

[54] **FLUID SAMPLER**

[75] Inventor: **Roland James West**, Andover, Mass.

[73] Assignees: **Ronald J. Borbely**, Bangor, Maine;
Richard S. Burt, Tewksbury, Mass.;
Paul Newcomb, Weymouth, Mass.;
James Vaughn, Seabrook Beach,
N.H.; **George Grant**, Medford;
Robert Gomes, Boxford, both of,
Mass.; **Inc. Andover Medical
Industries**, Andover, Mass.; part
interest to each

[22] Filed: **June 14, 1973**

[21] Appl. No.: **369,792**

[52] U.S. Cl. **128/2 F, 128/DIG. 5, 128/216**

[51] Int. Cl. **A61b 5/10, A61m 1/00**

[58] Field of Search **128/2 F, DIG. 5, 276, 216,
128/297, 215, 275, 272, 2 R, 2 B**

[56] **References Cited**

UNITED STATES PATENTS

2,848,999 8/1958 McGrew et al. 128/DIG. 5
3,143,109 8/1964 Gewertz 128/2 F

3,181,529 5/1965 Wilburn 128/DIG. 5
3,228,444 1/1966 Weber et al. 128/2 F X
3,424,148 1/1969 Cadeillan 128/DIG. 5
3,491,748 1/1970 Pate 128/2 F

FOREIGN PATENTS OR APPLICATIONS

599,394 10/1959 Italy 128/DIG. 5
469,055 2/1952 Italy 128/DIG. 5
968,833 12/1950 France 128/DIG. 5

