Sept. 2, 1969 B. SCHWARTZ 3,464,412

INTERMIXING SYRINGE

Filed June 12, 1967 2 Sheets-Sheet 1

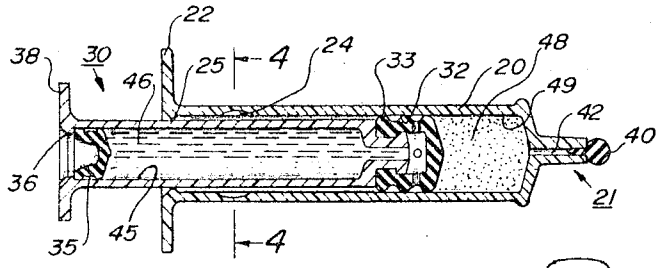

Fig-1.

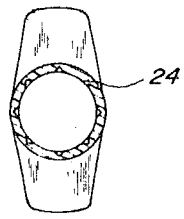

Fig-4.

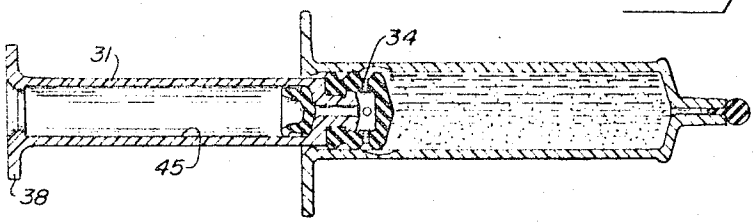

Fig-2.

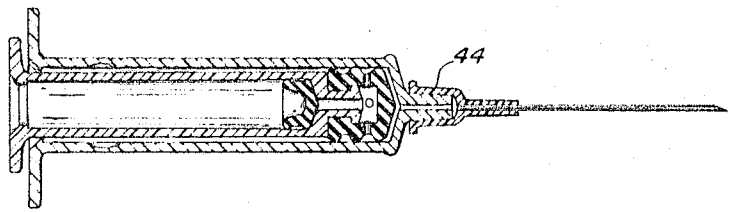

Fig-3.

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INTERMIXING SYRINGE

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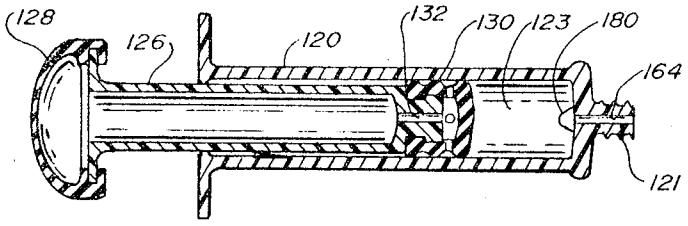

Fig - 6.

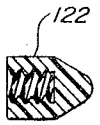

Fig - 7.

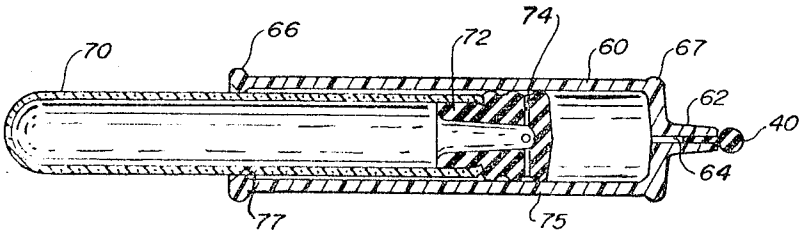

Fig - 5.

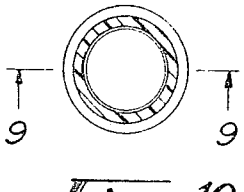

Fig - 10.

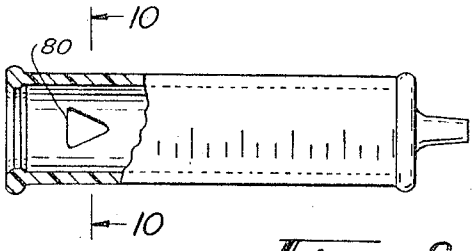

Fig - 8.

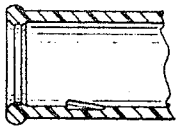

Fig - 9.

