Aug. 4, 1964 H. R. GEWERTZ 3,143,109

BLOOD DRAWING DEVICE

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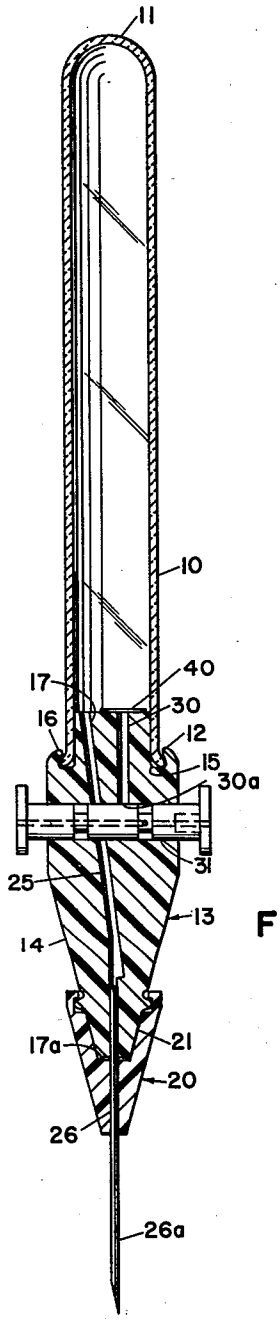


Fig. 1

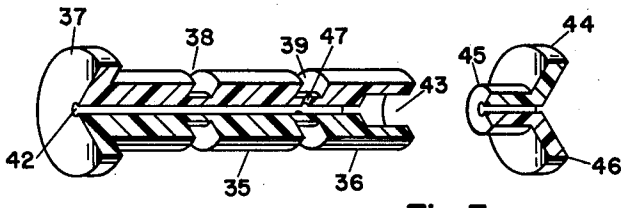


Fig. 3

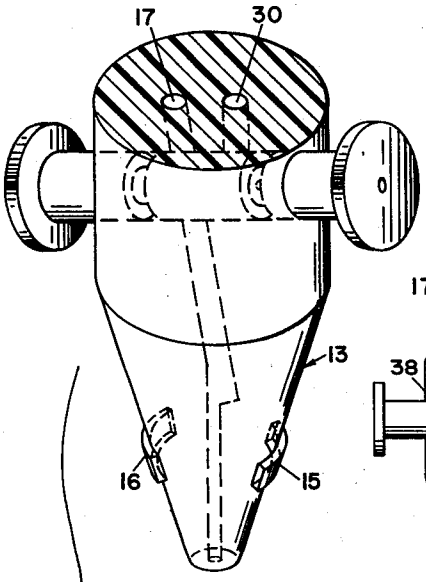
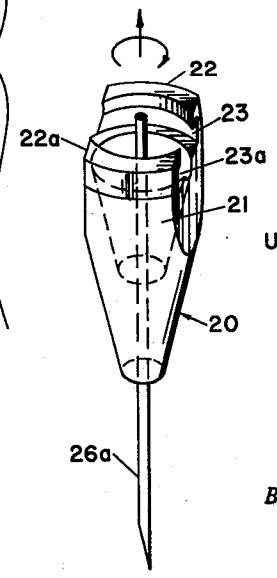