Primary Examiner—Richard A. Gaudet

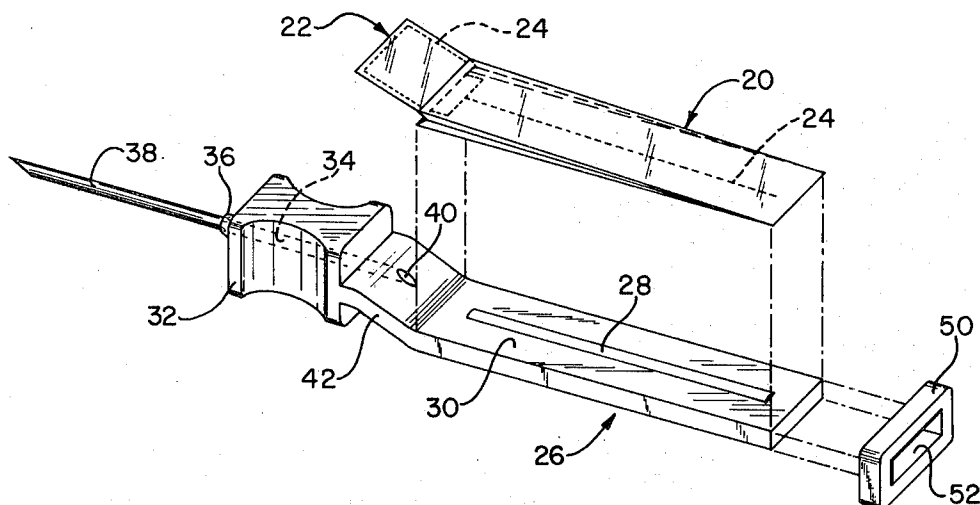
Assistant Examiner—J. C. McGowan

Attorney, Agent, or Firm—Schiller & Pandiscio

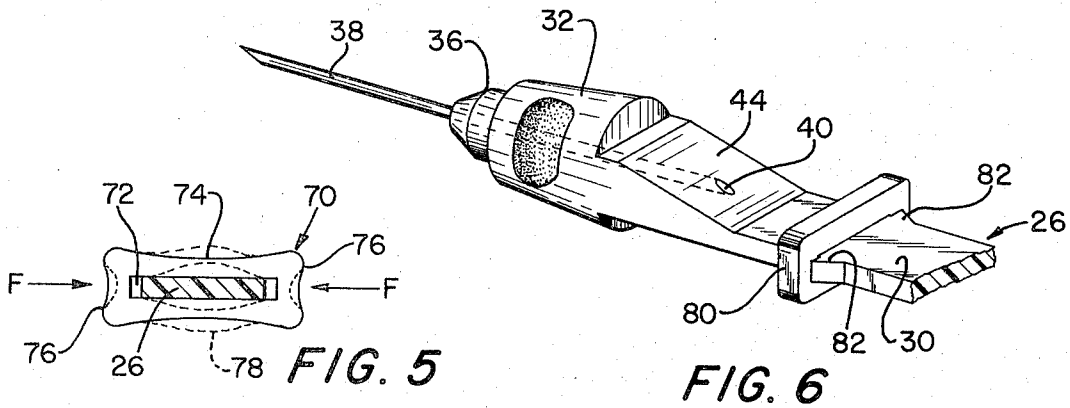
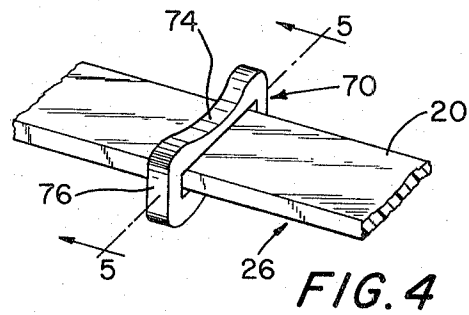
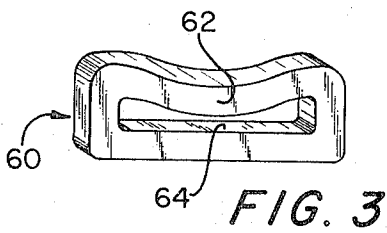
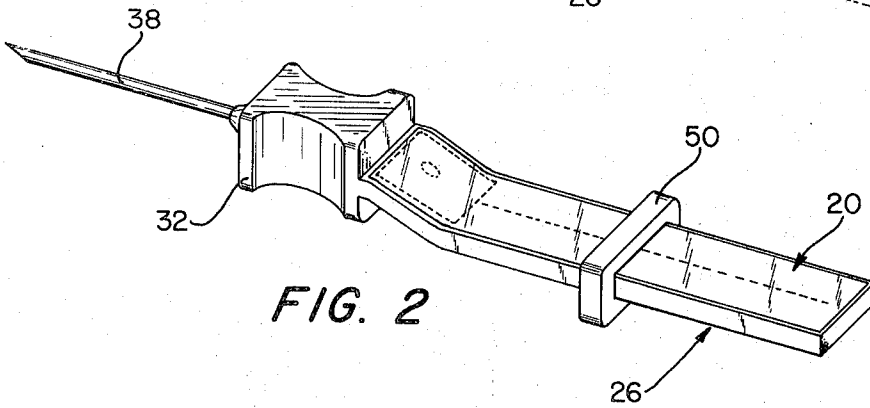
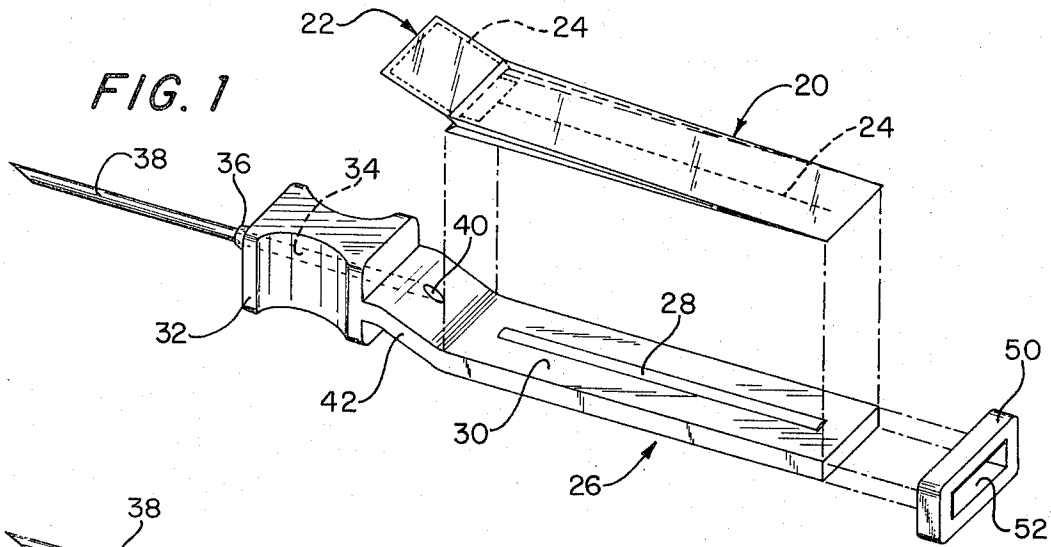
[57] **ABSTRACT**

