Aug. 5, 1969 F. DEUSCHLE 3,459,177

FLUID TRANSFER STRUCTURE

Filed April 28, 1967

FIG.1

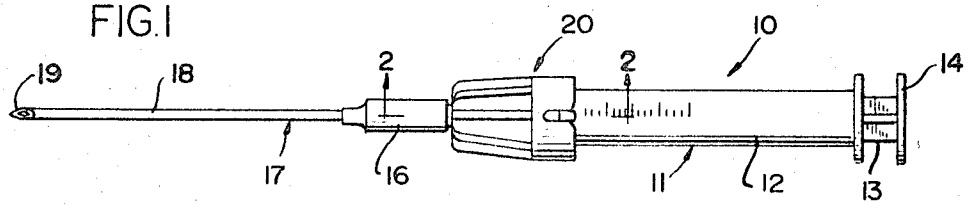



FIG.2

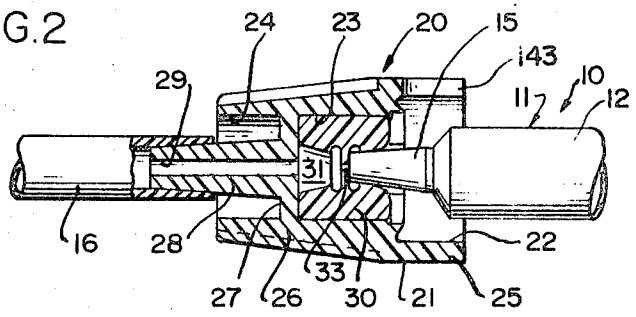



FIG.4

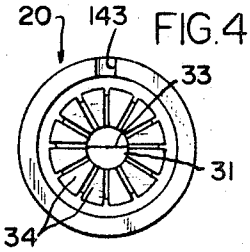
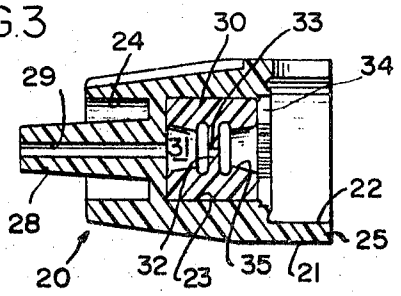



FIG.3



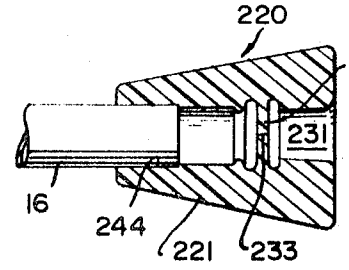




FIG.8

FIG.5

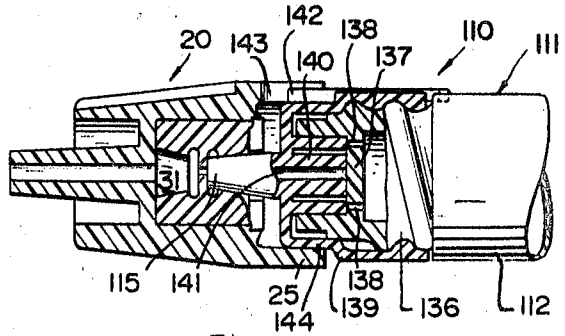



FIG.7

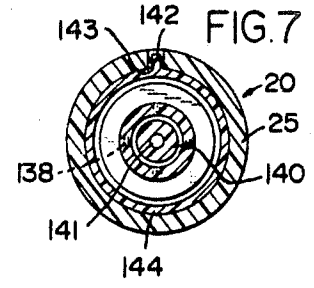
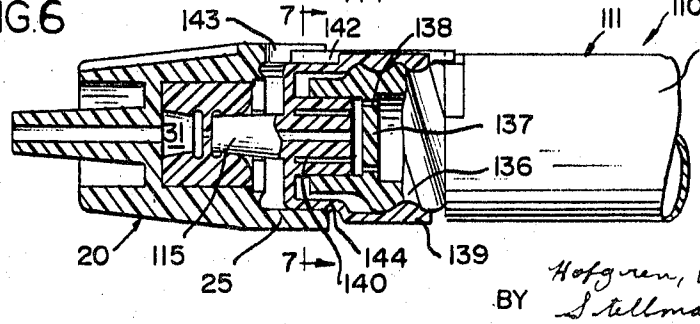



FIG.6




INVENTOR

FRITZ DEUSCHLE

BY Hofgren, Wegner, Allen, Stellman & McCord

ATTORNEYS.

