United States Patent

[11] 3,545,427

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[54] BLOOD-COLLECTING ASSEMBLY
12 Claims, 9 Drawing Figs.

[52] U.S. Cl. 128/2, 128/276
[51] Int. Cl. A61b 5/10, A61m 1/00
[50] Field of Search ..... 128/2, 276, 218.1, 218.1(P), 214

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ABSTRACT: A blood-collecting assembly includes an evacuated tube having a stopper closing off its one end, a holder having a tube-receiving portion into which the stopper and tube can be freely inserted in any angular position, and a cannula secured to the holder and having a stopper-piercing marginal end extending into the space within the tube-receiving portion and terminating at a stopper-piercing end and another marginal end extending outwardly of the holder and terminating at a flesh-piercing end. A stop formed in part by the holder and in part by the stopper enables partial penetration and thereafter complete penetration of said stopper-piercing end through the stopper.

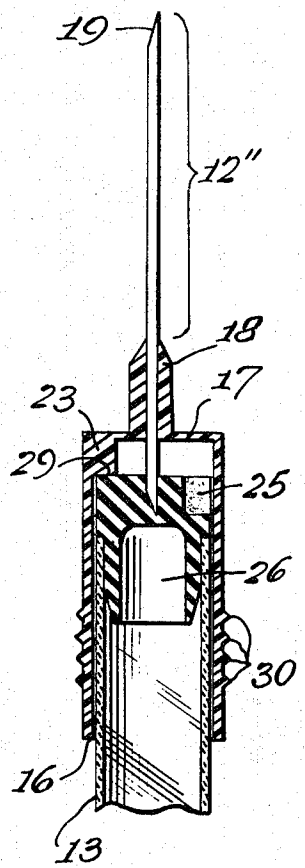


Fig. 1

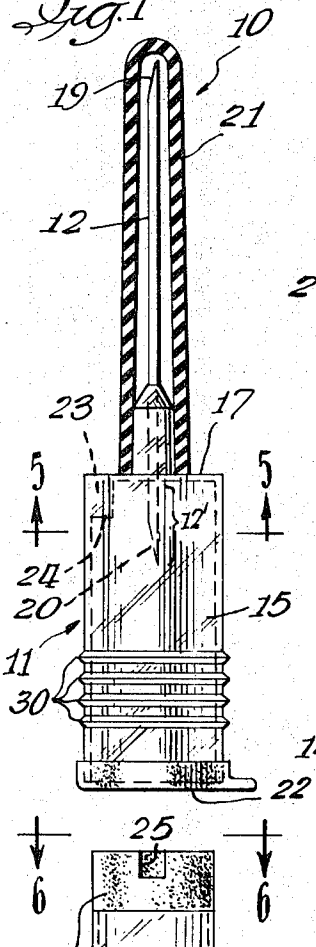


Fig. 2

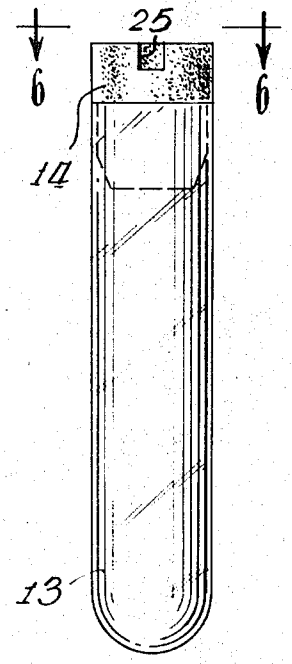


Fig. 5

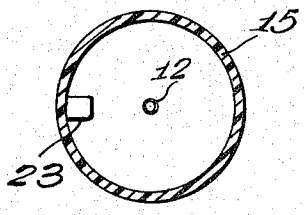


Fig. 6

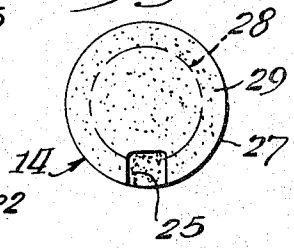


Fig. 3

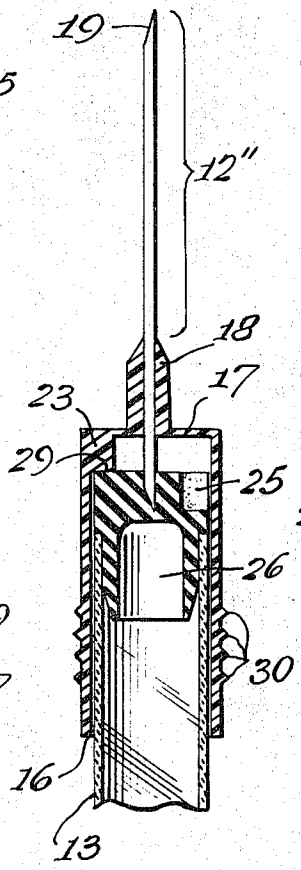


Fig. 4

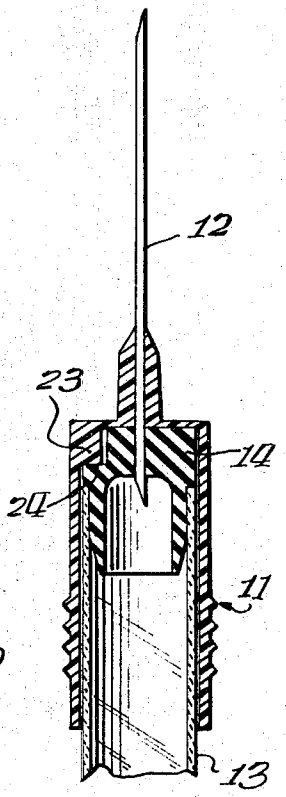


Fig. 7

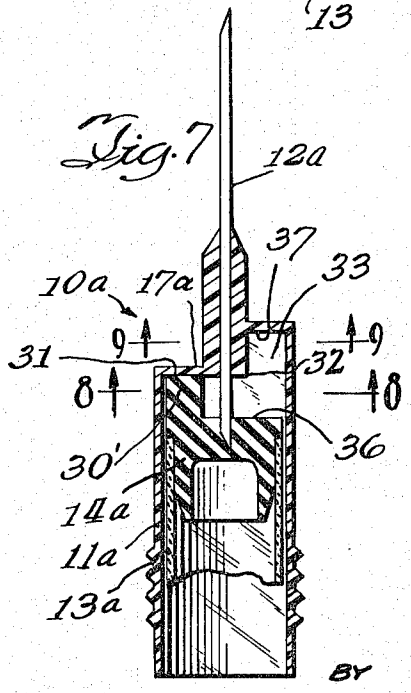


Fig. 9

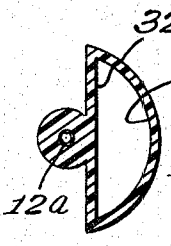
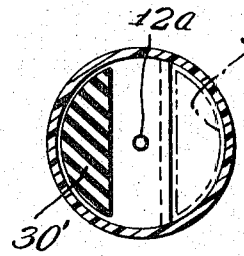


Fig. 8



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BLOOD-COLLECTING ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the art of collecting blood.

2. Description of the Prior Art