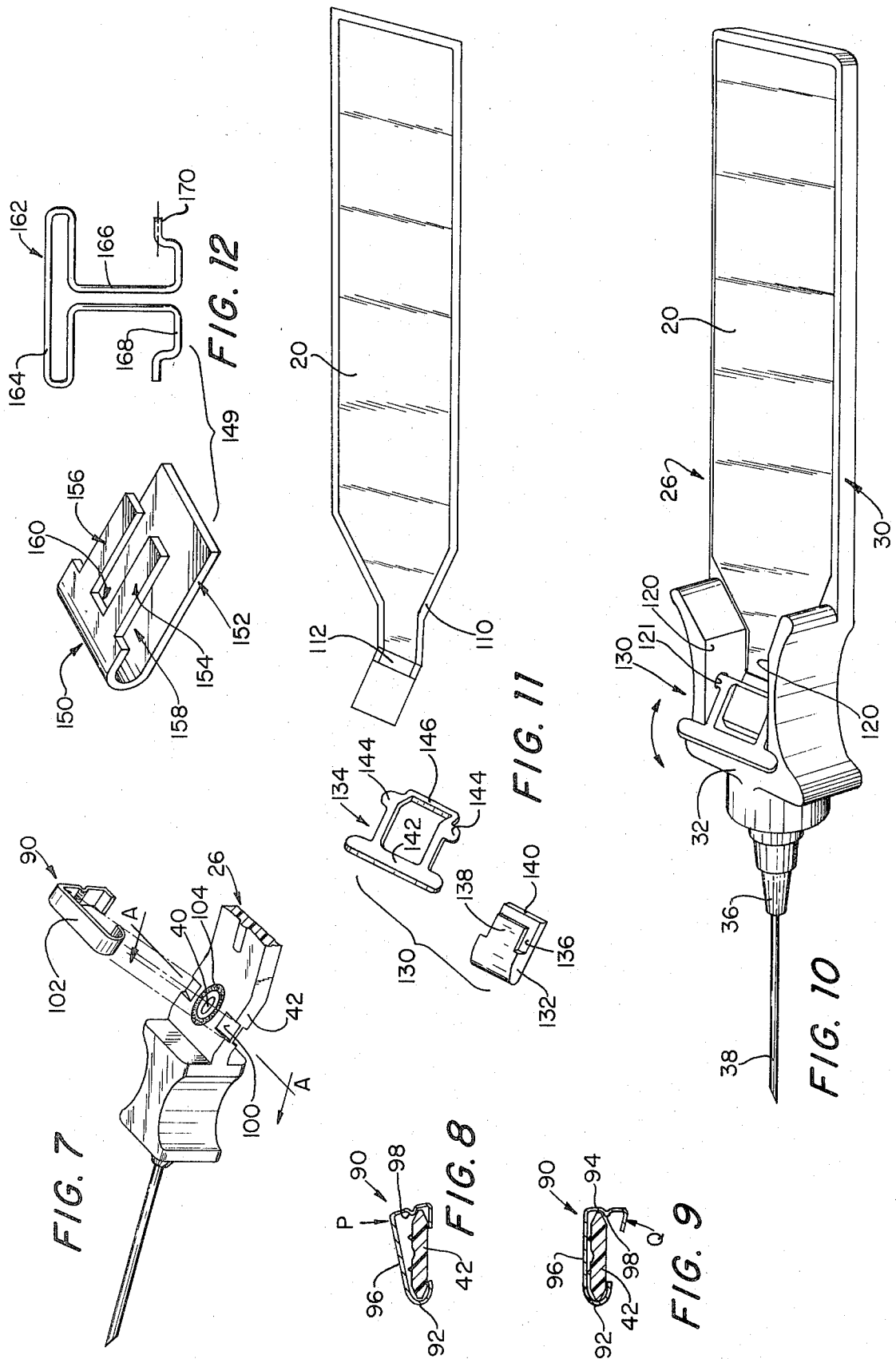
A device for collecting samples from pressurized fluids comprises a flat fluid impermeable expandable bag having an opening, a support and a clamping element. The bag is adapted to receive the samples through the opening causing the bag to expand. The clamping element cooperates with the support to releasably seal the bag near its opening in order to control the flow of the fluid sample to and from the bag and to seal the sample from contaminating atmospheres.

20 Claims, 12 Drawing Figures



SHEET 1 OF 2





FLUID SAMPLER

This device relates to the collection and storage of fluid samples and more particularly to the collection and temporary storage of blood samples.

