said interlocking release structure against said interlocking structure out of said retainable structure's control, whereby said springy element is released generating the tension force causes said needle mounting structure to carry said penetration means into interior of said hollow base member; and

(e) a collecting member is a hollow vacuum body removable positioned within said hollow base member co-alignment with said penetration means, so as to open fluid communication between said distal tip of said penetration means and the interior chamber of said collecting member, such that the fluid sample from a human body is collected and detachment of said collecting member once the necessary amount has been collected.

2. A safety blood collector according to claim 1 wherein a female threaded part is disposed internally within a central hole of said needle mounting structure, whereby said male threaded part of said penetration means can be detachably engaged with said female threaded part of said needle mounting structure therein.

3. A safety blood collector according to claim 1 wherein said proximal sharp tip of said penetration means is enclosed by a rubber structure which is thin enough with plastic memory to be punctured by said proximal sharp tip without application of any substantial force, exposing said proximal sharp tip except said rubber structure punctures through a thin layer of rubber sheath of said collecting member into interior thereof.

4. A safety blood collector according to claim 3 wherein said rubber sheath is made close with a cap at one end of said collecting member, which is made from a soft resilient material having plastic memory.

5. A safety blood collector according to claim 1 wherein said engagement structure further comprises a catch structure for receiving said protuberance structure which includes a plurality of runners detachably and slidably run by said catch structure.

6. A safety blood collector comprising:
a hollow, axially elongated base member comprises a distal opening with a base at one end and a proximal opening at other end engaged with a release interlocking structure adapted thereon which is in response to an interlock structure being engaged with a retainable structure within said hollow base member therein ;
a hollow needle releasably carried by a needle mounting structure and having a distal sharp end exposing beyond said distal opening of hollow base member at one end and a rubber member with a proximal sharp end hidden underneath at other end which can puncture into a vacuum blood collecting member to open fluid communication between said distal sharp end and the interior chamber of said vacuum blood collecting member within said hollow base member when said distal sharp end punctures into human skin; and
a force generating structure in association with said interlocking structure axially in engagement with said needle mounting structure when the force is available by operating said release interlocking structure to release said interlocking structure out of said retainable structure's control therein, affecting said hollow needle to

be retracted into interior of said hollow base member after drawing required amount of fluid from human body.

7. A safety blood collector comprising:

(a) a hollow, axially elongated base member comprises a distal protruding opening structure within a base structure at one end and a proximal opening at other end, lying one or a plurality of retainable structures internally therein;

(b) a hollow penetration means comprises a distal sharp tip at one end and a proximal sharp tip enclosed by a rubber structure at opposite end with a male threaded structure located at midway, which is adapted to detachably engage with a needle mounting structure within said hollow base member exposing said distal sharp tip at said distal protruding opening structure enabling to penetrate into human body for collecting fluid, which later can be retracted into interior of said hollow base member after use, wherein said distal sharp tip when not in use are covered by a distal protective cap;

(c) an atmospheric generating means comprises a distal rubber element positioned snugly on the interior base of said base member and an another proximal rubber element is mounted snugly onto said needle mounting structure in association with one or a plurality of interlocking structures fitted therewith, adapted to fit snugly within and being pressed violently along inner wall axially within said hollow base member until said interlocking structure abutted by said retainable structure therein, thereby generating a compressed atmospheric pressure in the room between both said rubber elements, which then will expand returning said needle mounting structure engaging with said penetration means back to its original position, leading said penetrating means is totally retracted into interior of said hollow base member when said interlocking structure is released.

(d) a releasing means comprises: (1) a primary engagement structure detachably engaged with a protuberance structure which is allowed sliding axially to & fro therethrough; (2) a secondary engagement structure fitted with one or a plurality of interlocking release structures located at the identical places in response to said retainable structures, both said primary and secondary engagement structures are mounted onto said hollow base member externally adapted to release away said protective cap of said penetration means by pushing said protuberance structure forward when preparing to use, and to release said interlocking structures by pushing said interlocking release structure to release said interlocking structure out of said retainable structure's control, whereby the expansion force from the room in between both said rubber elements is released, leading said needle mounting structure to carry said penetration means totally into interior of said hollow base member; and

(e) a collecting member is a hollow vacuum body removable positioned within said hollow base member co-alignment with said penetration means, so as to open fluid communication between said distal tip of said penetration means and the interior chamber of said collecting member, such that the fluid sample from a human body is collected and detachment of said collecting member once the necessary amount has been collected.

8. A safety blood collector according to claim 7 wherein a female threaded part is disposed internally within a central hole of said needle mounting structure, whereby said male threaded part of said penetration means can be detachably engaged with said female threaded part of said needle mounting structure therein.

