

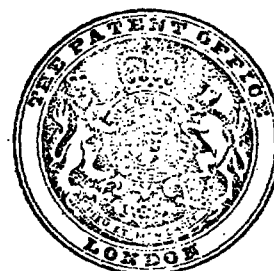
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(54) IMPROVEMENTS IN AND RELATING TO BLOOD SAMPLING TUBE HOLDERS

(71) We, IMS LTD., a corporation organised according to the laws of the State of Delaware, United States of America, of 811 West Seventh Street, Los Angeles, California United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to holders for blood sampling tubes.

It is well-known in the art of blood-sampling to utilize an evacuated blood sampling tube in conjunction with a holder fitted with a double-ended needle, one end of the needle projecting within the holder and the other end being adapted to be inserted into the vein of the patient. This device is described in United States Patent No. 2,460,641 to Kleiner. The problems associated with the Kleiner device are several.

In using the Kleiner device, it is normal hospital procedure to take two blood samples in succession. This procedure requires the changing of blood sampling tubes after the first tube has been filled with blood. In general, it is desirable to take the several blood samples from a single venapuncture in order to minimize the number of needle entries in the patient's arm. This is accomplished by preassembling the holder and the first blood sampling tube. Preassembly is necessary in order to prevent the discharge of blood through the needle and into the interior of the holder because of the normal blood pressure, or the pressure as it is increased by the application of a tourniquet. The open end of the preassembled unit is inserted in the vein with the stopper on the vacuum tube plugging the lumen of the inner end of the needle to prevent the discharge of blood into the holder. The position of the other end of the needle should be such that it lies well within the vein so that the blood is drawn

from the vein, rather than from surrounding tissue. If the blood is inadvertently drawn from surrounding tissue a hematoma will result. The blood sample is then taken by completing the puncture of the stopper by forward motion of the tube which drives the stopper over the inner end of the needle. After the drawing of the first tube of blood, it is necessary to remove the filled tube from the inner end of the needle. As soon as the stopper on the first blood sampling tube is removed from the inner end of the needle, there is nothing to prevent the flow of blood from the vein through the needle and into the holder. An attempt to prevent or minimize this condition as practiced by the technician is to position the needle for the venapuncture so that the lumen faces either up or down. In this way, by pressing on the vein prior to removing the first tube, the technician attempts to close the lumen of the needle within the vein by pressing the interior of the vein wall against the lumen to form a seal. Frequently, however, the lumen of the needle is not aligned properly, since the operator cannot exactly locate the position of the lumen within the vein by feel, and its position cannot be observed visually. In changing the first tube to the second, the application of pressure is rarely completely effective in preventing the escape of blood into the holder. In addition, this technique is also undesirable because it involves the forcing of the interior of the vein against the sharp cutting edge of the lumen tending to produce a trauma at that point.

In contrast to the foregoing, a device has now been developed which obviates the need for any particular type of alignment of the needle within the vein. Many of the devices constructed in accordance with the present invention also eliminate the need for the pre-assembly of the blood sampling tube over the inner end of the needle, thereby eliminating any accidental premature puncture of the

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stopper and loss of vacuum. Devices constructed in accordance with the present invention are also adapted to prevent any leakage of blood into the holder between the removal of the first blood sampling tube and the positioning of the second blood sampling tube. Further, the devices constructed according to the present invention do not depend upon the application of pressure on the vein wall in the vicinity of the lumen of the needle to control the flow of blood during the changing of tubes. In this way any possibility of the production of a trauma within the vein wall is eliminated.