Fig. 2



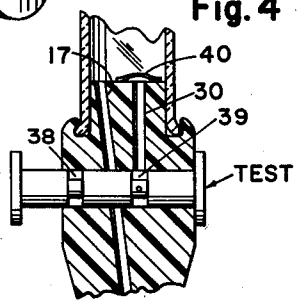


Fig. 4

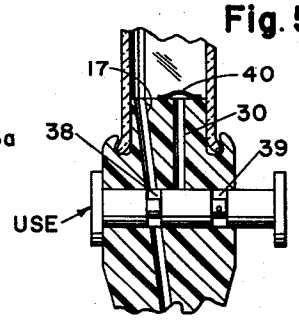


Fig. 5

INVENTOR.
HARRY GEWERTZ
BY
ATTORNEY

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BLOOD DRAWING DEVICE

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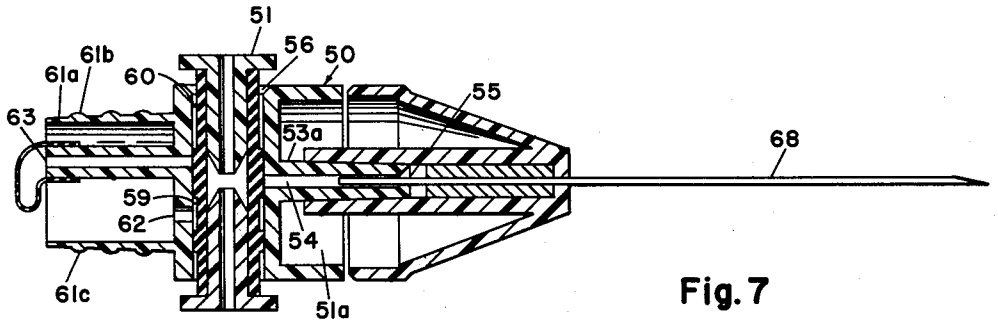


Fig. 7

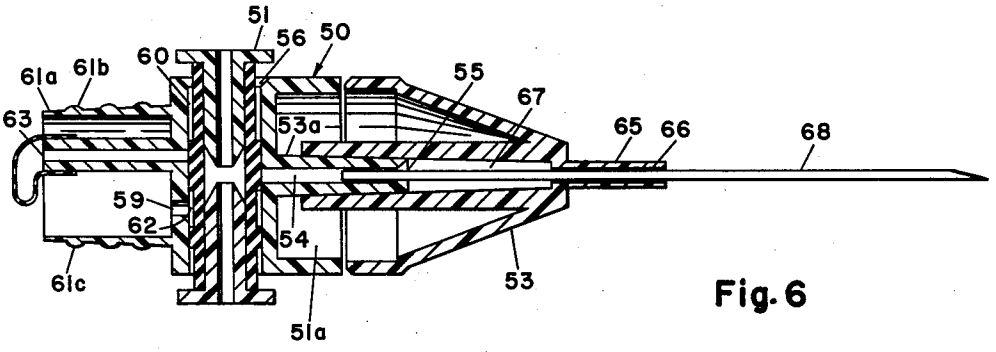


Fig. 6

INVENTOR.
HARRY GEWERTZ
BY William V. Pearce
ATTORNEY

United States Patent Office

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BLOOD DRAWING DEVICE

Harry R. Gewertz, Sea Cliff, N.Y., assignor, by mesne assignments, to Raytheon Company, a corporation of Delaware

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2 Claims. (Cl. 128—2)

This invention relates to blood receptacles and in particular relates to disposable hypodermic syringes in combination with a vacuum blood receptacle attached thereto for receiving blood specimens and similar fluid items under vacuum conditions.

In the field of medicine whenever blood is required to be extracted from the human body, a cannula type hypodermic needle is first injected into some portion of the anatomy, human or otherwise, where blood or fluid will flow freely and/or is easily extracted. In general, this blood removal or aspiration is accomplished by producing a partial vacuum after injection by drawing up on a plunger type piston rod within the blood vial which, because of the compact arrangement between plunger and wall causes a vacuum effect. After sufficient blood has been withdrawn, the needle is then also withdrawn. If insufficient blood is at first extracted another injectable device is required and the process repeated. In such a process the flow velocity of the blood depends upon the vacuum created and where insufficient blood is withdrawn, the patient is again subjected to the uncomfortable feeling of being injected.

In the present invention it is one of the principal objects to provide a hypodermic syringe and blood receptacle assembly which is simple, efficient, rugged and inexpensive.

Another object of the invention is to provide a hypodermic syringe and blood receptacle assembly which requires but a single injection or penetration regardless of the number of blood samples taken or required.

A still further object of the invention is to provide a hypodermic syringe and blood receptacle having a prearranged vacuum within the receptacle to facilitate and speed up the process of blood removal from the body and a readily identifiable means for testing vacuum conditions.