Various assemblies have been used in the collection of blood. The use of evacuated containers such as tubes in which blood is collected has been found to be quite useful in that the blood readily flows into the space in the tube, no venting of the tube is required in that there is no air to displace, and because a relatively inexpensive glass tube and rubber stopper are not only sufficient to maintain the tube in the evacuated state until it is used but the glass tube and rubber stopper serve to contain the collected blood and seal it off from the ambient conditions. When the blood is ready to be collected, it has been found desirable to cause the cannula to partially penetrate the stopper, and thereafter, when the venepuncture has been made, to cause the cannula to penetrate completely through the stopper to enable blood to flow from the vein, through the cannula, and into the tube. To this end, relatively costly and difficult to use assemblies have been devised.

SUMMARY OF THE INVENTION

The purpose of the invention is to provide a simple, low-cost, easy-to-use, and reliable blood-collecting assembly. The assembly of the invention has a simple holder for the cannula, and a simple stopper for the tube. The stopper and the tube are freely insertable into a tube-receiving portion of the holder in any angular position and can be freely rotated relative to the holder. The holder has a stop surface and the stopper has a stop surface. Before the venepuncture is made these stop surfaces can be rapidly brought up against each other to cause one end of the cannula to penetrate the stopper to an extend insufficient to establish communication between the cannula and the inside of the tube, andthen the tube and its stopper are rotated to bring these stop surfaces out of alinement with each other. Now the venepuncture is made with the other end of the cannula, and the tube and its stopper are moved relative to each other so that the one end of the cannula penetrates through the stopper to allow the patient's blood to flow into the tube.