Many devices are known in which samples can be taken from fluids under pressure. These devices are particularly useful in taking blood samples from patients since such devices need only employ the arterial or venous pressure of the patient to draw the blood. Most devices, however, do not attempt to maintain the blood samples in an equilibrating atmosphere, free of any gas or bacterial contaminants, since such maintenance is not necessary to perform most of the known blood tests. However, with the advent of blood-gas analysis machines such maintenance is now important since these machines enable one to measure the amount of gases, such as oxygen and carbon dioxide, which are dissolved or trapped in the blood. If blood is exposed to an atmosphere which has a gas content which differs from the gas content of the blood, the two will tend to equilibrate, i.e., the blood will absorb or release gas. Thus, if for example, blood taken from the vein of a patient is exposed to the atmosphere, since the oxygen content of the atmosphere is greater than the oxygen content of the blood, the blood will absorb oxygen. On the other hand, if blood is drawn by suction from an artery, thereby exposing the blood to an atmosphere where the oxygen content is less than the oxygen content of the blood, the blood will release enough oxygen to reach equilibrium. Additionally, the introduction of bacterial contaminants and the like may also change or effect the gas content of a blood sample.

It is apparent therefore, that the accuracy of blood-gas analysis depends on the maintenance of a blood sample in an aseptic as well as equilibrating atmosphere in which all gases dissolved in the blood are maintained in equilibria. Until the present invention, however, it has been difficult to maintain such samples under strictly aseptic conditions free of contaminating gas atmospheres.

One prior art device which is disclosed in U.S. Pat. No. 3,424,148 issued Jan. 28, 1969 to J. Cadeillan, utilizes an expandable plastic bag sealed along its edges except for a neck portion. A mandrel is inserted in the neck portion. A needle or cannula is mounted in the mandrel and covered with a cap. This device, however, is not acceptable for taking blood under aseptic conditions free of contaminating gases. It is noted that no efforts are made to remove all contaminating gases from the bag of the Cadiellan device before the sample is taken. Even if such efforts were made, after a sample is taken with the Cadiellan device, the bag is not sealed until the needle is removed from the patient and a cap is placed over the needle. This is undesirable since it allows the blood sample taken to be exposed to the atmosphere. This would cause the gas contents of the sample to equilibrate with the gas contents of the atmosphere, and also expose the sample to bacterial contaminants which may affect the gas content the sample. of the problems also could occur when the cap is removed and the sample transferred into the blood-gas analysis machine.

Accordingly, an object of the present invention is to provide a simple, practical and economical device which overcomes the aforementioned problems.

Another object of the present invention is to provide an improved device for collecting and storing fluid samples.

Yet another object of the present invention is to provide an improved device for taking samples from pressurized fluids under aseptic conditions.

Still another object of the present invention is to provide an improved device for collecting and temporarily storing blood samples, and allowing the samples to be transferred to blood-gas analysis machines without affecting the gas content of the samples or exposing the samples to bacterial contaminants.

Yet another object of the present invention is to provide an improved device for temporarily sealing blood samples in a contaminant free expandable container by using valve means to releasably seal the bag at a predetermined location.

Still another object of the present invention is to provide an improved blood sampling device which is economically produced and therefore disposable after use, easily identifiable, easily heparinized and free of gas and bacterial contaminants.

Generally, the foregoing and other objects of the invention are achieved by a device which comprises a sealed contaminant-free expandable container or bag having at least two flat sides or opposing walls normally mated or in full contact with one another throughout the interior portion of the bag. The bag further has an "opening" at one end thereof.

A valve which is in the form of a clamping element is utilized to releasably seal the two sides of the bag together, near the opening of the bag. When one wishes to take samples from fluids which are under pressure, for example, blood samples from a patient, the clamping element is opened and the fluid allowed to flow freely between the normally contacting sides, expanding the bag employing only the pressure of the fluid being taken. In the case of blood sampling, arterial or venous pressure will normally be sufficient to force blood into the bag.

The bag is preferably mounted on a support so that it will, when unfilled, lie flat. The support has a fluid conduit therethrough and the bag is mounted so that the opening of the bag is releasably sealed around one of the apertures provided by the termination of the conduit. The opposite end of the conduit remote from the bag can be provided with mounting structure adapted to support a demountable hypodermic needle.

The clamping element is normally closed and must be opened when the sample is received or expelled from the sample bag. Once a desired sample has been taken, the clamping element can be closed, i.e., the clamping element cooperates with the support to releasably clamp the interior portion of the two sides of the bag together at a location preferably near the opening so as to releasably seal the opening from the interior of the bag, thereby sealing the sample in the bag.

