

[54] SYRINGE WITH MULTIPLE COMPARTMENTS

[72] Inventor: Robert F. Kapelowitz, 5652 132nd N.E., Seattle, Wash. 98005

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[51] Int. Cl.A61m 5/00

[58] Field of Search ..128/218 R, 218 M, 218 N, 218 P, 128/218 PA, 218 D, 220, 215

[56] References Cited

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Primary Examiner—Louis G. Mancene

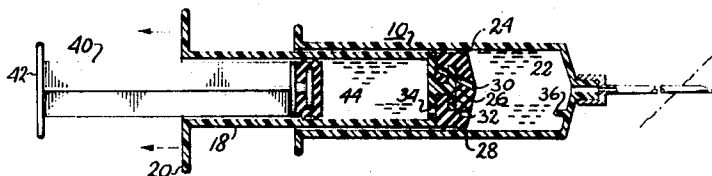
Assistant Examiner—D. L. Weinhold

Attorney—Pasqual J. Sferra and Nicolaas De Vogel

[57] ABSTRACT

A syringe with two or more telescoping compartments for collecting and/or administering fluids. The compartments are separated from one another by a valve which can be opened or closed upon slight rotation of a component acting as plunger and compartment or syringe barrel.

3 Claims, 8 Drawing Figures



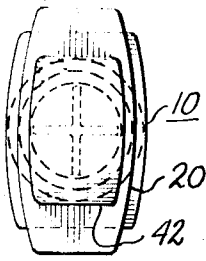


Fig. 2.

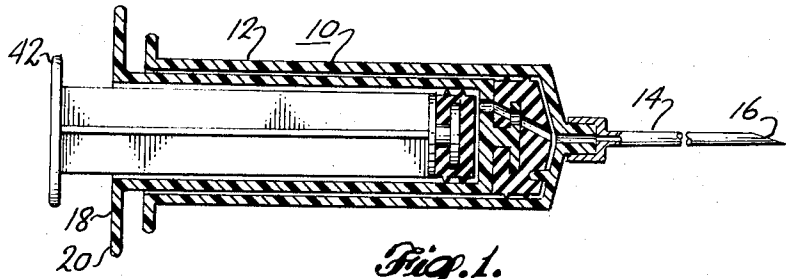


Fig. 1.

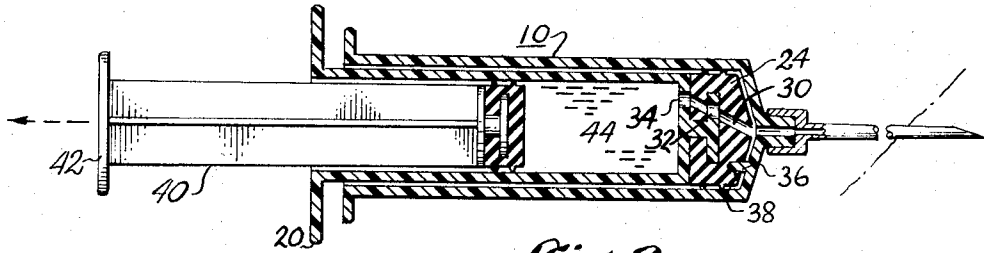


Fig. 3.

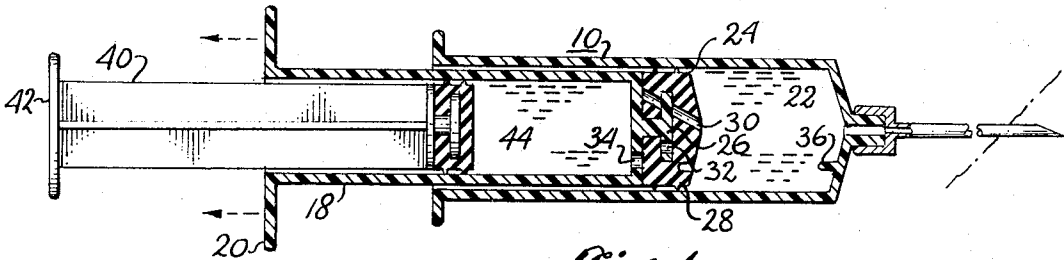


Fig. 4.