United States Patent Office 3,459,177 Patented Aug. 5, 1969



3,459,177

# FLUID TRANSFER STRUCTURE

Fritz Deuschle, St. Augustine, Fla., assignor to Brunswick Corporation, a corporation of Delaware

Filed Apr. 28, 1967, Ser. No. 634,722
Int. Cl. A61b 5/10
U.S. Cl. 128—2 17 Claims

## ABSTRACT OF THE DISCLOSURE

A fluid transfer structure comprising an adapter to be removably secured to the needle connector end of an apparatus such as a syringe and having a valve to be actuated by the connection to the syringe end. The adapter has a needle connector end to which the needle hub is secured whereby the needle may be maintained in a patient while a number of syringe connections are effected as for taking multiple samples.

This invention relates to fluid transfer structures and in particular to valve means for use with syringes and the like.

In obtaining a number of samples of fluid such as blood from a patient, it is desirable to permit the needle to remain in place in the inserted disposition while making the several connections to the different fluid receiving receptacles such as conventional hypodermic syringes. To permit such maintained insertion, means must be provided for preventing loss of the fluid during the time no receptacle is connected thereto. The present invention comprehends an improved adapter for use with a hypodermic syringe to provide such desirable maintained insertion of the associated needle in such multi-sample operations.

Thus, a principal feature of the present invention is the provision of a new and improved fluid transfer structure.

Another feature of the invention is the provision of such a fluid transfer structure comprising a new and improved valved adapter for use with a receptacle such as a hypodermic syringe.

A further feature of the invention is the provision of such a fluid transfer structure for use with a receptacle provided with means for connecting a needle hub in fluid flow association therewith and a flow control device comprising a body defining a flow passage, having an inner end and an outer end, means on the body defining a wall across the flow passage and having flow passage means therethrough biased to a closed condition, means on the body for removably mounting the receptacle to the body with the connecting means extending into the inner end of the body flow passage and urging the flow passage means of the wall means to an open condition, and means for connecting a needle hub to the body for communication with the outer end of the body flow passage.

A yet further feature of the invention is the provision of such a fluid transfer structure wherein the wall means comprises a resilient means.

Another feature of the invention is the provision of such a fluid transfer structure wherein the wall means comprises a resilient means and the flow passage means is biased to the closed condition by the resiliency of the wall means.

Still another feature of the invention is the provision of such a fluid transfer structure wherein the wall means comprises an element sealingly installed in the body within the flow passage.

A further feature of the invention is the provision of such fluid transfer structure wherein the wall means is formed integrally with the body.



A yet further feature of the invention is the provision of such a fluid transfer structure wherein the mounting means comprises means for connecting the body to the needle hub connecting means of the receptacle.

Another feature of the invention is the provision of such a fluid transfer structure wherein the wall means is provided with cam means responsive to engagement by the needle hub connecting means of the receptacle to urge the flow passage means of the body to the open condition.

Still another feature of the invention is the provision of such a fluid transfer structure wherein the last named needle hub connecting means comprises a luer connector.

Yet another feature of the invention is the provision of such a fluid transfer structure wherein the body is formed of resilient material.

A further feature of the invention is the provision of such a fluid transfer structure wherein the body includes an inner inturned portion for retaining the wall means in the flow passage.

A still further feature of the invention is the provision of such a fluid transfer structure wherein the flow passage means of the wall means comprises a slit in the wall means.

A yet further feature of the invention is the provision of such a fluid transfer structure further including means for selectively opening and closing the needle hub connecitng means of the receptacle.