Other features of the invention will become apparent from the following detailed description and the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an elevational view showing a holder and cannula in accordance with one embodiment of the invention;

FIG. 2 is an elevational view of an evacuated blood collecting tube, together with a stopper constructed in accordance with the invention;

FIG. 3 is a sectional view of the holder and cannula shown in FIG. 1 and the stopper and a fragmentary portion of the tube shown in FIG. 2, depicting the cannula as only partially penetrating the stopper;

FIG. 4 is a sectional view similar to FIG. 3, but depicting the cannula as having penetrated through the stopper;

FIG. 5 is an enlarged sectional view taken along line 5–5 of FIG. 1;

FIG. 6 is an enlarged top plan view taken along line 6–6 of FIG. 2;

FIG. 7 is a sectional view of a holder and cannula, together with a stopper and a fragmentary portion of an evacuated tube, in accordance with an alternative embodiment of the invention;

FIG. 8 is a sectional view taken along line 8–8 of FIG. 7; and

FIG. 9 is a sectional view taken along line 9–9 of FIG. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2 of the drawing, there is shown a blood collecting assembly generally indicated at 10 including

a holder 11 for a cannula 12 and a rigid evacuated container or tube 13 having stopper 14 closing off its one end. The head of the stopper 14 has a circular periphery, the diameter of which is equal or substantially equal to the outside diameter of the tube 13. The holder 11 is of one-piece construction and is preferably composed of transparent plastic material. The holder 11 has a tubular portion 15 open at one end 16 and joining an end wall 17 at its other end. The tubular portion 15 is shown to be circular in cross section and the inside diameter of the tubular portion 15 is slightly greater than the outside diameters of the head of the stopper 14 and of the tube 13. A hub 18, disposed axially with respect to the tubular portion 15 and the end wall 17, is formed integrally with the end wall 17. The cannula 12, disposed axially of the holder 11, is securely held by the hub 18. The tubular portion 15, the end wall 17, and the hub 18 are preferably molded as a unit directly to the cannula 12. The cannula 12 has a flesh-piercing end 19 adapted to pierce the flesh of the donor during the making of a venepuncture and a stopper-piercing end 20 of a noncoring type adapted to pierce the stopper 14. The stopper 14 can be composed of a molded elastomeric material which is self-sealing and capable of holding the vacuum in the tube 13. The tube 13 is preferably composed of glass. A conventional cannula sheath 21 is shown in FIG. 1, along with a temporary closure 22, both of which are removed when the assembly 10 is ready to be used.

Also formed during the molding of the holder 11 is a projection 23 having stop surface 24. The projection 23 is shown to be integral with the marginal end of the inside of the tubular portion 15 and to be integral with the marginal periphery of the endwall 17. The stop surface 24 is spaced from the end wall 17 by a distance about equal to the depth of a recess or depression 25 formed in the stopper 14. The projection 23 is dimensionally smaller than the recess 25 as seen in FIG. 4, and as is evident from a comparison of FIGS. 5 and 6. In making the venepuncture, the projection 23 also serves as a bevel indicator. The holder 11 is sufficiently transparent to enable the projection 23 to be readily seen by the user. With the projection 23 being inside the holder 11, the holder 11 should be transparent at least in the region of its stop surface 24. The stopper 14 is cored out as indicated at 26. As illustrated in FIG. 6, the area of the terminal end of the stopper 14 between peripheral edge 27 and phantom line 28, on either side of the recess 25, provides a stop surface 29. The projection 23 and the terminal end of the stopper 14 are stop portions which together form a stop. This stop is effective when the cannula 12 has partially penetrated the stopper 14 as best shown in FIG. 3. In this position, the end 20 of the cannula 12 is sealed off by the stopper 14 because it has only partially penetrated the stopper, and yet the vacuum in the tube 13 is not broken. Ridges 30, formed integrally with the tubular portion 15 and disposed closer to the end 16 than to the end wall 17, facilitate gripping of the holder by the user and also strengthen the holder 11. When the blood-collecting assembly 10 is ready to be used, the tube 13 and its stopper 14 are moved through the open end 16 and into the space inside the tubular tube-receiving portion 15. The stop surface 29 can be readily visually alined with the stop surface 24, and the stop limits the movement of the tube 13 and its stopper 14 with respect to the holder 11 and cannula 12. The user now rotates the tube 13 and its stopper 14 as a unit about marginal end 12′ of the cannula 12, which serves as a spindle, until the recess 25 is alined with the projection 23, then grasps the holder 11 at ridges 30 and makes the venepuncture. As the stop surface 24 of the projection 23 is alinedwith the recess 25, the user can apply force to the tube 13 to move the tube 13 and its stopper 14 relative to the holder 11 and cannula 12, thereby effecting penetration of the end 20 of the cannula 12 the rest of the way through the stopper 14 to the position best shown in FIG. 4; in this figure the entire terminal end including stop surface 29 of the stopper 14 is shown in abutment with the end wall 17. As communication is established between the inside of the vein of the patient and the inside of the tube 13 through the cannula