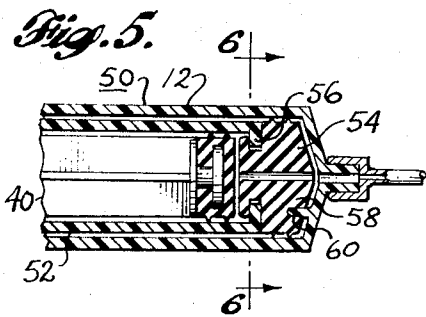


Fig. 5.

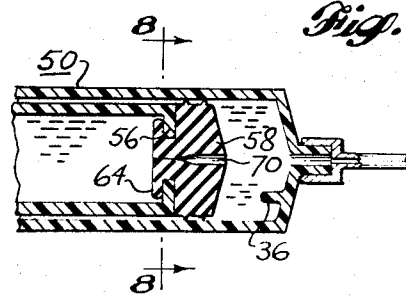


Fig. 7.

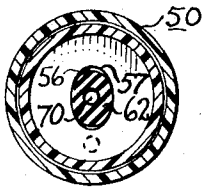


Fig. 6.

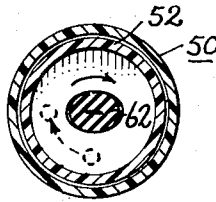


Fig. 8.

INVENTOR
ROBERT F. KAPELOWITZ

BY
Carroll J. Yerra
ATTORNEY

SYRINGE WITH MULTIPLE COMPARTMENTS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is generally related to syringes commonly used in the practice of medicine and more particularly to a syringe with two or more compartments for collecting and/or administering fluids.

2. Description of the Prior Art

There are a variety of patented syringes having two or more compartments. However, none of these devices has received wide acceptance by the medical profession. The reasons become obvious after one conducts a thorough study of the prior art. It becomes also obvious that the present invention will become an important item in the medical field, not only because of the economical manufacturing possibility and its simplicity of operation, but most of all for its versatility. This syringe can be and will be used by the medical profession for many different applications relating to multiple administration or collection of fluids with but a single injection. The above statements will become clear and understood by comparison with the prior art.

For instance, the U.S. Pat. Nos. 2,869,543 and 2,869,544 by K. A. Ratcliff et al. disclose two-compartment syringes which are specifically designed for injections only and wherein the two compartments are separated by an orifice with a cap. The one compartment is filled with a fluid and the second compartment with a powder and mixing of the powder and the fluid will occur during the injection procedure at which time the compartments become interconnected through removal of the cap. This syringe has thus a very limited use and its configuration does not lend itself to widespread applications. Another referenced patent in the prior art is U.S. Pat. No. 2,939,459 by J. A. Lazarte et al. which discloses a "tandem syringe." This device is specifically designed for the injection of two fluids in consecutive order. The general operation is as follows: after the fluid from the first compartment is released, the second compartment is opened by the breaking of a seal. It will be obvious that the cumbersome replacement of seals as well as the impossibility of collecting two separate fluid samples rapidly from a patient is a disadvantage and limits its use. There are more syringes having two or more compartments; however, they are not as pertinent as the ones described above and their applicability, construction and operation are more specific, complicated and cumbersome.

In summary, it can be stated that a study of the prior art reveals a variety of double compartment syringes which are used for mixing incompatible medicaments during injection or administering procedures or for the injection of two separately held solutions consecutively without disengagement of the hypodermic needle from the injected subject. In addition, it was found that each of the conventional specific type of syringes was used for the treatment of specific and most often rare diseases.

A syringe having two compartments, which compartments can be interconnected by a simple rotationally operating valve, and which can be used for injections as well as collections, is not available to the medical profession and, as will be shown, is very much needed.

