United States Patent [19]

Edwards

[11] **3,920,001**

[45] **Nov. 18, 1975**

[54] **ASPIRATOR DEVICE**

[76] Inventor: **Donald W. Edwards,** 821 Peoria Ave., Dixon, Ill. 61021

[22] Filed: **June 10, 1974**

[21] Appl. No.: **477,847**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 58,049, July 24, 1970, abandoned.

[52] **U.S. Cl.** ..... **128/2 F;** 128/DIG. 5; 128/215; 128/221

[51] **Int. Cl.**[2] **A61B 5/14**

[58] **Field of Search** ... 128/2 F, DIG. 5, 221, 218 N, 128/214 R, 214.2, 214.4, 215, 276, DIG. 25, 2

[56] **References Cited**

UNITED STATES PATENTS

2,402,306	6/1946	Turkel	128/214 R
2,512,568	6/1950	Saffir	128/215
2,590,895	4/1952	Scappellino	128/221
2,952,256	9/1960	Meader et al.	128/221
3,064,648	11/1962	Bujan	128/214 R
3,076,457	2/1963	Copen	128/221
3,277,893	10/1966	Clark	128/221
3,487,837	1/1970	Petersen	128/DIG. 26
3,509,880	5/1970	Guttman	128/221
3,662,754	5/1972	Halloran	128/221

Primary Examiner—Kyle L. Howell

[57] **ABSTRACT**

The cannula is provided with a hub for mounting on a syringe. Adjacent the point of the cannula is a lateral opening which intersects the end opening. A slidable sleeve is provided for sealing to the cannula outwardly of the lateral opening during insertion of the cannula and, in some instances, during taking of the blood sample. An outwardly-extending disk is arranged at an oblique angle to the sleeve to seal against the skin of a patient.

3 Claims, 8 Drawing Figures

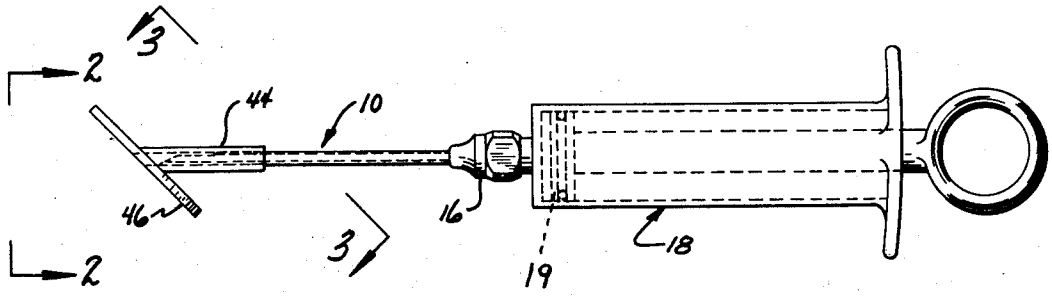


Fig. 1.

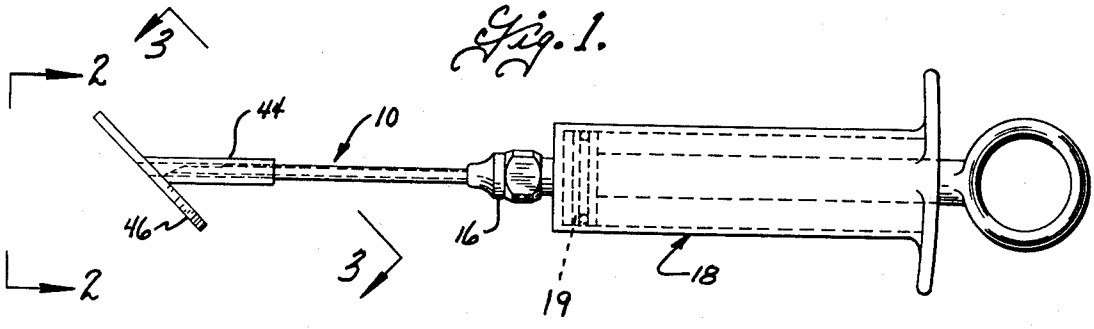


Fig. 2.