12, blood flows into the tube 13. When the blood has been collected, the marginal end 12'' of the cannula 12 can be withdrawn from the patient. Then the tube 13 and its stopper 14 can be withdrawn from the holder 11 and its cannula 12.

In the event it is desired to take two or more samples of blood from the donor, the end 19 is not removed from the donor's vein when the first sample has been taken, but the tube 13 with its stopper 14 are withdrawn from the holder 11. Immediately thereafter, a second tube with a like stopper is inserted into the holder 11 and is moved directly to the position shown in FIG. 4. When the second sample has been collected in the second tube, the second tube and its stopper are withdrawn from the holder 11. By this method, multiple blood samples can be taken even though only one venepuncture is made.

Referring to the embodiment of FIGS. 7, 8 and 9, there is shown an alternative form of blood-collecting assembly generally indicated at 10*a*. The assembly 10*a* is used in the same manner as the assembly 10 of the embodiment of FIGS. 1 through 6. A holder 11*a* and a stopper 14*a* differ from the holder 11 and the stopper 14 in that a projection 30' formed on the end of the stopper 14*a* has a stop surface 31 which is capable of abutting the end or end wall 17*a* of the holder 11*a* when the projection 30' is out of alinement with an arcuate interruption 32 in the end wall 17*a*. The end portion of the holder 11*a* provides a closed recess or depression 33 into which the projection 30' can extend when the projection 30' is alined with the recess 33, as indicated by phantom lines 35. In use, a tube 13*a* and its stopper 14*a* are slid into the holder 11*a*,until stop surface 31 of the stopper projection 30' is in abutment with end wall 17*a* as shown in FIG. 7. Thereupon, the tube 13*a* and its stopper 14*a* are rotated relative to cannula 12 and its holder 11*a* until the projection 30' and the recess 33 are aligned. The venepuncture can now be made, and thereafter the tube 13*a* and its stopper 14*a* are moved relative to the holder 11*a* so that the projection 30' is moved into the recess 33. Relative movement of the tube 13*a* and its stopper 14*a* are arrested when stopper surface 36 abuts end wall 17*a*; when the stopper surface 36 and the end wall 17*a* are in abutment, the stop surface 31 also abuts holder surface 37. In this position communication is established between the donor's vein and the inside of the evacuated tube via cannula 12*a*.

Other embodiments and modifications of this invention will suggest themselves to those skilled in the art, and all such of these as come within the spirit of this invention are included within its scope as best defined by the appended claims.

I claim:

1. A blood-collecting assembly, comprising: a rigid, elongated, evacuated tube, a pierceable self-sealing stopper closing off one end of said tube, said stopper having a head with a circular periphery, said head having a terminal end providing a stop surface, a recess in said head providing an interruption in said stop surface, a holder having a round tube-receiving portion with a greater inside diameter than the diameter of said head to enable said tube and its stopper to be freely inserted into said tube-receiving portion at any angular position, and a cannula secured to said holder and having one marginal end extending into the space defined by said tube-receiving portion and terminating at a stopper-piercing end and another marginal end extending outwardly of said holder and terminating at a flesh-piercing end, said holder having a stop surface adjacent one end of said tube-receiving portion of said holder, said holder stop surface being smaller than said recess, said stop surfaces being disposed so that when they come into engagement with each other, the opening in said one marginal end of said cannula is sealed off by said stopper, said tube being rotatable relative to said holder to aline said recess in said stopper and said holder stop surface so that said tube can be moved relative to said holder and cannula to move said holder stop surface into said recess to enable said stopper-piercing end to penetrate through said stopper so that communication is established between said cannula and the inside of said tube through said opening.