The specific impetus for the development of this invention came from the desire and frequent need to

simply, quickly and efficiently collect from patients separate samples of whole blood and blood to which an anticoagulant is to be added. Such samples are frequently needed for routine laboratory determinations and with devices presently in use, the collection of such samples requires several pieces of equipment, a few more steps or procedures and more time than would be required when using the present invention.

After studying the existent variety of special purpose syringes, it became obvious that not just another special syringe was needed for obtaining blood samples, but that a syringe was needed that could do all of the special applications, in a simpler embodiment, at a less expensive price. Thus, the present invention is not only designed and destined for the above blood sampling use; on the contrary, its versatility will permit frequent use in many laboratory, clinical and ward procedures.

The novel syringe can be used for any single injection or collection of fluids, or for the administering of incompatible medicaments to be mixed in the syringe prior or during injection, or for the collection and injection of a fluid with the same needle insertion, or for the collection and/or administering of two different fluids consecutively without disengagement of the needle from the syringe or from the subject.

It is quite evident that the medical profession has been waiting for a daily-use syringe device which is easy to operate, simple in disengagement of parts, inexpensive and good for most all uses and offering multiple capabilities. The present invention will find a large acceptance and will become a must in the medical profession.

Therefore, it is an object of the present invention to provide for a syringe having at least two separate compartments which can be manually interconnected and vice versa, independent of the main plunger position.

It is another object of the present invention to provide for a syringe which allows collection of a first fluid in one compartment and release of a second fluid from another compartment during the same application.

It is a specific object of the present invention to provide for a double compartment syringe which has a versatility permitting use in most medical situations and wherein the syringe is further provided with a novel and simple-to-operate valve means for opening each compartment for interconnecting purposes or for closing and opening each compartment consecutively during use.

It is an additional object of the present invention to provide for a syringe having two compartments connected via a valve means which can be economically manufactured in mass production of uniform quality from materials which can withstand sterilization and average abuse.

Other objects and advantages of the present invention reside in the details of the construction and the correlation of the various parts and will become apparent in the following description taken together with the accompanying illustrations.

IN THE DRAWINGS

FIG. 1 is a cross-sectional view of a syringe representing the first preferred embodiment. The two-compartment syringe is in its compact position.

FIG. 2 is a view taken from FIG. 1 along line 2—2.

FIG. 3 is a cross-sectional view of the syringe shown in FIG. 1 wherein the main plunger-piston is pulled in an extended position so that a first compartment is formed.

FIG. 4 is a cross-sectional view of the same syringe shown in FIG. 3 wherein the inner cylindrical barrel is in an extended position so that a second compartment is formed which is separate from the first by the closing of the valve means as shown in between the two compartments.

FIG. 5 is a partial cross-sectional view of the second preferred embodiment of the two-compartment syringe wherein the syringe is in a compact position with open valve.

FIG. 6 is a view taken from FIG. 5 along line 6—6.

FIG. 7 is a partial cross-sectional view of the syringe shown in FIG. 5 with the main plunger and the inner cylindrical barrel in an extended position similar to the position of the first preferred embodiment syringe shown in FIG. 4.

FIG. 8 is a view taken from FIG. 7 along line 8—8.

DESCRIPTION AND OPERATION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

The double compartment syringe 10 which is illustrated in the FIGS. 1 through 4 comprises an outer cylinder barrel 12 with a conventional tapered end portion for the securement of a hypodermic needle 14. The needle 14 communicates with the interior of the syringe 10 by means of a bore 16.

An inner cylinder barrel 18 provided with a pulling knob 20 is slideably positioned within the outer cylinder barrel 12. The inner cylinder barrel 18 has three distinct functions: it acts as a cylinder barrel for containing or storing purposes, acts as a plunger for collecting or disposing matter from another compartment and acts as a handle for operating a valve.

As shown in FIG. 4, the pulling operation of the inner cylinder barrel 18 indicated by the arrows caused the existence of the compartment 22. Of course, the volume of the compartment 22 can be regulated by pulling the inner cylinder barrel 18 more or less distance from the needle 14 location.