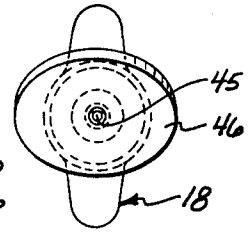
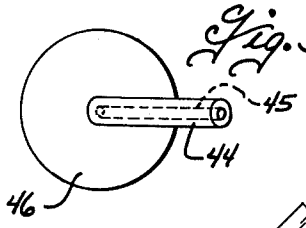


Fig. 3.



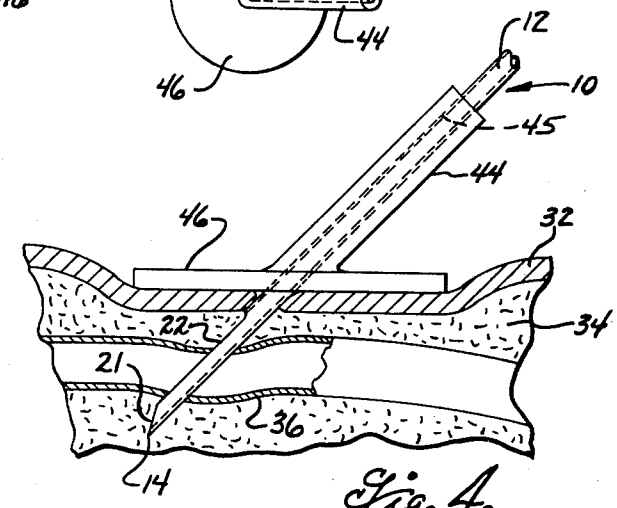
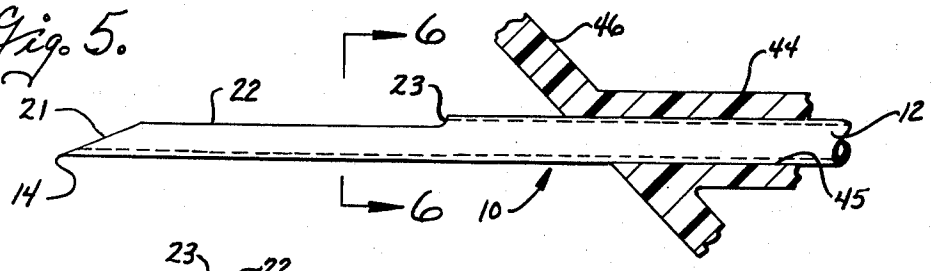


Fig. 4.

Fig. 5.



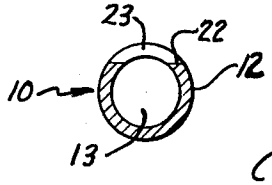


Fig. 6.

Fig. 7.

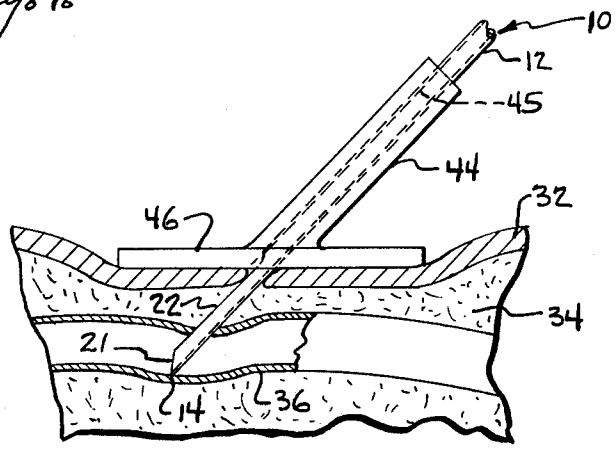
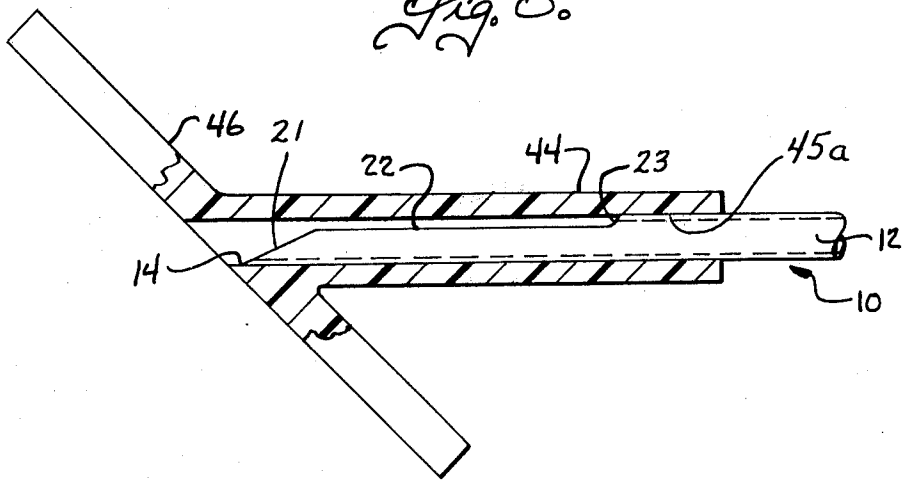