2. A blood-collecting assembly as defined in claim 1, wherein said tube-receiving portion is tubular and is transparent at least in the region of its stop surface.

3. A blood-collecting assembly, comprising: a rigid, elongated, evacuated tube having a pierceable self-sealing stopper closing off one end, a holder having a tube-receiving portion, a cannula secured to said holder and having one marginal end extending into the space defined by said tube-receiving portion and terminating at a stopper-piercing end and another marginal end extending outwardly of said holder and terminating at a flesh-piercing end, and a stop formed by a stop portion of said holder and a stop portion of said stopper, the maximum width of said stopper being less than the minimum dimension of the opening provided by said tube-receiving portion to enable said tube to be freely inserted into said tube-receiving portion at any angular position, said stop being effective before communication is established between said cannula and the inside of said tube, said stop portions being misalignable by rotating said tube relative to said holder and thereafter moving said tube and its stopper toward said cannula to establish communication between said cannula and the inside of said tube.

4. A blood-collecting assembly as defined in claim 3, wherein said stop portion of said stopper is formed by the terminal end of said stopper, said stopper having a recess into which said stop portion of said holder can be moved when said stop portions are misaligned.

5. A blood-collecting assembly as defined in claim 3, wherein said stop portion of said holder is in alinement with the bevel at the flesh-piercing end of said cannula to provide a bevel indicator.

6. A blood-collecting assembly as defined in claim 3, wherein said tube-receiving portion is tubular in cross section.

7. A blood-collecting assembly as defined in claim 3, wherein said stop portion of said stopper is provided by a projection on the end of said stopper, and said stop portion of said holder is formed by an end wall of holder.

8. A blood-collecting assembly as defined in claim 3, wherein said holder is composed of transparent material to enable visual observation of said stop portions to facilitate easy alinement and misalignment of said stop portions.

9. A blood-collecting assembly as defined in claim 3, wherein said holder with its tube-receiving portion provides a container having an opening through which said tube can be inserted.

10. A blood-collecting assembly, comprising: an evacuated glass tube, a pierceable self-sealing stopper closing off one end of said tube, said stopper having a head with a circular periphery, said head having a terminal end providing a stop surface, a recess in said head at its periphery providing an interruption in said stop surface, a one-piece transparent plastic holder having an end portion joined to a tubular portion, a cannula axially secured to said end portion and having one marginal end extending into the space defined by said tubular portion and terminating at a stopper-piercing end and another marginal end extending outwardly from said holder and terminating at a flesh-piercing end, a projection in said holder having a stop surface spaced from said end wall, said stopper-piercing end extending beyond said holder stop surface so that when said stop surfaces are in engagement said stopper-piercing end only partially penetrates said stopper, said projection stop surface being of smaller size than said recess so that when said projection is alined with said recess said tube can be used to force said stopper-piercing end the rest of the way through until said stopper abuts said end wall.

11. A blood-collecting assembly as defined in claim 10, including means formed integrally with the outer surface of said holder and remote from said projection for (a) stiffening said tubular portion and for (b) facilitating gripping of said holder.

12. A blood-collecting assembly, comprising: a rigid, elongated, evacuated tube having a pierceable self-sealing stopper closing off one end, said stopper having an outside diameter substantially equal to the outside diameter of said tube, a holder having a tube receiving portion, a cannula secured to

said holder and having one marginal end extending into the space defined by said tube-receiving portion and terminating at a stopper-piercing end and another marginal end extending outwardly of said holder and terminating at a flesh-piercing end, and a stop formed by a stop portion of said holder and a stop portion of said stopper, said tube and its stopper being freely insertable into said tube-receiving portion at any angular position, said stop being effective before communication is established between said cannula and the inside of said tube, said stop portions being misalignable by rotating said tube relative to said holder and thereafter moving said tube and its stopper toward said cannula to establish communication between said cannula and the inside of said tube.