A still further object of the invention is to provide a hypodermic syringe and blood receptacle assembly having no moving plunger or rod or manually moving parts for producing a vacuum and/or otherwise for the removal of blood or fluid.

Other objects and advantages will become apparent from a reading of the specification and a study of the accompanying drawings in which:

FIG. 1 shows an axial sectional view of the hypodermic syringe and blood receptacle assembly according to the invention;

FIG. 2 shows a perspective and partially exploded view of the hypodermic syringe and valve body assembly;

FIG. 3 shows a perspective and partially sectioned view of the valve;

FIG. 4 is a fragmentary sectional view of a portion of the valve and valve body in section with the valve in test position for testing the vacuum of the receptacle;

FIG. 5 is a view similar to FIG. 4 showing the valve in the operating position to permit the free flow of fluid or blood to the receptable;

FIG. 6 is an enlarged axial sectional view of the valve body and cannula hub assembly according to another embodiment of the invention; and

FIG. 7 is a view similar to FIG. 6 showing a variation of the cannula hub assembly.

Now referring to the drawings where similar parts will be identified with the same reference numbers, and

particularly to FIG. 1, there is shown therein a sectional view of the disposable hypodermic syringe and blood receptacle assembly according to the invention. In particular there is shown a blood receptacle **10** made preferably of glass, plastic or the like, sealed at one end **11** and having a flared opening **12** at the other end to which is attached the valve body **13**. The valve body **13** is preferably made of solid rubber, plastic or some other suitable non-porous material having slightly elastic properties. The valve body is generally cylindrically shaped but is coned shaped at its lower extremity **14** with its upper extremity having an annular recessed portion **15** encircled by an upwardly and inwardly extending spaced flanged portion **16** disposed to snugly engage and fixedly hold the flared portion **12** of bottle **10**. The valve body **13** has its upper-most portion cylindrically shaped and disposed to snugly fit into the lower open end portion of the blood bottle to create an air-tight, water-tight seal between bottle and valve body.

The valve body **13** is further disposed to have radially along the conical lower portion **14** thereof a pair of oppositely disposed track members **15** and **16** each forming equal arcs of a circle and attached to the said conical shaped member to receive in fixed relation a cannula cone shaped hub assembly **20**. In particular, the cannula hub assembly **20** comprises a conically shaped cannula hub **21** having internally a conical recess at its upper extremity, such recess being disposed to snugly receive the lower portion of the valve body **13**. The cannula hub **21** is further disposed to have at the upper extremity thereof a pair of oppositely disposed and upwardly extending flange members **22** and **22***a* each forming segments of a circle and each having a raceway **23** and **23***a* respectively along the inner periphery for receiving the track members **15** and **16** of the valve body in fixed and locked position. The valve body **13** may be rotated with respect to the cannula hub **21** so as to cause the track members **15** and **16** to become disengaged from the raceways so that under these conditions the cannula hub can be removed and/or otherwise disengaged from the valve body.

There is further shown within the valve body **13** of FIG. 1 a tunnel or passageway **25** which extends from the top of the valve body **17** to the lower-most portion **17***a*, the said passageway communicating with the passageway **26** extending longitudinally of the cannula hub **21** and within which is mounted a cannula **26***a*, so that when the cannula hub and valve body **13** are attached to each other they will form a single unitary member, known as the vacuum blood receptacle. There is further shown in the valve body **13** another passageway **30** extending from the upper-most portion thereof to a point **30***a* intermediate the said upper portion and terminating in a passageway **31** extending transversely the direction of the passageway **30**.

The passageway **31** extending transversely the valve body **13** is disposed to snugly receive a valve member **35**, the valve member being free to move, when urged, along the passageway **31** according to the type of operation contemplated. The valve itself is composed of an elongated body member **36** having at one extremity an enlarged cylindrical base **37** and approximately midway a pair of spaced axially aligned annular recesses **38** and **39**. The said valve body member is further disposed to have extending axially a passageway **42** extending through the said base **37** and terminating at the other extremity thereof in a larger passageway **43** which communicates with the passageway **42**. The upper enlarged passageway **43** is further disposed to receive a valve cap **44** having a cylindrical stem **45** capable of fitting into the passageway **43**, and an enlarged flange **46** so as to permit closure of the valve body. The cap **44** is thus

permitted transverse movement with the valve body 35 for operational purposes. A small porthole 47 extends transversely from the passageway 42 to the annular recess 39 and communicates with both to permit the free flow of air or any other fluid media between them.