9. A safety blood collector according to claim 7 wherein said proximal sharp tip of said penetration means is enclosed by a rubber structure which is thin enough with plastic memory to be punctured by said proximal sharp tip without

application of any substantial force, exposing said proximal sharp tip except said rubber structure punctures through a thin layer of rubber sheath of said collecting member into interior thereof.

10. A safety blood collector according to claim 9 wherein said rubber sheath is made close with a cap at one end of said collecting member, which is made from a soft resilient material having plastic memory.

11. A safety blood collector according to claim 7 wherein said primary engagement structure further comprises a catch structure for receiving said protuberance structure which includes a plurality of runners detachably and slidably run by said catch structure therein.

12. A safety blood collector comprising:
(a) a hollow, axially elongated base member comprises a distal opening with a base structure at one end and a proximal opening at other end, lying a plurality of abut structures and one or a plurality of retainable structures internally therein;
(b) a hollow penetration means comprises a distal sharp tip at one end and a proximal sharp tip enclosed by a rubber structure at opposite end with a male threaded structure located at midway, which is adapted to detachably engage with a needle mounting structure exposing said distal sharp tip at said distal end of said base member enabling to penetrate into human body for collecting fluid, which later can be retracted into said hollow barrel means after use, wherein said distal sharp tip and said proximal sharp tip when not in use are covered by a distal protective cap and a proximal cap at opposite ends respectively ;
(c) a vacuum generating means comprises a proximal rubber element mounted snugly onto a platform structure having a proximal protruding member on one side and a distal protruding member on other side engaging with one end of a soft

elongated hollow rubber tube which other end connected with a needle mounting structure, a distal rubber element is mounted snugly onto said needle mounting structure in association with one or a plurality of interlocking structures fitted therewith, said platform structure with said proximal rubber element are fixed steadily at upper abut structure and said needle mounting structure with said distal rubber element are slidably fixed at lower abut structure respectively within said hollow base member, wherein said needle mounting structure with said distal rubber element are pressed violently along inner wall axially within said hollow base member until said interlocking structure abutted by said retainable structure therein, thereby creating a vacuum in the room between both said rubber elements, which then will generate a sucking force returning said needle mounting structure engaged with said penetration means back to its original position, leading said penetrating means is totally retracted into interior of said base member when said interlocking structure is released.

(d) a secondary hollow penetration means comprises a distal tip at one end and a proximal sharp tip enclosed by a rubber structure at opposite end which is covered by a protective cap when not in use, said distal tip is engaged with said proximal protruding member of said platform structure within said base member;

(e) a releasing means comprises an engagement structure detachably engaged with a protuberance structure which is allowed sliding axially to & fro therethrough in association with one or a plurality of interlocking release structures located at the identical places in response to said retainable structures, are mounted onto said hollow base member externally adapted to release away said protective cap of said penetration means by pushing said protuberance structure forward when preparing to use, and to release said interlocking structures by pushing said interlocking release structure to release said interlocking structure out of said retainable structure's control, whereby the

sucking force from the room in between both said rubber elements is released, leading said needle mounting structure to carry said penetration means totally into interior of said hollow base member; and

(f) a collecting member is a hollow vacuum body removable positioned within said base member co-alignment with said secondary penetration means, so as to open fluid communication between said distal sharp tip of said penetration means through said soft rubber tube as well as said secondary penetration means, and the interior chamber of said collecting member, such that the fluid sample from a human body is collected and detachment of said collecting member once the necessary amount has been collected.

13. A safety blood collector according to claim 12 wherein a female threaded part is disposed internally within a central hole of said needle mounting structure, whereby said male threaded part of said penetration means can be detachably engaged with said female threaded part of said needle mounting structure therein.

14. A safety blood collector according to claim 12 wherein said proximal sharp tip of said penetration means is enclosed by a rubber structure which is thin enough with plastic memory to be punctured by said proximal sharp tip without application of any substantial force, exposing said proximal sharp tip except said rubber structure punctures into the central hole of said needle mounting structure.

15. A safety blood collector according to claim 12 wherein said proximal sharp tip of said secondary penetration means is enclosed by a rubber structure which is thin enough with plastic memory to be punctured by said proximal sharp tip without application of any substantial force, exposing said proximal sharp tip except said rubber structure punctures through a thin layer of rubber sheath of said collecting member into interior thereof.

16. A safety blood collector according to claim 15 wherein said rubber sheath is made close with a cap at one end of said collecting member, which is made from a soft resilient material having plastic memory.

17. A safety blood collector according to claim 12 wherein said engagement structure further comprises a catch structure for receiving said protuberance structure which includes a plurality of runners detachably and slidably run by said catch structure therein.

18. A safety blood collector according to claim 12 wherein said rubber tube is a soft elongated body with elastic plastic property which is in coil manner when being not stretched.