Other features and many of the attendant advantages of the invention are described or rendered obvious by the following detailed description which is to be considered together with the accompanying drawings wherein:

FIG. 1 shows an exploded perspective view of an embodiment of the invention;

FIG. 2 shows a perspective view of the embodiment of FIG. 1 assembled for use;

FIG. 3 shows a perspective view of one embodiment of the clamping element;

FIG. 4 shows a perspective view of another embodiment of the clamping element;

FIG. 5 shows a cross-sectional view taken along line 5—5 of FIG. 4;

FIG. 6 shows a perspective view of another embodiment of the clamping element and supporting structure;

FIG. 7 shows a sectional exploded perspective view of still another embodiment of the clamping element and supporting structure;

FIG. 8 shows an assembled cross-sectional view along section line A—A in FIG. 7 when the clamping element is in the open position; and

FIG. 9 shows an assembled cross-sectional view along section line A—A in FIG. 7 when the clamping element is in the closed position.

FIG. 10 shows a perspective view of yet another embodiment of a clamping element and supporting structure.

FIG. 11 shows a perspective view of the clamping element and expandable container of the embodiment of FIG. 10.

FIG. 12 shows a perspective view of another embodiment of the clamping element of the embodiment of FIG. 10.

Referring to the drawing wherein like numerals designate like parts throughout the several views there will be seen in FIG. 1 an exploded view of an embodiment of the invention and the relation of the several parts to one another. One of the elements of the embodiment of FIG. 1 is expandable container or bag 20 which is formed of two substantially flat rectangular sheets, both of the same width and one of which is slightly longer than the other. The two sheets are disposed in face to face contacting relationship with three edges in common and bonded or sealed to one another. The fourth edge of one of the sheets therefore extends outwardly to define flap 22, and the fourth edge of the other of the sheets simply overlies the first sheet and constitutes part of the periphery of an opening into the pouch formed by the three sealed edges. The sheets from bag 20 may be made of any fluid impermeable material such as metal foils, synthetic plastics and the like and preferably should be flexible as well as transparent.

Bag 20 is mounted on frame support shown generally at 26. Support 26 includes a substantially flat or planar portion 30 upon which most of bag 20 is intended to rest and frame head 32 disposed at one end of frame support 26. Frame head 32 typically will be formed as a rectangular block or the like in order to provide a hand grip, i.e., to facilitate ready manipulation of the device between the thumb and forefinger of the user. Fluid conduit or similar channel 34 is provided between the outer end of frame head 32 through the frame head structure to a point adjacent the junction between portion 30 and frame head 32. The opening of conduit 34 at the outer end of frame head 32 is provided with mounting structure 36 which is typically a fitting adapted to receive the hub of a standard hypodermic needle 38. The junction of the portion 30 and frame head 32 includes incline ramped portion 42 which is disposed at an angle to the plane of frame head 32, and opening 40 at the other end of conduit 34 which is disposed substantially centrally in portion 42.

Bag 20 is releasably secured to support 26. Typically, an adhesive is disposed in such manner as to allow conduit 34 to communicate with the interior of bag 20 by sealing the bag around aperture 40. The adhesive which seals bag 20 to support 26 must be sufficiently strong to withstand the pressure from the fluid from which the sample is taken and allow the bag to be removed from the support so that the bag can be disposed of after use and the support used with another bag. Typically, the adhesive may be applied along the three edges of the inside surface of flap 22, the outer edge of the shorter sheet of the bag adjacent the opening of the bag and along the outer surface of the shorter sheet as shown by dotted lines 24 in FIGS. 1 and 2. The areas of support 26 and ramped portion 42 which are to receive the adhesive when the bag is secured thereto may be provided with slightly raised portion 28 on the top surface of planar portion 30 in order to accommodate bag 20, as well as aid in the proper alignment of bag 20 when it is mounted on support 26.

A valve in the form of a clamping element, several embodiments of which are designated in the drawings as numerals 50, 60, 70, 80, 90, 130 and 149 is provided in order to control the flow of blood to and from bag 20 and to keep the sample sealed from the outside atmosphere. The clamping element is designed to be positioned in an open position wherein the bag is allowed to fill with a sample and a closed position wherein the clamping element cooperates with support 26 to temporarily seal the two sheets of bag 20 by clamping the sheets together preferably near aperture 40. In this closed position, the seal is sufficient to prevent any gases from entering or escaping the bag. The clamping element may be slidable or nonslidable and pivotal or nonpivotal. The clamping element is made of any resilient and flexible material including metals, natural or synthetic elastomers and the like.