As previously mentioned in the objects herein, one of the primary purposes of the invention is to provide a blood receptacle assembly having a vacuum within the blood chamber or receptacle so as to readily permit the free flow of fluid or blood from the patient into the blood chamber without the necessity for manipulating a plunger or plunger handle which previously formed a part of blood receptacles. The vacuum herein is achieved by standard ordinary techniques and need not be shown or described in detail herein, but suffice it to say that one does exist. Assuming now that there is available the necessary vacuum, FIGS. 4 and 5 show what procedure is required to obtain blood specimens. In particular, there is shown in FIG. 4 the valve body in the test position, this being the position whereby the annular recess 39 of the valve body, and the passageway or test port 30 are in complete alignment. This permits the free flow of air into the tube chamber. In this situation air will traverse a path comprised of the passageway 30 and terminate in and impinge upon a distensible diaphragm 40 which is attached over the upper extremity of the passageway 30. Under these conditions, the diaphragm 40 will be subjected to atmospheric pressure and will become distended, but will not rupture. This is a visual check to determine if a vacuum is still present in the blood chamber. If the diaphragm does not distend, but remains constant, it would then be an indication that the vacuum was not present or was otherwise destroyed. Since it is contemplated that the blood receptacle will be stored before using, the length of storage being undetermined, there is always a possibility that the vacuum will be destroyed or otherwise become deteriorated, hence the reason for this testing procedure. FIG. 5 shows the operating position of the valve when aspiration is to take place on the patient. Essentially the needle is injected into the patient, then the valve body placed in the position as shown in FIG. 5 with the passageway 25 aligned with the annular recess 38, so as to have both in complete alignment and communicating with each other to allow for the free flow of the fluid media such as blood. After the blood has been aspirated, the valve body may then be moved so as to block the passageway for the free flow of blood and the complete blood chamber or bottle assembly removed from the patient. However, in the alternative, if additional blood samples are required, the needle assembly is permitted to remain in the patient and the blood bottle removed by rotating the valve body with respect to the cannula hub in such a direction as to permit the tracks attached to the valve body to become disengaged from the raceways which are attached to and form a part of the cannula hub. After removal of the blood bottle, the procedure is repeated by slipping another blood bottle into the cannula hub and merely rotating same so as to permit the tracks attached thereto to again engage the raceways which form an integral part of the cannula hub. This action permits a positive locking action between the hub and receptacle so as to permit the process to take place again for the extraction of further samples of blood.

There is now shown in FIG. 6 another embodiment of the invention and in particular there is shown a needle and receptacle assembly comprising a valve body 50 having a valve 51 attached thereto and forming a part thereof and a cannula hub 53 disposed to combine with the valve body so as to form a single complete unitary structure therewith. The valve body 50 in particular is a generally cylindrically shaped body having its lower extremity partially recessed, the said recess 51*a* being defined by a downwardly extending circumferential flange 52 and an inner concentrically located tapered hub 53*a* extending axially downward beyond the termination of the said circumferential flange, the said hub having an axial bore 54 extending from its lower most- portion 55 and terminating in a cylindrical bore 56 extending tranversely completely across the valve body member. The transverse bore 56 has one extremity thereof 56*a* countersunk and is further disposed to receive the valve 55, the said valve being freely movable within the said bore when used by some external force. In particular, the valve consists of a cylindrical member 57 having peripheral rings 57*a* and 58, the said rings defining a series of annular shaped passageways 62 and 60. The valve bore 56 is so arranged as to receive a pair of valve caps or stems at opposing ends to permit the free movement of the valve by manual means. The upper portion 61*a* of the valve body is cylindrical in shape and is provided with a partially tapered outer wall 61*b* having spaced corrugated type ridges 61*c* for engaging internally any receptacles, bottles, containers or otherwise (not shown) where placed thereover and to fixedly retain same to keep them from freely moving and to also provide a seal-tight arrangement therewith. There is further provided in the upper portion of the valve body member a pair of longitudinally extending ports or passageways 59 and 63, the first passageway 59 being relatively short to permit the access or free flow of fluid, whereas the other port 63 is relatively longer and has attached thereto at its upper extremity a small elastic type water and airproof bag for permitting passage of air therein under vacuum conditions as previously described. In testing for vacuum conditions, the valve is displaced in a direction so as to permit passageway 60 to communicate with port 63, air then being available so as to permit its access via the countersunk portion 56*a* of the bore 56, passageway 60, and port 63, thus allowing the bag to become inflated. For the reception of blood, the valve 55 is displaced in the opposite direction to that for test purposes, so as to allow the blood to flow through the bore 54 of the hub 53, the passageway 62, and the blood port 59 as heretofore described.