In the drawing of blood it is absolutely essential that the needle be within the vein of the patient so that the blood sample is withdrawn from the vein rather than from the surrounding tissue. If the blood is accidentally drawn from the surrounding tissue, a hematoma is produced accompanied by discoloration, swelling and pain. In utilizing the available blood sampling assemblies for the drawing of blood by vacuum, the normal practice is to insert the end of the needle within the vein, relying solely upon what can be seen by the eye or felt by pressing on the skin to determine whether the lumen of the needle is in the vein, or partially or wholly extending into the surrounding tissue. Previously proposed devices are not equipped with any means for making a preliminary determination that the lumen is in fact in the vein. The present invention in a preferred form is concerned with a means for making a preliminary determination that the lumen of the needle is properly positioned in the vein before the evacuated blood sampling tube is punctured.

In previously proposed blood sampling assemblies the blood sampling tube is normally first preassembled with the holder so that the inner end of the needle partially penetrates the stopper to form a seal over the scarf of the needle. This is accomplished by forcing the tube into the holder until the scarf is just buried in the center of the stopper. The free end at the needle of the assembly is then inserted in the vein and the final puncturing of the stopper is accomplished by a forward thrust-like motion of the blood sampling relative to the holder. This practice carries with it the danger that in pushing the blood sampling tube over the inner end of the needle to puncture the same, the operator may inadvertently allow the holder to also move forward, thereby causing the other end of the needle to move from within the vein through the vein wall and into the surrounding tissue. If this occurs and the blood is withdrawn from the surrounding tissue rather than from the vein, there is produced in the arm of the patient a hematoma because of the sucking of blood from the tissue. The hematoma produces an enlargement of the affected area accompanied by severe discoloration. The

hematoma is not only unsightly and uncomfortable, but can be quite painful. According to a preferred feature of the present invention a novel interlocking arrangement between the blood sampling tube and the holder makes it unnecessary to utilize any forward thrust motion in puncturing the stopper of the evacuated blood sampling tube.

The present invention provides a blood sampling tube holder which comprises a generally tubular body, one end of which is open, a double-ended needle secured to the holder so that one end of the needle projects inwardly into the body and the other end is free for injection into the vein of a patient, and an imperforate resilient tube covering the opening at the inner end of the needle and being arranged to form a seal, which is arranged to be effective under the influence of normal blood pressure, between the interior of the needle and at least the open end portion of the interior of the holder, the imperforate resilient tube being such that, when the stopper of an evacuated blood sampling tube is forced over the inner end of the needle, the resilient tube is pierced by the needle and compressed in an axial direction, the pierced end of the resilient tube being displaced away from the end of the needle pierced by the stopper, and when the stopper is removed from the needle, the resilient tube recovers its original length to again enclose the inner end of the needle.

With such a holder, one sampling tube can be removed from the needle of the holder after obtaining a sample, and a second sampling tube can be advanced over the needle of the holder without leakage of blood into the holder occurring during the change from one tube to the other.

Advantageously, the said other end of the generally tubular body is closed, the holder is translucent, and the inner end of the needle extends within the holder and is covered over a portion of its length by the imperforate resilient tube, the resilient tube being open at the end remote from the end that is arranged to be pierced in operation by the needle and the internal diameter of the resilient tube being greater than the external diameter of the needle so that a fluid passage is provided from the inner end of the needle to the open end of the resilient tube, the exterior of the resilient tube sealing on the interior of the holder at a position spaced apart from the end of the resilient tube arranged to be pierced in operation by the needle, the holder being flexible in proximity to the sealing position so that when the outer end of the needle is inserted in the patient, the operator can establish whether the needle is in a vein by squeezing the holder out of round, thus creating an air passage in proximity to the sealing position and therefore permitting a small amount of blood to escape

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from the inner end of the needle and flow inside the resilient tube to visibly emerge at the open end, of the resilient tube. This enables a preliminary determination to be made whether the lumen of the needle is properly positioned in the vein of a patient before the stopper of the evacuated blood sampling tube is punctured.

The resilient tube, which is preferably of rubber, may seal on an annular shoulder on the interior of the holder. The resilient tube may be formed of rubber with the exterior of the resilient tube sealing on the interior of the holder at the open end portion of the resilient tube or sealing on the interior of the holder at a position between the ends of the resilient tube.