The inner cylinder 18 is provided with a valve arrangement or valve means 24 which includes the integral bottom portion of the inner cylinder barrel 18 shaped as a round flange 26 and a thereon slideably fitted seal member 28. The seal member 28 and the flange 26 are slideably and rotationally mounted with one another. A passageway 30 is provided in the seal member 28 and a first orifice 34 and a second orifice 32 are provided in the bottom of the inner cylinder barrel 18 and the flange 26, respectively. In addition, a plug or upheaval 36 is provided in the inside bottom area of the outer cylinder barrel 12 which corresponds with a recess 38 in the seal member 28 when the seal member 28 is in a position fitted against the inside bottom area of the barrel 12. As illustrated in FIG. 1 and FIG. 3 the first orifice 32, the passageway 30 and the second orifice 34 are in alignment with one another so that a fluid communication channel is established between the inside bottom area of barrel 12 and the inside bottom area of barrel 18.

The syringe 10 is further provided with a main plunger rod or piston 40 having a knob 42.

Assuming now that the double compartment syringe 10 is used for the collection of two blood samples as has been described earlier, the syringe 10 will be taken in the compact position as shown in FIG. 1 and as soon as the hypodermic needle 14 is inserted into a subject or patient the piston 40 is extended to a predetermined position by pulling of knob 42 until the desired volume of compartment 44 length is reached. Accordingly, blood will flow from the patient through the bore 16 of the hypodermic needle 14 and via the passageway 30 and orifices 32 and 34 enter the compartment 44.

When the desired quantity of blood is collected, the operator will turn the inner cylinder barrel knob 20 several degrees while holding the syringe 10 in place. This simple action will close the valve 24 because the flange 26 will rotate and the orifices 32 and 34 will thus become out of alignment with the passageway 30. The seal member 28 cannot rotate with the flange 26, since the plug 36 and recess 38 prevents such rotation so that opening or closing of the valve 24 is always definite.

It should be realized, of course, that the plug and recess 36 and 38 can be replaced by all kinds of constructions which simply prevent rotation of the seal member 28, for instance, a slightly contoured surface of the seal member 28, which would coincide with the inside area surface of the bottom of the barrel 12 in a complimenting arrangement would suffice as an anti-rotational means.

After the operator has turned the knob 20, the second sample of blood will be collected by extending the cylinder barrel 18 by pulling knob 20.

It will be obvious that the reversed procedure of operation applied to the double compartment syringe 10 will transform the syringe 10 for the use of administering two medicaments in consecutive order.

The operation procedures for the second preferred embodiment of the double compartment syringe 50 as illustrated in FIGS. 5 through 8 is exactly the same and thus the collecting of fluids or the administering of medicaments or both will be understood and thus an explanation of the operating procedures is deemed unnecessary.

The syringe 50 uses the same components as the syringe 10 with the exception of the inner barrel 18 and the valve arrangement 24.

The syringe 50 has an inner cylinder barrel 52 which is provided with a pulling knob (not shown). The barrel 52 is slideably positioned within the outer cylinder 12. The inner cylinder barrel 52 has also three functions which are anonymous to the functions of the inner cylinder barrel 18 of the syringe 10 as described above.

The inner cylinder barrel 52 is provided with a valve arrangement or valve means 54 which includes the integral bottom portion of the inner barrel 52 shaped as a flange 56.

The flange 56 forms an oval shaped opening 57 in the bottom of the inner cylinder barrel 52.

A seal member 58 having a surface which complements with the inside area of the bottom of the outer cylinder barrel 12 and a recess 60 which complements the extruded plug 36 for anti-rotation purposes of the seal member 58, is slideably and rotationally mounted on the flange 56. This mounting is accomplished by providing the seal member 58 with a stem portion 62 that has the same oval circumference as the oval hold 57 formed by the flange 56. A lip portion 64 next to the

stem 62 secures the seal member 58 in a movably connected relationship with the flange 56 or inner cylinder barrel 52. As further illustrated in FIGS. 5 and 6, the passageway 70 is made through the center of the seal member 58 and stem 62. For the operation of the valve means 54 it is a requirement that the integrally connected stem portion 62 of the sealing member 58 be made of a resilient material.

