

Description

This invention relates to devices for taking samples of body fluids from patients for subsequent examination in a clinical lab. More particularly, this invention relates to a specific configuration of evacuated tube with the vacuum in the tube being utilized to draw body fluid specimens from the body of a patient by a phlebotomist, nurse or doctor.

As practitioners in the art of blood draw procedures understand, it is most important that the vacuum in evacuated tubes utilized for that purpose be maintained at the proper level during storage for subsequent use. That is, these practitioners, during use of such evacuated tubes, insert one end of a double-ended needle into the vein of a patient. The other end extends through an open ended holder for receiving, sequentially, a plurality of evacuated tubes. It is most important that this procedure be carried out efficiently and as rapidly as possible, as anyone will understand, since the technician or phlebotomist carrying out the procedure must contend with a patient having a needle stuck through their skin into a vein. If, for example, the vacuum is deficient in one tube during such a procedure, it entails subsequent removal of the tube and insertion of another tube which prolongs the unpleasant procedure involved.

This invention is directed particularly to a stopper-shield combination for sealing the open end of such body fluid collection tubes. That is, the tube, regardless of its make-up or nature, must maintain the vacuum therein by a specific closure for that purpose. If the closure is defective or does not provide appropriate seal, the vacuum property deteriorates over time.

As a further consideration for the combination stopper-plastic cover or shield combinations currently utilized for body fluid collection tubes of the kind discussed herein, it is most important during subsequent examination, where samples of the material are being removed from the tubes that the insertion of a needle through the stopper for such withdrawal is relatively easily carried out. That is, if great effort is required to force a needle through the stopper, then the clinician in the laboratory may get involved with accidents wherein blood contamination may take place. Or simply the routine insertion of a great many needles through a great many stoppers entails more effort than should be required.

It is to this kind of situation that the present invention is directed. That is, this invention is directed to a specific configuration of elastomer stopper for sealing the closed end of an evacuated body fluid collection tube with a plastic shield or cover positioned thereover. It is routine to utilize a

plastic shield over the elastomer stopper for several reasons. First, the plastic shield provides a gripping surface for easy removal of the elastomer stopper from the evacuated tube to overcome the force of the vacuum, and for removal of samples, as required in the laboratory. Moreover, if samples are to be removed by a needle, as discussed above, when the needle is removed, blood droplets may form on the top surface of the elastomer stopper. The shield provides an overhang over the top surface to contain any of these blood droplets or an aerosol of the liquid spurting out of the top of the stopper when the needle is being withdrawn.

Efforts have been made in the past to develop stopper-plastic shield combinations for alleviating some of the problems discussed above. One such device is disclosed and claimed in U.S. Patent 4,465,200, which covers a stopper-plastic shield combination with cooperating annular abutments so that the plastic shield easily lifts the stopper from the top of an evacuated tube. Moreover, this particular configuration includes an overhang of the plastic shield over the top surface of the rubber stopper to prevent exposure to blood droplets withdrawn with the withdrawal of a needle from the stopper. While the structure is successful in providing the characteristics desired, the configuration of stopper and shield provided with that combination is somewhat cumbersome in size and requires a substantial space for storing such tubes before and after use.

Other representative patents directed to problems of the kind discussed above include U.S. Patents 4,187,952 and 4,186,840 which are both directed to combination peelable seal arrangements and plastic caps over the top of elastomer stoppers for the purpose of preserving the sterility thereof prior to use.

Further representative combination closures of the kind discussed herein include U.S. Patents 3,460,702; 4,204,606; European Patent Publication No. 0102851 and European Patent Publication No. 0028411.

The precharacterizing part of claim 1 refers to an assembly for closing evacuable tubes, as disclosed in US-A-4 465 200.

It is an object of the invention to provide a specific configuration of stopper-plastic shield or cover combination in which the specific configuration allows for dimensional reduction in the overall size of the closures, so that the storage space for such blood collection tubes, both prior and after use may be readily reduced.

The combination closure of the invention herein reduces the stresses placed on the elastomer stopper, once it is inserted into the body fluid collection tube. Because of this, the user may use substantially less force to insert a needle through the

elastomer stopper. As discussed above, this has the effect of reducing the overall effort in a daily environment handling many such tubes and inserting needles through the stoppers, but also it reduces the possibility of accidents simply because of the ease of insertion and withdrawal allowed with the invention here.

These objects are achieved with an assembly as characterized in claim 1.