Another feature of the invention is the provision of such a fluid transfer structure wherein the needle hub connecting means of the receptacle is movably, sealingly associated therewith and the flow control device is mounted on the needle hub connecting means of the receptacle.

Yet another feature of the invention is the provision of such a fluid transfer structure wherein the needle hub connecting means of the receptacle is movably, sealingly associated therewith and the flow control device is mounted on the needle.

Still another feature of the invention is the provision of such a fluid transfer structure wherein the needle hub connecting means of the receptacle is movably, sealingly associated therewith and the flow control device is mounted on the needle hub connecting means of the receptacle, the structure further including means for tactually indicating the arrangement of the needle hub connecting means of the receptacle thereon.

A further feature of the invention is the provision of such a fluid transfer structure wherein the body is formed of a polycarbonate resin.

Another feature of the invention is the provision of such a fluid transfer structure wherein the body is formed of a phenoxy resin.

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIGURE 1 is a side elevation of a fluid transfer structure provided with a flow control device embodying the invention;

FIGURE 2 is a fragmentary enlarged diametric section taken substantially along the line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary diametric section of the adapter;

FIGURE 4 is a rear end elevation thereof;

FIGURE 5 is a fragmentary enlarged diametric section of a fluid transfer structure having a modified form of receptacle end structure provided with valve means for selectively closing the receptacle, the valve means being illustrated in the closed position;

FIGURE 6 is a fragmentary diametric section of the structure of FIGURE 5 in the valve open position;

FIGURE 7 is a transverse section taken substantially along the line 7—7 of FIGURE 6; and

FIGURE 8 is a diametric section of a further modified form of adapter.

In the exemplary embodiment of the invention as disclosed in FIGURES 1 through 4 of the drawing, a fluid transfer structure generally designated **10** is shown to comprise a hypodermic syringe **11** including a receptacle in the form of a tubular barrel **12** having movably mounted therein a plunger **13** provided at the rear end of the structure with a thumbpiece **14** for selectively moving the plunger axially inwardly and outwardly through the barrel to effect a fluid transfer through a forward end **15** thereof. As shown in FIGURE 2, the barrel end **15** may comprise a conventional male luer connector having a frusto-conically tapered configuration adapted to receive the hub **16** of a conventional needle **17** having an elongated cannula **18** provided at the forward end with a sharp insertion tip **19**. Thus, when a needle **17** is mounted on the barrel end **15**, the barrel is open through the needle for fluid transfer into and from the barrel as a function of the displacement of the plunger **13**.

As discussed briefly above, if such a structure is employed for withdrawing blood from a person and it is desired to obtain a number of samples, such a structure would normally require the withdrawal of the needle from the person during a change of the receptacle as the open needle would permit the blood to flow outwardly therethrough at such time. The present invention comprehends the provision of an adapter generally designated **20** to which the needle hub **16** is connected and which defines means for selectively closing the needle when the syringe **11** is removed therefrom thereby permitting the needle to be maintained inserted in the person while changing receptacle connections thereto.

Referring now more specifically to FIGURES 2 through 4, the adapter **20** is shown to comprise a body **21** formed of a rigid material such as polycarbonate or phenoxy resins and the like. The body **21** is generally tubular having a through bore defined by a rear portion **22**, a midportion **23**, and a front portion **24**. The bore rear portion **22** is defined more specifically by a rear skirt **25**, and the bore portions **23** and **24** are more specifically defined by a forward body portion **26** provided with a transverse wall **27** separating the bore portions **23** and **24** and carrying a forward connector end **28**. The connector end **28** is externally frusto-conical and adapted to have the needle hub **16** sealingly mounted thereon. A passage **29** extends coaxially through the adapter end **28** and wall **27** to provide communication between the needle hub **16** and the bore portion **23**.

The adapter **20** is arranged to be sealingly mounted on the barrel end **15** by means of an annular resilient element **30** having an axial passage **31** with a transverse wall portion **32** normally closing the passage. Wall portion **32** is provided with a diametric slit **33** which is biased closed by the resiliency of the element **30** in the normal arrangement, as shown in FIGURE 3. The element **30** is retained in the adapter passage portion **23** by a plurality of inturned fingers **34** formed on the rear end of the body portion **26** and which extend inwardly therefrom to approximately the diameter of the outer end of the passage **31**.