The invention also provides a blood sampling assembly comprising a blood sampling tube holder according to the invention defined hereinbefore, and an evacuated blood sampling tube having an open end and a closed end, and a resilient imperforate stopper retained in the open end of the sampling tube and arranged, in operation, to be punctured by the needle of the holder.

Advantageously, there is provided means for retaining the stopper in the open end of the sampling tube and for sealing with the sampling tube, the stopper and the holder each being formed with threads for mating with each other to form to an interlock so that the inner end of the needle can be made to puncture the resilient tube and the stopper by relative rotary movement between the holder and the stopper. The retaining and sealing means may comprise a peripheral shoulder on the stopper, the underside of which bears against and forms a seal with the open end of the sampling tube.

With such an arrangement, it is not necessary to urge the blood sampling tube forwards into the holder to puncture the stopper, thereby reducing or eliminating the chances of producing a hematoma in taking a sample of blood.

The stopper may have a thin diaphragm section at its centre. The threads on the body of the holder and on the stopper, and the diaphragm, may be so disposed that the threads can be engaged over a part of their lengths to permit the passage of venous blood along the needle for observation without puncturing the diaphragm.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a sectional view of an imperforate resilient tube which forms part of one form of a blood sampling tube holder constructed in accordance with the invention;

Figure 1a shows the tube of Figure 1 in place over a needle equipped with means for mounting the same in a blood sampling tube holder;

Figure 2 shows the needle of Figure 1a carrying the imperforate resilient tube assembled in the first form of holder, together with a blood sampling tube and a needle cover;

Figure 3 shows the parts shown in Figure 2 with the exception of the needle cover, with the blood sampling tube inserted in the holder so that the inner end of the needle has compressed the resilient tube and punctured the stopper;

Figure 4 shows a different form of blood sampling tube in the first form of holder, the stopper on the evacuated blood sampling tube being provided with an annular ring within a recess in the outer face of the stopper, which ring engages the imperforate resilient tube on the needle during operation and assists in the recovery of the resilient tube to its original position covering the end of the needle after the removal of the sampling tube from the needle;

Figure 5 shows a different form of holder in accordance with the invention in which the imperforate resilient tube seals on the holder within a recess in an end wall of the holder;

Figure 6 shows a different form of holder constructed in accordance with the present invention, in which the resilient tube seals at a point along the walls of a thrust portion provided within the holder and the length of the resilient tube is less than the length of that portion of the needle that extends within the holder;

Figure 7 shows a known evacuated blood sampling tube with which the holders shown in Figures 2 to 5 can be used;

Figure 8 shows an enlarged view of a stopper for an evacuated blood sampling tube forming part of the present invention which can be used with the holders shown in Figures 2 to 5. Figure 8 is an enlarged view of the stopper shown in Figure 4;

Figure 9 shows a further form of blood sampling tube in accordance with the present invention;

Figure 10 shows a different form of holder in accordance with the invention; and

Figure 11 shows a further form of holder in accordance with the present invention.

Turning to the drawings in greater detail, the holders shown in the drawings each have generally tubular bodies, the holders being shown in axial sections in the drawings. The axially compressible tube 10 can be made to form a seal between the inner end 12 of needle 14 and the interior of holder 16 in a variety of ways. As is shown in Figure 1, the tube 10 is provided with a seal 18 at its open end which seals on the exterior of the needle 14. When the resilient stopper 20 of the blood sampling tube 22 is forced over the inner end 12 of the needle 14, the compressible tube 10 is punctured by the needle undergoes an

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5 accordion-like longitudinal compression in an axial direction as shown in Figure 3, and maintains this position during blood sampling. After the sample has been withdrawn, the tube 10 is capable of self-recovery to its original position covering the inner end 12 of the needle. The resilient nature of tube 10 is such that the needle puncture in the tube is closed to fluid flow when the needle is withdrawn therefrom. Various other embodiments of the longitudinally compressible cover will be apparent to those skilled in the art. For example, as is shown in Figure 5, the longitudinally compressible tube 24 may be provided with external rings 26 which seal at a recess 28 within the end of the holder; or as shown in Figure 6, the longitudinally compressible tube 30 may seal against the sidewalls of the thrust portion 32 of holder 34.