The results of this stopper-shield combination of the invention is achieved because the lower insertion portion of the stopper includes a plurality of vertically spaced alternating indentations and rings. The vertically spaced sealing rings inserted into the upper end of the tube provide spaced areas of sealing, while reducing the internal stresses in the stopper body.

Moreover, the upper flange of the stopper which extends out over the top of the tube of interest includes a plurality of circumferentially spaced protrusions. These protrusions cooperate with a plurality of ports or indentations in the plastic shield utilized with the stopper. By doing so, a proper positive connection is achieved between the plastic shield or cover and the related stopper while reducing the overall dimensions of the combination. The upper over-hang portion of the stopper is inserted in the plastic shield and twisted. This causes the protrusions on the stopper to move into place in the shield wall.

With the foregoing and additional objects in view, this invention will now be described in more detail, and other objects and advantages thereof will be apparent from the following description, the accompanying drawings, and the appended claims.

DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side elevational view of the stopper of the invention illustrating the vertically spaced sealing rings on the lower portion of the stopper, and the circumferentially spaced protrusions on the upper portion of the stopper;

Fig. 2 is a top plan view of the stopper of Fig. 1;

Fig. 3 is a side elevational view of the plastic shield-stopper combination of the invention with the initial insertion of the stopper into the plastic shield;

Fig. 4 is a top plan view of the device of Fig. 3;

Fig. 5 is a side elevational view, similar to that of Fig. 3, but with the stopper inserted fully into the shield of the invention for subsequent mounting on a tube;

Fig. 6 is a longitudinal sectional view of the closure device of the invention positioned on the top of a glass tube, and showing the cooperating position of the closure combination of the invention with the annular glazed bead positioned at

the top of the glass tube;

Figs. 7 and 8 are side elevational views of representative plastic tubes which may be utilized with a specific embodiment of closure of the invention; and

Figs. 9a, 9b, 9c and 9d show various views of the plastic-shield stopper combination utilized for closing plastic tubes for body fluid collection, and showing a specific embodiment of the invention with an annular sealing ring positioned adjacent the top well of the elastomer stopper to contain blood droplets or aerosol upon removal of a needle from insertion through the elastomer stopper.

Referring to the drawings in which like reference characters refer to like parts throughout the several views thereof, in Fig. 1 the stopper of the invention generally designated 10 is shown. Stopper 10 includes a depending annular portion 12 with a plurality of vertically spaced sealing rings 22 which cooperate with the annular internal surface at the top portion of a tube for maintaining the vacuum in the tube. The upper annular flange portion 14 of stopper 10 includes a plurality of circumferentially spaced protrusions 26, which cooperate with ports or indentations in the plastic shield or cover for the stopper, which will be discussed below. The stopper 10 includes an upper well portion having walls 18 which converge into an upper surface 20 for receiving the point of a needle inserted through stopper 10. The lower surface of stopper 10 includes a well 24 shown in section. Fig. 2 shows a top plan view of the stopper 10 and shows the positioning of the locking protrusions 26.

Referring now to Figs. 3, 4 and 5 a stopper 10 is shown positioned for insertion in the direction of arrow 25 into its cooperating plastic cover or shield 29. As can be seen in Figs. 3 and 4, shield 29 includes an upper opening 32 to allow access of the user to the top surface 20 of stopper 10 once the stopper is inserted into the shield and the stopper-shield combination are positioned on the top of an evacuated tube.

Plastic shield 29 includes an internal annular wall 38 defining a chamber 28 for receiving the inserted stopper 10 which is shown in its final position in shield 29 in Fig. 5. Once this has taken place, then, when a tube is inserted into the internal chamber 28 of shield 29, the annular bead of a glass tube, for example, cooperates with the annular undercut 36 positioned in annular wall 38 of the plastic shield 29.

As can be seen in the top plan view shown in Fig. 4, the plastic shield or cover 29 includes a plurality of circumferentially spaced ports 30 for receiving the cooperating protrusions 26 of stopper 10. As mentioned above, this is done by inserting stopper 10 in shield 29 and twisting to cause

protrusions 26 to move into ports or openings 30. Thus, the two parts are joined together circumferentially so that when the user wishes to remove the stopper from the tube, any force applied circumferentially to the plastic shield readily moves the elastomer stopper from gripping the internal surface of the glass tube, for example.