When the adapter is installed on the barrel end **15** as shown in FIGURE 2, the barrel end engages the adapter within the passage **31** to urge the slit **33** open against the resilient bias of the element **30** and thereby provide communication between the passage **29** and the interior of the syringe barrel **12**. To this end, the rear portion **35** of the passage **31** is frusto-conical, widening rearwardly and slightly smaller than the corresponding outer dimensions of the frusto-conical syringe barrel end **15**. Thus, the element **30** is sealingly resiliently mounted on the barrel end **15** and concurrently caused to have the passage **31** thereof open through the slit **33** when so installed. Alternatively, upon disconnection of the barrel end therefrom the slit automatically closes to prevent fluid transfer through the adapter.

Thus, where it is desired merely to use the syringe **11** for a one time fluid transfer, the needle **17** may be installed directly on the barrel end **15**. Where a multiple fluid transfer is desired, the needle may be firstly installed on the adapter **20**, and the several connections to the needle may then be made be simply connecting the respective barrel ends thereto while permitting the maintained insertion of the needle without loss of fluid during the reconnections. The adapter **20** is extremely simple and economical of construction and may effectively comprise a disposable element for cooperative use with syringes and needles which may be similarly disposable.

Referring now to the embodiment of FIGURES 5 through 7, the adapter **20** is shown to be mounted on a receptacle generally designated **111** defining a modified form of fluid transfer structure generally designated **110**. The receptacle **111** differs from receptacle **11** in the provision of a modified valved end structure. As shown, the barrel portion of the receptacle **111** may comprise a collapsible plastic bag having formed integrally thereon an externally screw threaded end **136** provided with an internal transverse wall **137** having a plurality of through ports **138**. A cap **139** is threaded onto the end portion **136** and includes an inwardly projecting axial portion **140** provided with an axial bore **141**. When the cap is threaded fully downwardly onto the receptacle portion **136**, the cap portion **140** seats against the wall **137** to preclude fluid flow through the ports **138** from or to bore **141**. When the cap is threaded outwardly to space the cap portion **140** from the wall **137**, such fluid flow is permitted, thus providing means for valving the receptacle **111** as a function of the rotational position of the cap on the end **136**.

The cap is further provided with a frusto-conical outwardly narrowing end **115** corresponding to end **15** of barrel **12** arranged to have adapter **20** mounted thereon in a similar manner. The cap may be provided with an upstanding, longitudinally extending, rib **142**, and the adapter may be provided with a complementary, longitudinally extending, recess **143** in which the rib is received when the adapter is mounted on the end cap. Thus, valve-operating rotation of the cap **139** may be effected by rotation of the adapter with the rib and slot structures defining a mechanical interlock therebetween which may be readily effected by simply slipping the adapter skirt **25** over the cap. As best seen in FIGURE 6, the cap may be provided with a reduced diameter outer end portion **144** for improved mounting of the skirt **25** thereon.

Thus, fluid transfer structure **110** provides the desirable feature of permitting sealed closure of the receptacle before and/or after connection thereof through the adapter to the needle **17**. In the illustrative embodiment, the barrel **112** may comprise a collapsible plastic bag which may be suitably collapsed by finger manipulation thereof with the valve means **140–137** in the open arrangement of FIGURE 6. By closing the valve means with the bag thusly collapsed, a vacuum may be maintained therein which may be uilized subsequently in facilitating withdrawal of fluid such as blood from a person into the receptacle. Thus, the valve may be maintained closed while the receptacle **111** is connected to the needle **17** and the needle inserted in blood collecting relationship with the donor. The receptacle may be then rotated relative to the adapter to effect an opening of the valve means whereupon the vacuum within the bag **112** effects a positive withdrawal of the blood through the needle **17** thereinto. Upon collection of the desired quantity of blood, the valve means may be closed by suitably rotating the bag **112** relative to the adapter, and the receptacle may then be withdrawn from the adapter while maintaining the needle in the inserted arangement as discussed above relative to fluid transfer structure **10**.