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3,464,412

INTERMIXING SYRINGE

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Filed June 12, 1967, Ser. No. 645,264
Int. Cl. A61m 5/00; A61j 1/00; B67d 5/42
U.S. Cl. 128—218 9 Claims

ABSTRACT OF THE DISCLOSURE

A syringe combination having an outer housing and a hollow plunger providing a pair of chambers of determined size. The plunger is provided with a piston having a plurality of spaced, ring-like sealing surfaces and with a fluid passageway from the interior of the plunger which is flow-connected to the outer piston surface and between ring-like sealing surfaces. The outer housing has one or more recesses of determined size formed in its inner surface with the recesses positioned near the open end of the housing and of a length so that the rearmost sealing surface of the plunger piston engages the housing between the recesses and the rear end of the housing when the flow-connection is brought into a fluid conducting position with the recess.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to the general class of surgery and more particularly to the subclass of syringes.

Description of the prior art

Syringes are well known in the general field of surgery and those for storing and intermixing various ingredients are represented in patents as to Pierick, U.S. Patent No. 3,279,654 of October 1966; to Brown, U.S. Patent No. 2,591,046 of April 1952, and to Camber, Great Britain No. 746,057 of January 1959. These and other patents use gravity to induce a flow from one chamber to another. This method of transfer is often uncertain and sometimes is incomplete or requires an exact manipulation by the user who may not have the required skill or training. The precise and exact mixing of the various components comprising some of the new medicants is an absolute necessity. Ease of mixing by any potential administrator of the medicant is necessary and desirable, and an easily manipulative device is an object of this invention.

The syringe of present invention provides a means for bringing the interior of the housing of the syringe into a condition of reduced pressure, whereupon as a flow-conducting portion of a piston of a hollow plunger is brought into a fluid passing or mixing position, the fluid which is preferably stored in the plunger is sucked from the plunger interior to flow to the housing chamber for a controlled mixing of the stored ingredients.

SUMMARY OF THE INVENTION

This invention provides a syringe-type apparatus having an outer housing of generally tubular construction which is formed with an open end and a closed end. This closed end has an aperture or passageway for the passage of medicants and the like which is usually to and through a needle. The plunger is slidable in the bore of the housing and is formed with a hollow interior and has one end provided with a piston having a fluid-flow passageway extending from between a pair of ring-type sealing surfaces and to the interior of the plunger. The inner surface of the barrel portion of the outer housing has formed therein at least one recess of a determined length, width and depth and adapted to provide a fluid passageway from the interior of the plunger to and around one of the

sealing rings and thence to the foreportion of the housing.

In one embodiment of this invention the syringe is arranged as an intermixing syringe in which one ingredient is stored in the foreportion of the housing and another and preferably fluid ingredient is stored in the hollow plunger portion. In a modification of the intermixing syringe, the outer plunger portion is provided with a resilient bulb end so that the after mixing of the ingredients the syringe may be used as a medicant dropper. In use, in either of the above embodiments, the foreportion of the housing is sealed so that as the plunger is moved outwardly the pressure in the housing foreportion is caused to be reduced.

The two ring-type sealing surfaces between which one end of the fluid-flow passageway is terminated are at the forward or inner end of the plunger. Extending rearwardly from the second ring surface is a piston portion preferably having at least one more ring or formed as a continuation of the second ring. This sealing surface rearwardly of the second ring is preferably of a length great enough so that as this sealing means is moved across the recess in the housing the fluid-flow portion of the piston is sealed from passing rearwardly of the sealing means and out of the housing. The arrangement of the sealing surfaces on the plunger piston is made of a length great enough so that when the innermost ring is brought into a fluid-flow condition with the recess in the housing the remaining sealing surfaces seal the housing bore so as to prevent flow of fluid or atmosphere to and from the open end of the housing to the plunger interior or to the foreportion of the housing.

In yet another embodiment of the invention the syringe is intended to be used as a vacuum container in which the hollow plunger portion is a test tube which may be furnished with small predetermined quantities of various blood treating fluids stored in the test tube. By manipulation, the test tube or plunger and the interior of the housing is caused to be brought into a condition of reduced pressure after which the plunger in the reduced pressure condition is moved to a storing position after which the interior of the housing is opened to the atmosphere to bring the interior of the housing to atmospheric pressure. At the time of use, the fore-end or closed end of the housing has a needle mounted on a hub portion.

The apparatus with the needle attached is used as a syringe to withdraw a blood sample from the patient and to secure and store a determined quantity of blood within the syringe. After the desired amount of blood is drawn into the housing, the syringe is manipulated to draw the blood into the test tube. When the transfer of the blood to the test tube is completed the needle is discarded and the test tube is moved fully into the housing for shipment to the laboratory. At the time the blood sample is to be tested, the housing and the piston are discarded and the test tube with the blood therein is tested or treated in the usual manner.