Fig. 6 shows the closure combination of the invention positioned on a glass tube 40. The entire assembly is shown in section, and tube 40 is a conventional evacuated glass tube having a closed end 39 and an open end 41 sealed by the stopper 10 of the invention. The tube 40 includes an annular glazed bead 42 for cooperating with the undercut 36 positioned on the internal surface of the plastic shield 29, as shown in Fig. 6. As can be readily seen in Fig. 6, the top surface 27 of plastic shield 29 includes opening 32 for gaining access by needle into the top surface 20 of elastomeric stopper 10.

For the purpose of collecting body fluid specimens, it has been conventional for many years to utilize glass tubes for this purpose, because glass provides appropriate maintenance of a vacuum in the tubes for a practical shelf-life prior to use of such tubes for blood collection, for example. As mentioned above, it is most important for the user at the moment when a blood collection procedure is taking place, for example, to have the vacuum be appropriate for carrying out the procedure.

However, in recent years, plastic tubes have been developed and are being further developed routinely. The reason for this is that plastic tubes, as will be understood by anyone, will not break when dropped. This eliminates one problem with blood contamination, which is most important these days with the development of AIDS. Moreover, since such tubes, once a body fluid specimen is collected in the tubes, are inserted in centrifuge devices for application of high speed centrifugal force, the tubes sometimes break under those conditions splattering blood over clinical lab technicians. Plastic tubes, again, remove substantially such dangers.

Thus, Figs. 7 and 8 are representative of configurations of plastic tubes developed recently. They include tube 44 in Fig. 7 and tube 56 in Fig. 8. Both include upper collars such as 50 shown in Fig. 7 with an annular transition abutment 52 between the upper collar portion 50 of the tube 44 and the lower tube portion 54 thereof. Of course, both tubes 44 and 56 include closed ends 48 and 60, respectively. Also, they include open ends 46, 58, respectively, for closure by an elastomer stopper-plastic cover or shield combination of the invention. As can be seen in Fig. 8, the annular transition abutment 62 is configured differently than the annular transition abutment 52 in Fig. 7. For

this reason, it is necessary to configure the internal surface of the stopper-shield combination of the invention to cooperate with these different configurations. Also, walls 64 of tube 56 are more tapered in tube 56.

Referring now to Figs. 9a, 9b, 9c and 9d, an embodiment of the invention is shown in section of a stopper-plastic shield combination for positioning on the top of a plastic evacuated tube. As shown in Fig. 9a, stopper 102 is shown with the lower sealing portion thereof having the vertically spaced rings 122. The upper portion 100 of stopper 102 includes a plurality of circumferentially spaced apart protrusions 106, which in this case number 4 rather than the 6 in stopper 10. Plastic shield 82 has an internal annular compartment or chamber 91 for receiving and inserting therein stopper 102 and the upper portion of a plastic tube. The plurality of circumferentially spaced protuberances 92 cooperate with the annular transition abutments 52, 62 of the plastic tube embodiments shown in Figs. 7 and 8.

The combination shown in section in Fig. 9a includes an annular cooperating sealing surface 94 between an edge of a portion of the annular plastic shield 82 and the upper portion 100 of the stopper 102. The plastic shield, in this embodiment includes an annular sealing ring 88 positioned to depend from the opening 93 in the top surface 83 of plastic shield 82. The lower end 121 of ring 88 is inserted into an annular groove 123 in stopper 102 to provide a cooperating sealing surface between stopper 102 and plastic shield 82 in the vicinity of the well 97 where blood droplets may form on the surface 120, when a needle is withdrawn from stopper 102.

The various showings in Fig. 9 with the section lines show the various cooperating surfaces of the stopper 102 and shield 82 of the embodiment of this invention for use with plastic tubes, in particular. As can be seen in Fig. 9b, for example, a top plan view indicates the cooperation of the circumferentially spaced openings 95 in shield 82 for receiving the circumferentially spaced protrusions 106 of elastomer stopper 102.

As can be seen in Fig. 9c, however, this sectional view shows the discontinuity of the cooperating protrusions 106 and ports or openings 95. This also provides the viewer with the showing of the reduced dimensional characteristics of the combination claimed. The sectional view shown in Fig. 9d shows the positioning of the cooperating chamber 91 for receiving the top edge of an evacuated tube when the stopper-plastic shield combination is positioned on the top of such a tube.