Referring to FIGS. 1 and 2, clamping element 50 is provided in order to control the flow of the sample into bag 20 as well as to seal the sample in bag 20 in order to prevent gases from entering or escaping the bag. Element 50 is typically formed as a rectangular block and is provided with rectangular aperture 52 therethrough. Aperture 52 is dimensioned to enable element 50 to slide along planar portion 30 and ramped portion 42 as well as frictionally engage portions 30 and 42 with sufficient force to clamp bag 20 there between. Element 50 slides forward to an "open" position between head 32 and aperture 40 on ramped portion 42. When element 50 is in this position, a sample will flow freely to and from bag 20. When a sufficient sample has been taken, element 50 is slidably moved to either cover aperture 40 or moved to the opposite side of aperture 40 remote from frame head 32 in order to cooperate with support 26 to clamp the two sheets of bag 20 together, thereby closing bag 20 from the outside atmosphere.

One embodiment of element 50 is shown in FIG. 3 wherein clamping element 60 is preformed so that the thickness of the walls of the element are substantially uniform. Side 62 of element 60, which is to come into contact with bag 20 when in the closed position, is made slightly longer than the opposite side of the element and is smaller at its center than at its sides as shown at 64. When in a closed position, side 62 of element 60 will cooperate with portions 30 or 42 to releasably seal the two sheets of bag 20 to prevent any gases from entering or leaving the bag.

Clamping element 70 which is shown in FIGS. 4 and 5 is a slight modification of clamping elements 50 and 60. Element 70 is substantially rectangular in shape having a center aperture adapted to receive planar portion 30 and ramped portion 42. As shown at 72, the aperture of element 70 is dimensioned slightly wider than the width of planar portion 26, and of a depth slightly less than the thickness of portion 26. Transverse sides 74 of element 70 are made thinner at their center than at their ends. Sides 76 of element 70 are preferably pre-shaped to facilitate gripping of element 70 by the user with his thumb and forefinger. When a compression force F is applied to sides 76 by the user, because of the elasticity and shape of element 70, sides 74 will expand or bulge outwardly from support 26, as best shown by dotted lines 78. When element 70 is located on support 26 over aperture 40 or on the side of aperture 40 remote from head 32, the user need only apply compression force F to place element 70 in an "open" position, without the necessity of sliding the element to the opposite side of aperture 40. As a result, the user need only remove the compressive force F, to place the element 70 in a "closed" position, i.e., the resiliency of element 70 will cause element 70 to cooperate with support 26 to the two sheets of clamp bag 20 at the location of contact. It should be apparent, therefore, that the user need not slide element 70 to place it in the "open" position as it is with elements 44 and 46.

Another modification in which a tight seal can be insured between the two sheets of bag 20 when the clamping element is placed in the closed position is shown in FIG. 6. In this modification, ramped portion 44 is tapered so that it increases in thickness from the planar portion 30 of support 26 toward head 32. The aperture of clamping element 80 is dimensioned to easily slide along planar portion 30 with some clearance. This clearance is provided to allow sample bag 20 to fill when element 80 is placed in an open position by slidably moving element 80 onto planar portion 30. When a sufficient sample is taken element 80 is closed by slidably moving it forward onto ramped portion 44 until portion 44 wedges itself in the aperture of element 80, in a position between aperture 40 and portion 30. It will be evident that in such a position element 80 cooperates with ramped portion 44 to clamp the two sheets of bag 20 together to seal it from any outside atmosphere. An additional feature which may be utilized is clamping element stops 82. Stops 82 typically are small projections formed on both sides of planar portion 30. These stops will prevent element 80 from accidentally sliding off support 26 during handling, shipping, storing, etc.

Another and the preferred embodiment of the invention is shown in FIGS. 7-9. As shown, an integrally formed resilient clamping element 90 is in the form of a spring clip having U-shaped side portion 92 and W-shaped side portion 94 with a flat portion 96 in between. The center extending portion of W-shaped side portion 94 is a detent 98. W-shaped side portion 94 is preferably approximately twice the length of U-shaped side portion 92, and thus the width of each of the two sections defined by detent 98 and either of the ends of side portion 94 is approximately equal to the width of side portion 92.

When clamping element 90 is employed it is preferable, although not necessary, to notch, slot, or form portion 42 in such a manner as to restrain element 90 from sliding along portion 42 and planar portion 30. This

may be accomplished by utilizing four beveled notches 100, three of which are shown in FIG. 7. With this arrangement beveled notches 100 and clamping element 90 are dimensioned so that U-shaped side portion 92 is adapted to fit over and be restrained within two of the notches on one side of neck 42, and the two sections of W-shaped side portion 94 are each adapted to selectively fit over and be restrained within the other two notches.