Fig. 8.



ASPIRATOR DEVICE

CROSS REFERENCE

This application is a continuation-in-part of application Ser. No. **58,049,** filed July **24, 1970,** now abandoned.

BACKGROUND

The invention pertains to instruments used in the field of medicine and more particularly to an aspirator and method for taking a blood sample.

In taking a blood sample, it is customary to insert the cannula into a vein and withdraw a sample into a syringe. In the use of a conventional cannula it is necessary to accurately position the point in the vein in such a manner that the opening at the point is not blocked. For example, an **18**-gauge cannula has a lumen of about **0.03** inch diameter. If the penetrating point is at a **30°** angle, the axial length of the end opening is only about **0.06** inch. This emphasizes the problem of accurately positioning the point. If the cannula is inserted too deeply, the point may pass through the vein and the opening will be blocked. If the opening is otherwise positioned adjacent the wall of the vein, it may be blocked, or it may become blocked when a slight vacuum is applied in drawing blood. It is desirable to have a device that alleviates the necessity of accurate positioning, without affecting the operability. Additionally, the material punctured by the cannula has a tendency to bulge into the lumen and cause what is commonly known as "coring" or "heel shaving." When this occurs, a piece of the material plugs the lumen so that it is difficult to draw a blood sample. It is desirable to have a device which alleviates the problem of "coring," without affecting the operability of the aspirator.

In the practice of pediatrics, it is frequently necessary to take a blood sample of an infant — perhaps a newborn baby. Such a sample may be taken from the femoral vein and, while it is usually possible to pierce the vein, to accurately position the point of a **25**-guage cannula is difficult at best. The femoral vein is near the femur and this fact is used in taking the sample. A cannula is inserted in the infant's thigh until it contacts the femur, the cannula is then slowly retracted until the open end communicates with the femural vein. Obviously this is a difficult operation. It is desirable to provide a method which alleviates the necessity of accurately positioning the end of the cannula.

SUMMARY

The present invention relates to an improved aspirator device and method.

It is an object of the present invention to provide a new and improved device and method for taking a blood sample and which is fully operative even when not exactly positioned.

Another object is to provide an aspirator device including a sleeve which is slidably mounted on the cannula and seals thereto.

Still another object is to provide an aspirator device which seals against the skin of a patient.

Yet another object is to provide an aspirator device in accordance with the preceding object and in which the member that seals against the skin is transparent for viewing therethrough.

These, and other objects and advantages of the present invention, will become apparent as the same becomes better understood from the following detailed description when taken in conjunction with the accompanying drawings.

DRAWINGS

FIG. **1** is a side elevational view of a preferred embodiment of the present invention mounted on a syringe;

FIG. **2** is a front view as seen from line **2—2** of FIG. **1**;

FIG. **3** is a view of the back side of the disk as seen from line **3—3** of FIG. **1**;

FIG. **4** is an enlarged fragmentary side elevational view of the apparatus shown inserted in a vein which is partially shown in vertical section to illustrate details;

FIG. **5** is an enlarged longitudinal sectional view through the sleeve and disk;

FIG. **6** is a cross-sectional view taken along line **6—6** of FIG. **5** and on a still larger scale;

FIG. **7** is a view similar to FIG. **4** but with the end of the cannula at a different position relative to the vein, and showing the lateral opening sealed by the sleeve; and

FIG. **8** is a view similar to FIG. **5** but showing the lateral opening sealed by the sleeve.