Thus, there is provided, in accordance with this invention, a new composite closure assembly for evacuated tubes for taking body fluid samples and

especially blood samples. The closure assembly is more hygienic to the user and the patient in that lower contamination from blood is provided by the assembly thus reducing exposure of a technician to aerosol caused by either stopper removal from the top of an evacuated tube or removing the needle after insertion through the stopper of the combination claimed. Moreover, because of the relative ease with which the user may insert and remove a needle because of the vastly reduced internal stresses of the combination claimed herein for sealing an evacuated tube, the exposure of the type discussed herein is reduced simply because there is much less likelihood of accidents involved simply because the applied force is so much less.

Of course, as users will understand, this substantial reduction in required force for insertion and removal of a needle through the elastomer stopper relieves the technician of a substantial amount of work during the course of a work day. Finally, because of the substantially reduced dimensional characteristics of the combination, the closure and its accompanying tube take up much less space for storage prior to use and during and after use. Moreover, the sealing assembly herein is more readily removable from an evacuated tube because it provides a cooperating gripping surface while the reduced internal stresses of the stopper inserted into the top of the tube makes it much easier to remove the assembly from the evacuated tube.

As is apparent from the foregoing, the arrangements of apparatus provided in accordance herewith are readily and simply manufactured by mass production techniques and conventional molding procedures, and the parts may be simply assembled and mounted on evacuated tubes with a limited amount of effort.

Claims

1. An assembly for closing evacuable tubes for receiving samples of body fluids, said assembly comprising:

an annular stopper body (10, 102) having an upper annular flange portion (14, 100) with a top surface (20, 120), and a lower annular portion (12), both said upper and lower annular portions being integral with each other;

an annular shield body (29, 82) having an annular wall (38) defining a chamber (28, 91) for receiving said stopper body (10, 102), and having a top surface (27, 83) with a central circular opening (32, 93) for receiving a needle therethrough,

characterized in that

said lower portion (12) of said stopper body (10, 102) has a vertical surface comprised of a plurality of vertically spaced integral annular

rings (22, 122);

a plurality of protrusions (26, 106) are circumferentially spaced around said upper annular flange portion (14, 100); and

said shield body (29, 82) has a plurality of openings (30, 95) through its wall (38), said openings (30, 95) being positioned so that each opening (30, 95) receives one of said plurality of protrusions (26, 106) on said stopper body (10, 102) when said stopper body (10, 102) is received in said shield chamber (28, 91).

2. The assembly of claim 1, further comprising:
 - a well in the top surface of said upper annular flange portion (14, 100) of said stopper body (10, 102);
 - said well having a bottom surface for receiving the needle through said stopper body (10, 102); and
 - said well being formed from walls (18) extending from the top surface of said stopper body to the bottom surface of said well.
3. The assembly of claim 2, wherein the diameter of said central circular opening (32, 93) in said top surface (27, 83) of the shield is less than the diameter of said stopper well so that said top surface (27, 83) provides an annular overhang around said well.
4. The assembly of one of claims 1-3, further comprising:
 - an elongated evacuable tube (40) having a closed end (39) and an open end (41);
 - the internal surface of said open end (41) receiving the lower annular portion (12) of said stopper body (10) in sealing engagement; and
 - the outer surface of said open end (41) being received in said chamber (28) of said shield body (29).
5. The assembly of claim 4, wherein said tube (40) is a glass tube having an annular bead (42) positioned on the rim of the open end (41), said annular bead being received in an undercut (36) provided in the internal surface of said shield body (29) adjacent the lower surface of said upper annular flange portion (14).
6. The assembly of one of claims 1-3, wherein a plurality of circumferentially spaced protuberances (92) is provided on the internal surface of said shield body (82);
 - said protuberances (92) being spaced from the bottom surface of said lower portion of the stopper body (102) received in said shield



especially blood samples. The closure assembly is more hygienic to the user and the patient in that lower contamination from blood is provided by the assembly thus reducing exposure of a technician to aerosol caused by either stopper removal from the top of an evacuated tube or removing the needle after insertion through the stopper of the combination claimed. Moreover, because of the relative ease with which the user may insert and remove a needle because of the vastly reduced internal stresses of the combination claimed herein for sealing an evacuated tube, the exposure of the type discussed herein is reduced simply because there is much less likelihood of accidents involved simply because the applied force is so much less.