As is shown in Figures 4 and 8, the blood sampling tube stopper 36, which is resilient, may be provided with an annular ring 38 which has an inside diameter slightly less than the outside diameter of tube 10 so that it engages the longitudinally compressible tube 10 and aids in its operation, particularly in causing the tube to recover to its original position after the taking of a blood sample. The longitudinal compressibility and recovery of the tube 10 is provided by the resiliency of the material from which it is made, and by maintaining its inside diameter over the compressible portion larger than the outside diameter of the needle so that no seal is formed therebetween.

It is apparent that the longitudinally compressible tube can be used with those blood sampling devices wherein a positive type of interlock is provided between the holder and the blood sampling tube. For example, as shown in Figure 6 there is a threaded interlock provided by the threaded open end portion on thrust portion 32, and a threaded extension on the stopper of a blood sampling tube.

In operation, the device is originally made up as in Figure 2. The operator then removes the needle cover and inserts the free end of the needle 14 within the vein of the patient. Thereafter, the drawing of the first blood sample is completed by moving the blood sampling tube 22 to the position shown in Figure 3. Once the first blood sampling tube has been filled it is withdrawn from the holder, thereby permitting the longitudinally compressible tube 10 to recover over the inner end of the needle to prevent the escape of blood into the interior of the holder. Thereafter, the operator inserts a second blood sampling tube as before. As will be apparent, it is unnecessary that the lumen of the needle inserted within the vein be positioned in any particular fashion. Likewise, it is unnecessary for the operator to apply any pressure to the

vein of the patient during the changing of tubes, since the shutting off of the flow of blood from the vein is fully regulated by the longitudinally compressible tube when it is positioned over the inner end of the needle.

The holders of Figures 9 through 11 are constructed to be flexible in proximity to an annular shoulder which forms a seal with the compressible tube (which is made of rubber) on the inside of the holder so that when the operator aspirates by applying squeezing force to the exterior of the holder, air is permitted to escape from the lower end of the holder around the sealing area, which in turn permits blood from the patient to flow upward in the needle out the inner end thereof and down the fluid passage inside the rubber tube to the point around the open end of the tube where it may be visually observed, the portions of the holders in the vicinity of the open end of the rubber tube being translucent. The squeezing of the holder distorts it from its normal circular cross section to an elliptical cross section which breaks the seal between the exterior of the rubber tube and the inside walls of the holder. In this way the operator may first insert the free end of the needle into the patient in what he believes to be the vein. Then by squeezing the walls of the holder at or around the point of sealing of the rubber tube on the annular shoulder inside of the holder, blood can be made to appear around the opening of the rubber tube. If blood does not appear, this indicates that the needle has not been inserted in a vein, since only venous blood pressure would be capable of causing the production of blood at the opening of the rubber tube. If no blood appears upon squeezing, the operator withdraws the needle and re-inserts it again, squeezes and looks for blood as before. Once the operator is satisfied that the needle has been properly inserted because of the production of blood upon aspirating by squeezing, an evacuated blood sampling tube provided with a stopper is then inserted within the holder and the inner end of the needle is forced through the stopper to withdraw the blood by vacuum into the blood sampling tube. The rubber tube is punctured in the process of forcing the blood sampling tube over the inner end of the needle. Upon withdrawal of the blood sampling tube the inherent recovery properties of the rubber tube causes it to spring back in place over the end of the needle enclosing the same in preventing the escape of blood after the blood sampling tube has been withdrawn. The annular shoulder prevents the rubber tube from being pushed down into the holder by the blood sampling tube. In this fashion, a series of samples can be readily taken without the discharge of blood into the interior of the holder between tubes.