Referring now to FIGURE 8, a modified form of adapter generally designated **220** is shown to comprise a

body **221** formed of a resilient material such as rubber having a through passage **231** generally similar to passage **31** of adapter **20**. The passage is normally closed by a transverse wall **232** provided with a slit **233** functioning in the same manner as wall **32** and slit **33** of adapter **20**. In lieu of the connector end **28** of adapter **20**, adapter **220** is provided with an outer portion **244** having a diameter slightly smaller than the outer diameter of the needle hub **16** whereby the needle hub may be sealingly connected to the adapter by insertion into the passage portion **244**. Thus, adapter **220** is generally similar to adapter **20** except for the unitary construction thereof and the use of the female needle hub connecting means. In all other respects, adapter **220** functions similarly to adapter **20** in providing a valved connection of the needle to any one of a plurality of receptacles.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

**1.** In a fluid transfer structure having a receptacle provided with means for connecting a needle hub in fluid flow association therewith, a flow control device comprising:

a body defining a flow passage, having an inner end and an outer end;

means on the body defining a wall across said flow passage and having flow passage means therethrough biased to a closed condition;

means on said body for removably mounting the receptacle to the body with said connecting means extending into said inner end of the body flow passage means on said wall means responsive to the extension of said connection means into said inner end of the body flow passage for urging said flow passage means of said wall means to an open condition; and

means for connecting a needle hub to said body for communication with said outer end of the body flow passage.

**2.** The fluid transfer structure of claim **1** wherein said wall means comprises a resilient means.

**3.** The fluid transfer structure of claim **1** wherein said wall means comprises a resilient means and said flow passage means is biased to the closed condition by the resiliency of said wall means.

**4.** The fluid transfer structure of claim **1** wherein said wall means comprises an element sealingly installed in said body within said flow passage.

**5.** The fluid transfer structure of claim **1** wherein said wall means is formed integrally with said body.

**6.** The fluid transfer structure of claim **1** wherein said mounting means comprises means for connecting said body to said needle hub connecting means of the receptacle.

**7.** The fluid transfer structure of claim **1** wherein said means on said wall means comprises cam means.

**8.** The fluid transfer structure of claim **1** wherein said last named needle hub connecting means comprises a luer connector.

**9.** The fluid transfer structure of claim **1** wherein said body is formed of resilient material.

**10.** The fluid transfer structure of claim **1** wherein said body includes an inner inturned portion for retaining said wall means in said flow passage.

**11.** The fluid transfer structure of claim **1** wherein said flow passage means of the wall means comprises a slit in said wall means.

**12.** The fluid transfer structure of claim **1** further including means for selectively opening and closing the needle hub connecting means of the receptacle.

**13.** The fluid transfer structure of claim **1** wherein said needle hub connecting means of the receptacle is movably, sealing associated therewith and said flow control device is mounted on said needle hub connecting means of the receptacle.

**14.** The fluid transfer structure of claim **1** wherein said needle hub connecting means of the receptacle is movably, sealingly associated therewith and said flow control device is mounted on said needle hub connecting means of the receptacle, said structure further including means for indicating the arrangement of said needle hub connecting means of the receptacle thereon.

**15.** The fluid transfer structure of claim **1** wherein said needle hub connecting means of the receptacle is movably, sealingly associated therewith and said flow control device is mounted on said needle hub connecting means of the receptacle, said structure further including means for tactually indicating the arrangement of said needle hub connecting means of the receptacle thereon.

**16.** The fluid transfer structure of claim **1** wherein said body is formed of a polycarbonate resin.

**17.** The fluid transfer structure of claim **1** wherein said body is formed of a phenoxy resin.

**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 820,987 | 5/1906 | Perotti | 222—490 |
| 3,308,809 | 3/1967 | Cohen | 128—2 |
| 3,181,529 | 5/1965 | Wilburn | 128—2 |

RICHARD A. GAUDET, Primary Examiner

MARTIN F. MAJESTIC, Assistant Examiner

U.S. Cl. X.R.

128—218; 141—348; 222—490