Of course, as users will understand, this substantial reduction in required force for insertion and removal of a needle through the elastomer stopper relieves the technician of a substantial amount of work during the course of a work day. Finally, because of the substantially reduced dimensional characteristics of the combination, the closure and its accompanying tube take up much less space for storage prior to use and during and after use. Moreover, the sealing assembly herein is more readily removable from an evacuated tube because it provides a cooperating gripping surface while the reduced internal stresses of the stopper inserted into the top of the tube makes it much easier to remove the assembly from the evacuated tube.

As is apparent from the foregoing, the arrangements of apparatus provided in accordance herewith are readily and simply manufactured by mass production techniques and conventional molding procedures, and the parts may be simply assembled and mounted on evacuated tubes with a limited amount of effort.

Claims

1. An assembly for closing evacuable tubes for receiving samples of body fluids, said assembly comprising:
 - an annular stopper body (10, 102) having an upper annular flange portion (14, 100) with a top surface (20, 120), and a lower annular portion (12), both said upper and lower annular portions being integral with each other;
 - an annular shield body (29, 82) having an annular wall (38) defining a chamber (28, 91) for receiving said stopper body (10, 102), and having a top surface (27, 83) with a central circular opening (32, 93) for receiving a needle therethrough,
 - characterized in that
 - said lower portion (12) of said stopper body (10, 102) has a vertical surface comprised of a plurality of vertically spaced integral annular rings (22, 122);
 - a plurality of protrusions (26, 106) are circumferentially spaced around said upper annular flange portion (14, 100); and
 - said shield body (29, 82) has a plurality of openings (30, 95) through its wall (38), said openings (30, 95) being positioned so that each opening (30, 95) receives one of said plurality of protrusions (26, 106) on said stopper body (10, 102) when said stopper body (10, 102) is received in said shield chamber (28, 91).
2. The assembly of claim 1, further comprising:
 - a well in the top surface of said upper annular flange portion (14, 100) of said stopper body (10, 102);
 - said well having a bottom surface for receiving the needle through said stopper body (10, 102); and
 - said well being formed from walls (18) extending from the top surface of said stopper body to the bottom surface of said well.
3. The assembly of claim 2, wherein the diameter of said central circular opening (32, 93) in said top surface (27, 83) of the shield is less than the diameter of said stopper well so that said top surface (27, 83) provides an annular overhang around said well.
4. The assembly of one of claims 1-3, further comprising:
 - an elongated evacuable tube (40) having a closed end (39) and an open end (41);
 - the internal surface of said open end (41) receiving the lower annular portion (12) of said stopper body (10) in sealing engagement; and
 - the outer surface of said open end (41) being received in said chamber (28) of said shield body (29).
5. The assembly of claim 4, wherein said tube (40) is a glass tube having an annular bead (42) positioned on the rim of the open end (41), said annular bead being received in an undercut (36) provided in the internal surface of said shield body (29) adjacent the lower surface of said upper annular flange portion (14).
6. The assembly of one of claims 1-3, wherein a plurality of circumferentially spaced protuberances (92) is provided on the internal surface of said shield body (82);
 - said protuberances (92) being spaced from the bottom surface of said lower portion of the stopper body (102) received in said shield



chamber (91); and
said protuberances (92) being for engaging a
transition abutment (52) of an evacuable
plastic tube (44) positioned in said shield
chamber (91).

7. The assembly of claim 6, wherein
said plastic tube (44) has an integral annular
collar (50) formed adjacent said open end (46)
of said plastic tube;
an annular transition abutment (52) is provided
on said plastic tube (44) at the transition point
of said integral collar (50) with the part (54) of
said plastic tube which is not an integral collar;
and
said transition abutment (52) engaging said
circumferentially spaced protuberances (92) on
said internal surface of said shield body (82).