DESCRIPTION

Reference is now made more particularly to the drawings which illustrate the best presently known mode of carrying out the invention and wherein similar reference characters indicate the same parts throughout the several views.

A cannula, generally designated **10,** preferably has a size in the range of **25** gauge to **16** gauge and includes a tubular body **12** providing a lumen **13.** At the distal end of the body **12** is a penetrating point **14** provided by about a **30°** angle of the distal end. Thus the lumen terminates at what can be described as an opening **21** at the distal end of the cannula. A hub **16** is provided at the proximal end of the cannula for attachment to a syringe **18.** The syringe provides a reservoir for receiving blood from the patient, and has a plunger **19** for applying a partial vacuum on the reservoir as the plunger is retracted. Such syringes are well known in the art and additional description is deemed unnecessary. It is contemplated, however, that the present invention can be used with other suitable apparatus for applying a slight vacuum to draw blood from a patient.

In use, the cannula **10** is inserted through the skin **32** and moved therebeneath through the subcutaneous tissue **34.** The piercing point **14** pierces the wall of a vein **36** or other blood vessel and moves into the vessel. A conventional cannula is provided with an opening adjacent the penetrating point **14.** In use it is possible to partially or completely block this opening. For example, should the opening be positioned adjacent the wall of the vein **36,** the flow of blood will be restricted. Additionally, if the cannula is inserted too deeply, the penetrating point **14** may pass through the vein thereby necessitating repositioning.

In accordance with the present invention, the cannula is formed with a lateral opening **22** through the cannula wall. The lateral opening **22** (see FIG. **4**) intersects the opening **21** at the end of the cannula and having a width less than **180°** (see FIG. **6**). The lateral opening provides an entrance for blood in the event that the open end is obstructed in any of the manners

described above. The lateral opening **22** extends along the cannula to a remote end **23,** a distance from the proximal end preferably in the range of **10** to **40** times the diameter of the lumen **13.** For example, an **18** guage cannula has a lumen with a diameter of about **0.03** inch. For this size, the remote end **23** would be located between **0.3** inch and **1.2** inch from the proximal end of the cannula. In accordance with the present invention, it is essential that the cannula **10** have a smooth exterior surface with no obstructions thereon. For this purpose, the body **12** has a uniform outer diameter along its entire length.

It is essential to avoid introducing air into the vein **36** and also to avoid drawing air into the syringe **18** when taking a blood sample. For this purpose, a tubular sleeve **44** is provided to slidably surround the tubular body **12** of the cannula **10** and seal the lateral opening **22.** It is necessary that the sleeve **44** seal to the tubular body **12** of the cannula prior to insertion (as shown in the position of FIG. **1** or FIG. **8**), and that the cannula **10** be slidable extensible therethrough to the position shown in FIGS. **4, 5** or **7** where the lateral opening can communicate with the vein **36.** For this purpose, sleeve **44** has a bore **45** for receiving the tubular body of the cannula. The sleeve **44** has a length greater than the distance from the penetrating point **14** to the remote end **23** of the lateral opening **22,** as shown in FIG. **8.** The bore **45** is sized to closely receive the tubular body **12** and provide an air-tight seal thereagainst; for example, note the seal area designated **45a** in FIG. **8.** Yet the bore **44** is sized to permit sliding movement between the cannula and sleeve, from the position shown in FIG. **1** all the way to the hub **16.**