When a sample is to be taken, the clamping element is placed in an "open" position as shown in FIG. 8, wherein detent 98 will be restrained in the beveled notch of the upper surface of portion 42. When a sufficient sample has been taken, since element 90 is made of a resilient material, flat portion 96 will pivot about the intersection of portion 96 and side portion 92 when pushed by the user with force P as shown in FIG. 8. This force will cause detent 98 from the upper beveled notch into the lower beveled notch as shown in FIG. 9. In this position flat portion 96 will cooperate with portion 42 to releasably seal the bag by clamping the two opposing sheets of bag 20 and thus prevent the sample from being exposed to outside atmospheres. Once the sample has been taken and it is desired to remove the sample from bag 20, the user places element 90 back to the open position as shown in FIG. 8, by pushing upwardly with a force Q as shown in FIG. 9. This forces detent 98 out of the lower beveled notch into the upper beveled notch.

In order to help insure free flow of the sample into bag 20, a small amount of adhesive 102 as shown in FIG. 7, may be used underneath clamping element 90 thereby securing element 90 to the outside of flap 22 of bag 20. Thus when element 90 is "opened" the flap will be pulled up with enough clearance to allow blood to flow freely into bag 20 and yet the seal around the edges of the opening of the bag provided by adhesive 24 will not be broken.

Additionally, raised ring portion 104 may be employed around aperture 40 to help insure a good seal of bag 20 when element 90 is placed in the closed position over aperture 40.

Another embodiment of the invention is shown in FIGS. 10 and 11. As shown bag 20 is tapered at 110 to a small opening 112. This tapered bag is mounted on frame support 26 which has planar portion 30, frame head 32 and raised guides 120 between which the tapered portion 110 of bag 20 rests. Depression 121 is formed on each of portion 120 opposite to one another. As in the FIG. 1 embodiment, a fluid conduit (not shown) is provided between the outer end of frame head 32 through the frame head structure to a point adjacent the junction between planar portion 30 and frame head 32. The opening of the conduit at the outer end of frame head 32 is provided with mounting structure 36 which is typically a fitting adapted to receive the hub of a standard hypodermic needle 38.

Bag 20 is releasably secured to support 26 so that tapered portion 110 lies between raised portions 120 and opening 112 communicates with the conduit of frame support 26.

The valve or clamping element shown generally at 130 comprises a pressure member 132 and a pivot member 134. The pressure member 132 comprises flat portions 138 and 140 between which is formed slot 136. Pivot member 134 comprises tab 142, side projections 144 and slide bar 146.

Assembled, flat portion 140 of pressure member 132 is placed between raised portions 120 over opening 112 of bag 20 and the conduit of frame support 26. Pivot member 134 is forced between raised portions 120 so that projections 144 fit into depressions 121. In this position, pivot member 134 cooperates with pressure member 132 so that bar 146 slides in slot 136.

Referring to FIG. 10, clamping element 130 is shown in the open position wherein the sample will flow into container 20. In order to close bag tab 142 is pivoted in a clockwise direction whereby bar 146 slides in slot 136. Since pivot member 134 is constrained in depressions 121, force will be exerted by bar 146 against flat portion 140 which in turn is forced against bag 20 at opening 112.

Clamping element 130 can be modified as shown in FIG. 12, wherein clamping element 149 comprises a pressure member 150 and pivot member 162. Member 150 comprises flat portion 152, and prongs 154 and 156. Slot 158 is provided between portion 152 and the prongs 154, 156 and space 160 is provided between the prongs. Pivot member 162 comprises a wire which is bent to form a tab 164, a center portion 166 oppositely directed slide portions 168 which terminate in side projections 170. Projections 170 are spaced from slide portions 168, the reason being more apparent hereinafter.

Clamping element 149 cooperates with support 26 in the same manner as previously described element 130. Assembled, portion 152 of pressure member 150 is placed between raised portion 120 over opening 112 of bag 20 and the conduit of frame support 26. Pivot member 162 is forced between raised portions 120 so that projections 170 fit in depressions 121. In this position pivot member 162 cooperates with pressure member 150 so that center portion 166 will slide between prongs 154 and 156, and portions 168 slide in slot 158. Since pivot member 162 is constrained in depressions 121, force can be exerted by portions 168 against flat portion 152 which in turn is forced against bag 20 at opening 112.

Generally, when in use, needle 38 is attached to mount 36 and is inserted in an artery or vein of the individual from whom blood is to be taken. The clamping element will then be placed in the "open" position. Blood under normal pressure will flow through needle 38 and channel 34, out aperture 40 into flat bag 20, expanding the latter until a sufficient sample is taken. Once the bag is full, the clamping element is closed thereby sealing the bag. The needle is then removed from the artery or vein of the patient. The needle 38 is then detached from mount 36. The sample input of a bloodgas analysis machine can be adapted to sealingly mate with mount 36. The clamping element is then opened and blood permitted to flow out of the bag into the machine.