Patentansprüche

1. Anordnung zum Verschließen evakuierbarer
Röhrchen zum Aufnehmen von Körperflüssig-
keitsproben, wobei die Anordnung aufweist:
 - einen ringförmigen Stopfenkörper (10, 102) mit einem oberen ringförmigen Flanschbereich (14, 100), der eine Oberseite (20, 120) aufweist, und einem unteren ringförmigen Bereich (12), wobei der obere und der untere Bereich einstückig ausgebildet sind;
 - einen ringförmigen Schutzkörper (29, 82) mit einer ringförmigen Wand (38), die eine Kammer (28, 91) zum Aufnehmen des Stopfenkörpers (10, 102) begrenzt, und mit einer Oberseite (27, 83) mit einer zentralen kreisförmigen Öffnung (32, 93) zur Aufnahme einer hindurchgesteckten Nadel,
 dadurch gekennzeichnet, daß
 - der untere Bereich (12) des Stopfenkörpers (10, 102) eine vertikale Fläche aufweist, die aus mehreren vertikal voneinander beabstandeten einstückigen Ringen (22, 122) besteht;
 - mehrere Vorsprünge (26, 106) umfangsmäßig voneinander beabstandet um den oberen ringförmigen Flanschbereich (14, 100) herum verteilt sind; und
 - der Schutzkörper (29, 82) mehrere seine Wand (38) durchsetzende Öffnungen (30, 95) aufweist, die derart angeordnet sind, daß jede der Öffnungen (30, 95) einen der mehreren Vorsprünge (26, 106) des Stopfenkörpers (10, 102) aufnimmt, wenn der Stopfenkörper (10, 102) in der Schutzkammer (28, 91) aufgenommen ist.
2. Anordnung nach Anspruch 1, ferner mit:
 - einer Vertiefung in der Oberseite des oberen ringförmigen Flanschbereichs (14, 100) des Stopfenkörpers (10, 102);
 - wobei die Vertiefung eine Bodenfläche zur Aufnahme der durch den Stopfenkörper (10, 102) gehenden Nadel aufweist; und
 - wobei die Vertiefung durch Wände (18) gebildet ist, die sich von der Oberseite des Stopfenkörpers zur Bodenfläche der Vertiefung erstrecken.
3. Anordnung nach Anspruch 2, bei der der Durchmesser der zentralen Mittelöffnung (32, 93) in der Oberseite (27, 83) des Schutzes kleiner ist als der Durchmesser der Stopfenvertiefung, so daß die Oberseite (27, 83) einen ringförmigen Überhang um die Vertiefung bildet.
4. Anordnung nach einem der Ansprüche 1-3, ferner mit:
 - einem länglichen evakuierbaren Rohr (40) mit einem geschlossenen Ende (39) und einem offenen Ende (41);
 - wobei die Innenfläche des offenen Endes (41) den unteren ringförmigen Bereich (12) des Stopfenkörpers (10) in dichtendem Eingriff aufnimmt; und
 - wobei die Außenfläche des offenen Endes (41) in der Kammer (28) des Schutzkörpers (29) aufgenommen ist.
5. Anordnung nach Anspruch 4, bei der das Rohr (40) ein Glasrohr mit einem Ringwulst (42) am Rand des offenen Endes (41) ist, wobei der Ringwulst in einem hinterschnittenen Bereich (36) aufgenommen ist, der nahe der Unterseite des oberen ringförmigen Flanschbereichs (14) in der Innenfläche des Schutzkörpers (29) ausgebildet ist.
6. Anordnung nach einem der Ansprüche 1-3, bei der
 - mehrere umfangsmäßig beabstandete Vorsprünge (92) auf der Innenfläche des Schutzkörpers (82) vorgesehen sind;
 - wobei die Vorsprünge (92) von der Bodenfläche des in der Schutzkammer (91) aufgenommenen unteren Bereichs des Stopfenkörpers (102) beabstandet sind;
 - wobei die Vorsprünge (92) zum Angreifen an einem Übergangsanschlag (52) eines in der Schutzkammer (91) angeordneten evakuierbaren Kunststoffrohrs (40) dienen.



7. Anordnung nach Anspruch 6, bei der
- das Kunststoffrohr (44) einen nahe dem offenen Ende (46) des Kunststoffrohrs ausgebildeten einstückigen Ringkragen (50) aufweist;
 - ein ringförmiger Übergangsanschlag (52) am Übergang vom einstückigen Kragen (50) zu dem Teil (54) des Kunststoffrohrs, das kein einstückiger Kragen ist, an dem Kunststoffrohr (44) ausgebildet ist; und
 - der Übergangsanschlag (52) mit den umfangsmäßig beabstandeten Vorsprüngen (92) auf der Innenfläche des Schutzkörpers (82) zusammengreift.