It is an object of this invention to provide an intermixing syringe assembly in which two or more medicants are isolated for storage and which at a determined time and by manipulative action are mixed immediately prior to the use thereof. The intermixing of the components is provided when the plunger is manipulated to move the plunger outwardly so that the housing is brought into a condition of reduced pressure after which the piston of the syringe is brought into a fluid-passing position so that the fluid stored in the plunger is caused to be sucked into the reduced pressure portion of the housing portion for agitated mixing.

It is a further object of this invention to provide an intermixing syringe wherein the medicants may be isolated for storage and which, at the time of mixing, the

ingredients may be brought into comingle relationship with each other and in which the exterior end portion of the plunger is provided with a resilient bulb member adapted to act with the syringe as a medicant dropper.

It is a further object of this invention to provide a syringe apparatus in which the plunger is a test tube having a piston portion on its open end and adapted to slide within a housing so that the test tube may be brought to a condition of reduced pressure. The closed end of the housing is adapted to mount a needle for the drawing of blood from a patient and after the drawing of a determined quantity of blood into the housing this blood is transferred by manipulation of the plunger into the test tube for storage and transport.

There has been outlined rather broadly the most important features of the various embodiments of the syringe apparatus of this invention in order that the present contribution to the art may be more fully appreciated. Those persons skilled in this art will appreciate that the concept on which the present disclosure is based may be utilized to provide the basis for other syringe devices similarly carrying out the purposes of this invention. The chosen embodiments of the apparatus are provided for the purposes of illustration and description of the principles of this invention and are shown in the accompanying drawings forming a part of the specification wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 represents a sectional view of an intermixing syringe in which the components to be mixed are shown as stored in two separated compartments or members of the syringe;

FIG. 2 represents the syringe of FIG. 1 with the components brought into mixing relationship within the housing member;

FIG. 3 represents the syringe of FIG. 1 and showing a needle attached to the housing and the syringe after the contents have been expelled therefrom;

FIG. 4 represents a sectional view taken on the line **4—4** of FIG. 1 and showing one embodiment of a fluid bypass recess as formed in the outer housing member;

FIG. 5 represents a sectional view through an alternate embodiment in which the hollow plunger is a test tube;

FIG. 6 represents a sectional view through yet another embodiment in which the plunger outer end is provided with a resilient bulb and the plunger and housing are adapted for mixing and for dispensing of a medicant in the manner of a dropper;

FIG. 7 represents a sectional view showing an end closure or cap for mounting on the discharge end of the housing of FIG. 6;

FIG. 8 represents a side view of an outer housing with a portion of the side wall broken away to show yet another form of a fluid bypass formed in the housing inner wall;

FIG. 9 shows a fragmentary and sectional side view of the fluid bypass of FIG. 8, the view taken on the line **9—9** of FIG. 10, and

FIG. 10 shows a sectional view of the housing as taken on the line **10—10** of FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now particularly to the drawings in which like numbers refer to like members throughout the various figures and in particular to the intermixing syringe shown in FIGS. 1 through 4, in which is shown an outer housing **20** of conventional configuration and including a reduced front end **21** sized so as to retain a needle on its outer tapered end. This housing has an open rear end with an outer flange portion **22** providing a shoulder or stop for the user's fingers. The interior diameter of this housing **20** is substantially round and constant with the exception of a portion near the rear in which is provided a fluid bypass in the form of outwardly extending scallops **24**. These scallops are particularly seen in FIGS. 1 and 4 and, as reduced to practice, are in the form of arcuate cuts approximately one-quarter of an inch long and with a depth and width of one-sixteenth of an inch at their maximum. At the rear end of the housing **20** it is to be noted that a small internal lip **25** is formed in order to provide a limit means or stop for the outward movement of a plunger member **30**.

Referring now to the movable plunger member generally identified as **30**, it is to be noted that a generally tubular portion **31** has a reduced front end upon which is fitted a piston plunger preferably of rubber and identified as **32**. This piston plunger, in the preferred instance, is formed with three outwardly extending like-sized resilient ring-like portions **33**. Between the front first and second ring-like portions **33** there is formed a fluid passageway **34** extending from the inner portion of the plunger to and through the outer peripheral surface of the piston.

At the open or rearward end of the plunger **30** (as seen in FIG. 1) there is carried a movable piston **35** slidable within the interior diameter of the barrel **31**. This piston is sized to provide a fluid tight slip fit and, in the present instance, is formed with two outwardly extending ring portions adapted to provide a fluid sealing means as well as sliding surfaces. At the rear end of the tubular portion **31**, it is to be noted that there is a small internal shoulder or lip **36** provided to prevent or limit the unwanted outer movement of the piston **35**.