One can insure that the bag is absolutely free of gas by initially flushing it with a heparin solution or the like and expelling any excess solution, making sure only liquid remains in the bag.

Since certain changes may be made in the above apparatus without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in the limiting sense.

I claim

1. A device for collecting samples from pressurized fluids comprising, in combination;

a fluid impermeable container comprising two opposing walls sealed together, except at one opening therebetween, about a common periphery so as to be substantially in face-to-face contact with one another throughout the interior portion of said container, said container being expandable when said sample is received therein through said opening;

means for supporting said container along its length and including a fluid conduit, one end of said conduit defining an aperture in said supporting means, said opening of said container being releasably sealed to communicate with said aperture, and; valve means cooperating with said container and said supporting means for releasably clamping said two opposing walls of said container together at a location substantially near said opening.

2. A device as device as described in claim 1 wherein the opposite end of said fluid conduit of said supporting means includes means for mounting a hypodermic needle.

3. A device as described in claim 1 wherein said container comprises two substantially rectangular sheets, said sheets being sealed together along three edges, said opening of said container being defined by the fourth edges of said sheets.

4. A device as described in claim 3 wherein said sheets are transparent.

5. A device as described in claim 1 wherein said valve means is mounted on at least a portion of said supporting means for slidable movement between an open position, wherein said container is capable of receiving said samples, and a closed position, wherein said two opposing walls of said container are releasably clamped.

6. A device as described in claim 5, wherein said portion of said supporting means has a substantially rectangular cross-section, said valve means includes an aperture capable of receiving said support portion and said two opposing walls of said container, said support-receiving aperture has a substantially rectangular cross-section, said support-receiving aperture cross-section decreases in thickness from two opposite ends of said aperture toward the center of said aperture.

7. A device as described in claim 5, wherein the section of said supporting means at said closed position is tapered.

8. A device as described in claim 7 wherein said tapered section increases in thickness from said open position to said closed position and said valve means includes means for receiving said support and said two opposing walls of said container, said tapered section and said two opposing walls are capable of being wedged in said receiving means when said valve means is in said closed position.

9. A device as described in claim 8 wherein said receiving means is an aperture.

10. A device as described in claim 1, wherein said valve means is in a in closed position, wherein said two opposing walls of said container are releasably clamped, and said valve means is capable of bulging outwardly away from said supporting means in response to an external force to an open position, wherein said container is capable of receiving said samples when said valve means is in said open position.

11. A device as described in claim 10, wherein said valve means includes means for receiving said supporting means and said two opposing walls of said container, said receiving means being dimensioned so that said receiving means bulges outwardly in a unilateral direction away from said supporting means releasing said two opposing walls of said container when said external force is applied to said valve means in a direction substantially normal to said unilateral direction.

12. A device as described in claim 11, wherein said receiving means is an aperture.

13. A device as described in claim 1, wherein at least a portion of said valve means is mounted on said supporting means for pivotal movement between an open position, wherein said container is capable of receiving said samples, and a closed position, wherein said opposing walls of said container are releasably clamped.

14. A device as described in claim 13 wherein said valve means includes means for receiving said supporting means, said receiving means includes a portion which contacts one of said two opposing walls of said container when said valve means is in said closed position, said contacting portion having two opposing ends, said valve means being pivotal about one of said ends.

15. A device as described in claim 14, wherein said receiving means further includes two opposing side portions, each of said side portions being attached to a

corresponding one of said opposing ends of said contacting portion.

16. A device as described in claim 15 wherein said side portion attached to said pivotal end is secured to said supporting means on one side of said container, and the other of said side portions cooperates with said support on the other side of said container between said open and closed positions.

17. A device as described in claim 16, wherein said other of said side portions includes a detent, and said support includes means for releasably securing said detent in said open position and in said closed position.

18. A device as described in claim 17, wherein said means for securing said detent include notches in said supporting means.

19. A device as described in claim 17, wherein said side portion attached to said pivotal end is substantially U-shaped, said other of said side portions is substantially W-shaped, said detent being the center extending portion of said W-shaped said portion.

20. A device as described in claim 13, said supporting means includes means for receiving said pivotal portion of said valve means and said valve means includes a pressure member, wherein said pivotal portion and pressure member cooperate with one another.

* * * * *

30

35

40

45

50

55

60

65