Revendications

1. Ensemble pour fermer des tubes dans lesquels le vide peut être établi, pour leur permettre de recevoir des échantillons de fluides corporels, ledit ensemble comprenant:

un corps annulaire formant bouchon (10, 102) qui comporte une partie annulaire supérieure en collerette (14, 100) dotée d'une surface supérieure (20, 120), et une partie annulaire inférieure (12), lesdites deux parties annulaires supérieure et inférieure étant formées d'un seul tenant l'une avec l'autre;

un corps annulaire formant capuchon protecteur (29, 82) présentant une paroi annulaire (38) qui délimite une chambre (28, 91) destinée à recevoir ledit corps formant bouchon (10, 102), et présentant une surface supérieure (27, 83) dotée d'une ouverture centrale circulaire (32, 93) à travers laquelle une aiguille peut être reçue;

caractérisé en ce que

ladite partie inférieure (12) dudit corps formant bouchon (10, 102) présente une surface verticale munie de plusieurs bagues annulaires (22, 122), solidaires, espacées l'une de l'autre en direction verticale;

plusieurs saillies (26, 106) sont disposées à distance l'une de l'autre autour de ladite partie annulaire supérieure en forme de collerette (14, 100), dans le sens de la circonférence de cette dernière; et

ledit corps formant capuchon protecteur (29, 82) comporte plusieurs ouvertures (30, 95) ménagées à travers sa paroi (38), lesdites ouvertures (30, 95) étant positionnées de telle façon que chaque ouverture (30, 95) reçoive l'une desdites saillies (26, 106) situées sur ledit corps formant bouchon (10, 102) quand ledit corps formant bouchon (10, 102) est reçu dans ladite chambre (28, 91) du capuchon protecteur.

2. Ensemble selon la revendication 1, comprenant en outre:

une cuvette dans la surface supérieure de ladite partie annulaire supérieure en collerette (14, 100) dudit corps formant bouchon (10, 102);

ladite cuvette présentant une surface de fond destinée à recevoir l'aiguille traversant ledit corps formant bouchon (10, 102); et

ladite cuvette étant définie par des parois (18) qui s'étendent depuis la surface supérieure dudit corps formant bouchon jusqu'à la surface de fond de ladite cuvette.

3. Ensemble selon la revendication 2, dans lequel le diamètre de ladite ouverture centrale circulaire (32, 93) ménagée dans ladite surface supérieure (27, 83) du capuchon protecteur est inférieur au diamètre de ladite cuvette du bouchon, afin que ladite surface supérieure (27, 83) définisse un surplomb annulaire autour de ladite cuvette.

4. Ensemble selon l'une des revendications 1 à 3, comprenant en outre:

un tube allongé (40), dans lequel le vide peut être établi, possédant une extrémité fermée (39) et une extrémité ouverte (41);

la surface interne de ladite extrémité ouverte (41) recevant la partie annulaire inférieure (12) dudit corps formant bouchon (10), en étant en contact étanche avec celle-ci; et

la surface extérieure de ladite extrémité ouverte (41) étant reçue dans ladite chambre (28) dudit corps formant capuchon protecteur (29).

5. Ensemble selon la revendication 4, dans lequel ledit tube (40) est un tube de verre comportant un bourrelet annulaire (42) disposé sur le bord de l'extrémité ouverte (41), ledit bourrelet annulaire étant reçu dans une dépouille (36) ménagée dans la surface interne dudit corps formant capuchon protecteur (29) au voisinage de la surface inférieure de ladite partie annulaire supérieure en collerette (14).

6. Ensemble selon l'une des revendications 1 à 3, dans lequel

plusieurs protubérances (92) sont prévues sur la surface interne dudit corps formant capuchon protecteur (82), distantes l'une de l'autre dans le sens de la circonférence de ce dernier;

lesdites protubérances (92) étant situées à distance de la surface de fond de ladite partie inférieure du corps formant bouchon (102) reçu dans ladite chambre (91) du capuchon



protecteur; et

lesdites protubérances (92) étant destinées à venir en contact avec un appui de transition (52) d'un tube en matière plastique (44), dans lequel le vide peut être établi, positionné dans ladite chambre (91) du capuchon protecteur.

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7. Ensemble selon la revendication 6, dans lequel

ledit tube en matière plastique (44) présente un col annulaire (50) formé d'un seul tenant à proximité de ladite extrémité ouverte (46) dudit tube en matière plastique;

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un appui annulaire de transition (52) est ménagé sur ledit tube en matière plastique (44), à hauteur de la zone de transition dudit col (50), formé d'un seul tenant, avec la partie (54) dudit tube en matière plastique, qui ne constitue pas un col formé d'un seul tenant; et

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ledit appui de transition (52) venant en contact avec lesdites protubérances (92), situées à distance l'une de l'autre dans le sens de la circonférence, sur ladite surface interne dudit corps formant capuchon protecteur (82).

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