As is shown in Figure 9, the holder 48 is provided with a cannula 50 which is double-

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ended and extends through the end wall 52 of the holder. Over the inner end of the cannula 50 is positioned the rubber tube 54 which seals on the inner walls of the holder at annular shoulder 56. The inside diameter of the rubber tube 54 is slightly larger than the outside diameter of the cannula to provide a fluid passage 58 from the end of the cannula to the open end of the rubber tube. The walls of the holder 48 are made of a flexible material normally plastics such as polystyrene or polyethylene.

Turning to Figure 10, there is shown a preferred form of the rubber tube 60 having a tail-like portion 62 extending from a point below the point of which the rubber tube seals on the inside of the holder. In this way when the holder is inserted in the vein and squeezing action applied in proximity to the sealing point, the drops of blood appear at point 64 to tell the operator that the holder has been properly inserted in a vein. Thereafter, threads 66 on the holder and threads 68 on the stopper of the blood sampling tube 70 may be made up to puncture the thin diaphragm 72 and cause the withdrawal of the blood from the vein into the interior 74 of the blood sampling tube.

With reference to Figure 11, neither the holder 76 nor the stopper 78 on the tube 80 is equipped with any threads. The blood sampling tube is simply forced over the inner end of the needle 82 after aspirating blood has now been detected at point 84 by applying squeezing action at point 86, in the manner described above.

Having regard to the provisions of Section 9 of the Patent Act, attention is directed to the claims of the Applicants Patent Nos. 57843/68 and 39295/71, (Serial Nos. 1256521 and 1256524).

WHAT WE CLAIM IS:—

1. A blood sampling tube holder which comprises a generally tubular body, one end of which is open, a double-ended needle secured to the holder so that one end of the needle projects inwardly into the body and the other end is free for injection into the vein of a patient, and an imperforate resilient tube covering the opening at the inner end of the needle and being arranged to form a seal, which is arranged to be effective under the influence of normal blood pressure, between the interior of the needle and at least the open end portion of the interior of the holder, the imperforate resilient tube being such that, when the stopper of an evacuated blood sampling tube is forced over the inner end of the needle, the resilient tube is pierced by the needle and compressed in an axial direction, the pierced end of the resilient tube being displaced away from the end of the needle pierced by the stopper, and, when the stopper is removed from the needle, the

resilient tube recovers its original length to again enclose the inner end of the needle.

2. A tube holder as claimed in claim 1, in which the inner wall of the resilient tube has a portion of reduced diameter which forms a seal against the needle which is arranged to be effective under the influence of normal blood pressure to thereby seal the interior of the needle from at least the open end portion of the interior of the holder.

3. A tube holder as claimed in claim 1, in which the resilient tube has a sealing ring on its exterior which is received in a recess in a wall which closes the said other end of the tubular body to form a seal between the resilient tube and the holder which is arranged to be effective under the influence of normal blood pressure.

4. A tube holder as claimed in claim 1, in which the resilient tube has a sealing ring on its exterior which contacts the inner surface of the side wall of the tubular body to form a seal between the resilient tube and the holder which is arranged to be effective under the influence of normal blood pressure, and in which the said other end of the body is closed.

5. A tube holder as claimed in claim 1, in which the said other end of the generally tubular body is closed, the holder is translucent, and the inner end of the needle extends within the holder and is covered over a portion of its length by the imperforate resilient tube, the resilient tube being open at the end remote from the end that is arranged to be pierced in operation by the needle and the internal diameter of the resilient tube being greater than the external diameter of the needle so that a fluid passage is provided from the inner end of the needle to the open end of the resilient tube, the exterior of the resilient tube sealing on the interior of the holder at a position spaced apart from the end of the resilient tube arranged to be pierced in operation by the needle, the holder being flexible in proximity to the sealing position so that when the outer end of the needle is inserted in the patient, the operator can establish whether the needle is in a vein by squeezing the holder out of round, thus creating an air passage in proximity to the sealing position and therefore permitting a small amount of blood to escape from the inner end of the needle and flow inside the resilient tube to visibly emerge at the open end of the resilient tube.