The cannula hub 53 is generally conical in shape and is provided with a lower depending cylindrical stem 65 having an axial bore 66 terminating at one extremity in and communicating with an upper tapered bore 67 which extends axially the length of a cylindrical hub 68 forming an integral part of the cannula hub 53. The tapered bore 67 is so arranged as to engage the tapered hub 53*a* of the valve body to form a snug immovable unitary structure. A cannula member 68 is mounted within the cannula hub structure along the bore portions 66 and 67 thereof, and extends upwardly and beyond and into the bore of the tapered hub forming a part of the valve body.

FIG. 7 shows a needle and bottle assembly which is similar in construction and design to the assembly shown in FIG. 6 but differs therefrom in that the stem 65 is now placed within the bore 67 to provide sturdier support means for the cannula. The cannula is pressed or force-fit within the stem or ferrule 65 so that the cannula will be firmly fixed therein.

Having described the invention, what is claimed is:

1. A blood drawing device comprising a receptacle having an open end,

a valve body sealed at one end to the open end of the receptacle and extending outwardly therefrom,

means at the other end of the valve body for receiving and supporting a hollow needle,

a first passageway extending longitudinally of the valve body, said passageway communicating with said means at one end and with the receptacle at the other end,

valve means in said valve body comprising a transversely movable cylinder having a body portion intercepting said first passageway when the valve is located in a first position, said body portion having a port therein which provides continuation of the passageway when the valve is located in a second position for

permitting uninterrupted flow of blood from the needle into the receptacle,

a second passageway extending longitudinally of the valve body in spaced relation to the first passageway and communicating at opposite ends with the valve cylinder and receptacle,

a second port in said body portion of the valve located in spaced relation to said first port and in communication with said second passageway when the valve is in said first position,

a distensible member covering the receptacle end of the second passageway,

and a bore in the valve connecting said second port with atmosphere external of the device.

2. A blood drawing device comprising a receptacle having an open end,

a valve body sealed at one end to the open end of the receptacle and extending outwardly therefrom,

means at the other end of the valve body for receiving and supporting a hollow needle,

a first passageway extending longitudinally of the valve body, said passageway communicating with said means at one end and with the receptacle at the other end,

a second passageway extending longitudinally of the valve body in spaced relation to the first passageway,

valve means in said valve body for selectively permitting flow of blood through said first passageway or external gas through said second passageway, said valve means comprising a bore extending transversely through the body intercepting said first passageway

and terminating one end of the second passageway, and a cylinder located within and slidable longitudinally of the bore, said cylinder having a pair of spaced ports therein and being movable to a first position wherein said second passageway is blocked and one of said ports provides continuation of the first passageway for uninterrupted flow of blood from said first means to the receptacle, said cylinder further having an opening therein connecting said second port with gas external of the device and being movable to a second position wherein said first passageway is blocked and the second of said ports provides communication between the second passageway and the opening in the cylinder, and a distensible member covering the receptacle end of the second passageway.

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