The operation of the valve means 54 for opening or closing of the passageway 70 is accomplished by not more than 90° of rotation applied to the inner cylinder barrel 52. As shown in FIG. 8 and taken in comparison with the view in FIG. 6, the major axis of the oval shaped hole formed by the flange moves coincident with the minor axis of the oval shaped stem 62 cross-sectional area.

Because the seal member 58 is of a resilient material, the stem portion will deform and be squeezed in such a way that the passageway 70 is flattened and closed for fluid communication.

Although various minor structural modifications might be suggested to the preferred embodiments herein described by way of demonstrative example only, it should be understood that many changes could be effected without departing from the spirit of the present invention, and, accordingly, it should be further understood that the inventor wished to enclose within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of the inventor's contributions to the art.

Now, therefore, I claim:

1. A syringe for administering medicaments and for collecting of fluids comprising:
 - a. an outer cylinder barrel,
 - b. a hypodermic needle secured at one end of said outer cylinder barrel,
 - c. an inner cylinder barrel telescopically and slideably disposed within said outer cylinder barrel,
 - d. a piston rod telescopically and slideably disposed within said inner cylinder barrel,
 - e. said inner cylinder barrel provided with a valve means,
 - f. said valve means comprising
 1. an inward bent flange being an integral part at said inner cylinder barrel end and forming an oval-shaped opening,
 2. a sealing member having a passageway therethrough and made of resilient material complementally disposed about said oval opening for rotation within said flange,
 3. said sealing member shaped to complement within said outer cylinder barrel end area adjacent said needle and having anti-rotational means coaxing with said outer cylinder inside area adjacent said needle, and
 - g. whereby, when said inner cylinder is positioned

against said outer cylinder inside area adjacent said needle, said anti-rotational means prevents rotation of said sealing member so that upon 90° rotation of said inner cylinder barrel said flange with oval opening will turn and misalign with said sealing member complementing resilient material so that said passageway is squeezed shut, thereby separating said inner barrel from said outer barrel volume.

2. A syringe for administering medicaments and for collecting of fluids comprising:

- a. an outer cylinder barrel,
- b. a hypodermic needle, having a bore, secured at one end of said outer cylinder barrel,
- c. an inner cylinder barrel telescopically and slideably disposed within said outer cylinder barrel,
- d. a piston rod telescopically and slideably disposed within said inner cylinder barrel,
- e. said inner cylinder barrel provided with a valve means having a passageway for communication of said inner cylinder barrel with said outer cylinder barrel inside bottom adjacent and in alignment with said needle bore,
- f. said valve means comprising a flange formed integrally from said inner cylinder barrel bottom portion and extending radially inwardly to and substantially perpendicularly with said syringe longitudinal axis and said flange having radially varying dimensions so that an oval opening is formed within,
- g. a seal member complementing about said flange within said oval opening in slideably secured fashion and provided with means for preventing rotation of said seal member when said seal member is located at said outer cylinder barrel inside bottom adjacent said bore,
- h. said flange adapted to actuate opening and closing of said passageway in said valve means within a 90° rotational movement of said inner cylinder barrel in reference with said outer cylinder barrel about said inner cylinder barrel longitudinal axis,

whereby said seal member resilient material is adapted to be compressed upon 90° rotation of said inner cylinder barrel when said seal member is in said rotation preventing location by said oval opening rotation of said flange so that said minor axis of said oval opening upon said 90° rotation one way coincides with said major axis of said complementing stationary resilient seal member so that said passageway within said valve means closes through displacement of said resilient material.

3. A syringe as claimed in claim 2 wherein said means for preventing rotation of said seal member comprises a nonsymmetric surface complementation, being a plug and recess means located at said seal member surface and said outer cylinder barrel inside bottom.

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