6. A tube holder as claimed in claim 5, in which the exterior of the resilient tube seals on an annular shoulder on the interior of the holder.

7. A tube holder as claimed in claim 5 or claim 6, wherein the resilient tube is formed of rubber and the exterior of the resilient tube seals on the interior of the



ended and extends through the end wall 52 of the holder. Over the inner end of the cannula 50 is positioned the rubber tube 54 which seals on the inner walls of the holder at annular shoulder 56. The inside diameter of the rubber tube 54 is slightly larger than the outside diameter of the cannula to provide a fluid passage 58 from the end of the cannula to the open end of the rubber tube. The walls of the holder 48 are made of a flexible material normally plastics such as polystyrene or polyethylene.

Turning to Figure 10, there is shown a preferred form of the rubber tube 60 having a tail-like portion 62 extending from a point below the point of which the rubber tube seals on the inside of the holder. In this way when the holder is inserted in the vein and squeezing action applied in proximity to the sealing point, the drops of blood appear at point 64 to tell the operator that the holder has been properly inserted in a vein. Thereafter, threads 66 on the holder and threads 68 on the stopper of the blood sampling tube 70 may be made up to puncture the thin diaphragm 72 and cause the withdrawal of the blood from the vein into the interior 74 of the blood sampling tube.

With reference to Figure 11, neither the holder 76 nor the stopper 78 on the tube 80 is equipped with any threads. The blood sampling tube is simply forced over the inner end of the needle 82 after aspirating blood has now been detected at point 84 by applying squeezing action at point 86, in the manner described above.

Having regard to the provisions of Section 9 of the Patent Act, attention is directed to the claims of the Applicants Patent Nos. 57843/68 and 39295/71, (Serial Nos. 1256521 and 1256524).

WHAT WE CLAIM IS:—

1. A blood sampling tube holder which comprises a generally tubular body, one end of which is open, a double-ended needle secured to the holder so that one end of the needle projects inwardly into the body and the other end is free for injection into the vein of a patient, and an imperforate resilient tube covering the opening at the inner end of the needle and being arranged to form a seal, which is arranged to be effective under the influence of normal blood pressure, between the interior of the needle and at least the open end portion of the interior of the holder, the imperforate resilient tube being such that, when the stopper of an evacuated blood sampling tube is forced over the inner end of the needle, the resilient tube is pierced by the needle and compressed in an axial direction, the pierced end of the resilient tube being displaced away from the end of the needle pierced by the stopper, and, when the stopper is removed from the needle, the

resilient tube recovers its original length to again enclose the inner end of the needle.

2. A tube holder as claimed in claim 1, in which the inner wall of the resilient tube has a portion of reduced diameter which forms a seal against the needle which is arranged to be effective under the influence of normal blood pressure to thereby seal the interior of the needle from at least the open end portion of the interior of the holder.

3. A tube holder as claimed in claim 1, in which the resilient tube has a sealing ring on its exterior which is received in a recess in a wall which closes the said other end of the tubular body to form a seal between the resilient tube and the holder which is arranged to be effective under the influence of normal blood pressure.

4. A tube holder as claimed in claim 1, in which the resilient tube has a sealing ring on its exterior which contacts the inner surface of the side wall of the tubular body to form a seal between the resilient tube and the holder which is arranged to be effective under the influence of normal blood pressure, and in which the said other end of the body is closed.