It is preferable to introduce the cannula **10** into the skin **32** and vein **36** at an angle to facilitate penetration by the piercing point **14.** For this purpose, a disk or base **46** is mounted on the sleeve **44** at an oblique angle to the axis of the sleeve. The base **46** is adapted to be positioned on the surface of the skin **32** in overlying relation to the vein **36,** and the cannula is then pushed through the sleeve **44** to penetrate the skin and enter the vein of the patient. In order to facilitate aligning the cannula with the vein, the base **46** is preferably formed of a clear material such as transparent plastic. By pressure applied against the base **46,** it will seal against the skin **32** of the patient. A base of about ⅜ inch diameter is a suitable size for this purpose. An adhesive (not shown) can be applied to the underside of the base **46** to aid in holding the base and sleeve **46** in position over the vein and sealed against the skin **32.**

In one preferred arrangement, the remote end **23** of the lateral opening **22** is ½ inch from the penetrating point **14,** the sleeve **44** has a length of about ¾ inch, and the cannula is **18** guage, having a length of about **2** inches.

The importance of the sealing of the base **46** against the skin **32** and of the sleeve **44** over the lateral opening **22,** is demonstrated in FIG. **7.** If the vein **36** is close to the surface of the skin **32,** it is sometimes possible to pierce the vein while some of the lateral opening **22** is still exterior of the skin. When this occurs, the lateral opening **22** is sealed by the sleeve **44** while the base **46** seals against the skin **32.** Not only is a larger opening provided for receiving the blood, but a smaller area of the cannula penetrates the patient since the end **23** is still exterior. In such use, the lateral opening **22** is sealed by the sleeve **44,** and the base **46** seals against the skin **32** throughout the procedure. The cannula **10** is aligned with the vein **36** and inserted into the vein until the lateral opening communicates with the vein, but without regard to whether the lateral opening **22** is still external of the skin. Thereafter, a slight vacuum is applied to withdraw the blood sample.

In taking a blood sample from an infant, the apparatus of the present invention is also advantageous. The cannula **10** is inserted into the infant's leg, through the femoral vein, until the penetrating point is adjacent the femur. In many instances, the lateral opening **22** will then be communicating with the femoral vein; however, the walls of the vein may be pinched together. Therefore, the cannula should be retracted slightly until proper communication is provided between the lateral opening and the femoral vein. Thereafter, a slight vacuum is applied to withdraw the blood sample.

It is now deemed apparent that the present invention provides an aspirator device and method which alleviates the necessity of accurately positioning the end of a cannula.

I claim:

1. An aspirator device for taking a blood sample and which alleviates the necessity of accurate positioning, the device including: means defining a reservoir for receiving blood from a patient; means for applying a partial vacuum on the reservoir to draw blood from the patient; a cannula having a size in the range of **25** guage to **16** guage; the cannula having a penetrating point at its distal end and a hub at its proximal end operatively connected to the reservoir; the cannula having an opening at its distal end communicating with its lumen, and an axially elongate lateral opening through the cannula wall on the side opposite the penetrating point; the lateral opening intersecting the end opening and extending along the cannula to a remote end a distance from the distal end in the range of **10** to **40** times the diameter of the lumen of the cannula; the lateral opening having a width less than **180°;**the cannula having a smooth exterior surface of uniform diameter extending the full length thereof, with no obstructions thereon; a slidable sealing sleeve having a length greater than the distance from the distal end to the remote end of the lateral opening; the cannula having a length greater than twice the length of the sleeve; the cannula slidably extending through the sleeve from a first position where the penetrating point is inside the sleeve and the lateral opening is covered by the sleeve, to a position contiguous to the hub; the sleeve closely surrounding the cannula and arranged to provide an air-tight seal against the cannula at said first position to provide an air-tight cover extending over the lateral opening both prior to and during insertion of the cannula into the patient; means at the end of the sleeve adjacent the penetrating point for sealing against the skin of the patient; the last-mentioned means including an outwardly-extending base at an oblique angle to the axis of the sleeve and providing a flat, skin-engaging surface; the base being formed from a transparent synthetic resin and extending outwardly from the cannula about ⅜ inch in each direction.

2. An aspirator device as set forth in claim **1** including an adhesive on the skin-engaging surface of the base for sealing against the skin of the patient.

3. An aspirator device as set forth in claim **2** wherein the remote end of the lateral opening is about ½ inch from the distal end of the cannula, the sleeve has a length of about ¾ inch, and the cannula has a length of about **2** inches.

* * * * *