5. A tube holder as claimed in claim 1, in which the said other end of the generally tubular body is closed, the holder is translucent, and the inner end of the needle extends within the holder and is covered over a portion of its length by the imperforate resilient tube, the resilient tube being open at the end remote from the end that is arranged to be pierced in operation by the needle and the internal diameter of the resilient tube being greater than the external diameter of the needle so that a fluid passage is provided from the inner end of the needle to the open end of the resilient tube, the exterior of the resilient tube sealing on the interior of the holder at a position spaced apart from the end of the resilient tube arranged to be pierced in operation by the needle, the holder being flexible in proximity to the sealing position so that when the outer end of the needle is inserted in the patient, the operator can establish whether the needle is in a vein by squeezing the holder out of round, thus creating an air passage in proximity to the sealing position and therefore permitting a small amount of blood to escape from the inner end of the needle and flow inside the resilient tube to visibly emerge at the open end of the resilient tube.

6. A tube holder as claimed in claim 5, in which the exterior of the resilient tube seals on an annular shoulder on the interior of the holder.

7. A tube holder as claimed in claim 5 or claim 6, wherein the resilient tube is formed of rubber and the exterior of the resilient tube seals on the interior of the



holder at the open end portion of the resilient tube.

- 5 8. A tube holder as claimed in claim 5 or claim 6, wherein the resilient tube is formed of rubber and the exterior of the resilient tube seals on the interior of the holder at a position between the ends of the resilient tube.

- 10 9. A blood sampling assembly comprising a blood sampling tube holder as claimed in any one of claims 1 to 8, and an evacuated blood sampling tube having an open end a closed end, and a resilient imperforate stopper retained in the open end of the sampling tube and arranged, in operation, to be punctured by the needle of the holder.

- 20 10. A blood sampling assembly as claimed in claim 9, in which there is provided means for retaining the stopper in the open end of the sampling tube and for sealing with the sampling tube, the stopper and the holder each being formed with threads for mating with each other to form an interlock so that the inner end of the needle can be made to
- 25 puncture the resilient tube and the stopper by relative rotary movement between the holder and the stopper.

- 30 11. A blood sampling assembly as claimed in claim 10, in which the retaining and sealing means comprises a peripheral shoulder on the stopper, the underside of which bears against and forms a seal with the open end of the sampling tube.

- 35 12. A blood sampling assembly as claimed in claim 10 or claim 11, wherein male threads project from an extension on the outer face of said stopper.

- 40 13. A blood sampling assembly as claimed in any one of claims 10 to 12, wherein the stopper is provided with a thin diaphragm section at its center.

14. A blood sampling assembly as claimed

in claim 12 or claim 13 as appended to claim 12, wherein the open end of the body of the holder is provided with female threads which

45 mate with the male threads on the extension projecting from the outer face of the stopper.

15. A blood sampling assembly as claimed in claim 13 or claim 14 as appended to claim 13, wherein the threads on the body of the holder and on the stopper, and the diaphragm, are so disposed that the threads can be engaged over a part of their lengths to permit the passage of venous blood along the needle for observation without puncturing the dia-

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16. A blood sampling assembly as claimed in any one of claims 9 to 15, in which the stopper is formed with an inwardly-projecting ring in a recess in the stopper, the ring being arranged to engage the resilient tube when the resilient tube and stopper are pierced to assist its recovery to its original length on removal of the stopper from the needle.

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17. A blood sampling tube holder substantially as hereinbefore described with reference to, and as shown in, Figures 1, 1a, 2 and 3, or Figure 4, or Figure 5, or Figure 6, or Figure 9, or Figure 10, or Figure 11, of the accompanying drawings.

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18. A blood sampling assembly comprising an evacuated blood sampling tube and a holder for the blood sampling tube substantially as hereinbefore described with reference to, and as shown in, Figures 1, 1a, 2 and 3, or Figure and Figure 8, or Figure 5, or Figure 6, or Figure 9, or Figure 10, or Figure 11 of the accompanying drawings.

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