It is also to be noted that the rear end of the plunger **30** is provided with a small grasping flange **38** for the easy gripping thereof by the fingers of the operator. Still referring to FIG. 1, it is to be noted that the reduced end of the outer housing **20** is provided with a vacuum or fluid seal in the form of a rubber or plastic plug **40** which is adapted to enter into a passageway **42** and seal this passageway both from the unwanted loss or entry of or plugging by powder and also to prevent the flow of air in and out of this passageway.

Referring next to FIG. 3, it is to be noted that a needle **44** is shown as mounted on the front end of the outer housing **20** after the plug **40** has been removed. This needle is of standard and conventional construction. After mounting on the syringe the insertion of this needle into the flesh or vein of the patient is in the manner of conventional practice.

OPERATION OF THE INTERMIX SYRINGE

Within the interior **45** of the plunger **30**, a determined amount of fluid **46** is stored in isolated condition and in that portion of the outer housing **20** which is forwardly of the piston **32**, there is stored in isolated condition a powder portion **48**. This powder is of a determined quantity and is stored without loss in isolation and is prevented from entering and packing in the fluid passageway **42** by means of the plug **40**. In use, the interior forepart of the outer housing **20** identified as **49** is filled with the powder **48** of a determined quantity and consistency.

After the powder is placed in the housing, the plunger-**30** is then inserted a determined distance into the housing as in FIG. 1. The sealing ring portions **33** of the piston **32** after they are forwardly or inwardly of the fluid bypass **24** are sized to be in fluid tight relationship to the inner surface of the barrel **20** so that the fluid **46** which is then fed into the interior **45** of the plunger **30** for storage therein is sealed by means of the rings **33** and, as assembled in FIG. 1, is in condition for premix storage. This syringe with the isolated fluid and powder may be shipped and stored for such period of time as is necessary and so that those medicants having ingredients which are mixed just prior to use may be fully mixed at that time.

To mix the fluid and powder, the plunger **30** is slowly pulled towards the rear of the housing **20** so that the rearward first and second rings **33** of the piston **32** pass

by the fluid bypass 24. It is to be noted that as they pass by this bypass portion that two of the three rings 33 are spaced so as to always be in a housing sealing position. As the plunger 30 is drawn backwardly, the interior volume of air in the housing is caused to expand, so that a reduced pressure is developed within the interior of the housing 20. As the midring 33 of the piston is brought behind the fluid bypass 24, the front ring 33 of the piston is spaced to engage or come in the way of the fluid bypass so that the interior passageway 34 of the piston is in flow communication with the housing interior. The reduced pressure in the housing causes the fluid to flow from the plunger passageway 34 and into the forward interior of the housing 20. This is done rapidly by means of the differential of pressure.

In order to provide means for the fluid to rapidly flow into the powder chamber without exposing the fluid in the plunger to atmospheric pressure or to possible contamination, the freely movable piston 35 is permitted to slide forward in the barrel of the plunger 30. This piston is drawn forwardly to replace the fluid as the fluid is drawn into the housing by the negative pressure induced within the outer housing.

The entire amount of fluid may be transferred rapidly in a very short time to instantly mix the powder and the fluid. Once the two components have been brought into a mingled relationship, the sealing plug 40 is withdrawn and the needle 44 is mounted upon the reduced front end 21 of the tapered shank portion of the outer housing. The syringe now becomes, in effect a conventional syringe with the mixed ingredients in the housing ready for injection in the customary manner. The plunger is manipulated in the conventional manner to expel any air residual in the barrel and to advance the fluid to the tip of the needle prior to the insertion of the needle into the patient after which the entire intermix contents may be injected into the patient.

When it is desired to cause the fluid to transfer from the plunger to the housing at a less than rapid rate, the plunger is manipulated so that a determined amount of recess is brought in the way of the front sealing ring. The more area of the recess exposed to the sealing surface of the front seal the more rapid is the rate of transfer. As reduced to practice, the rate of transfer of fluid has been a slow flow at the rate of a mist to a maximum flow of a jet stream.

DESCRIPTION OF OTHER EMBODIMENTS

Referring now to FIG. 5 and a syringe in which the plunger is a test tube and in which an outer housing 60 is similar to the housing 20 above-described, this housing 60 is formed with a closed and reduced front end 62 sized to receive and retain a needle, not shown, but which may be the needle 44 (FIG. 3) above-described. Within the front end of this housing is shown a plug 40 as previously described which plug seals a passageway 64 within the housing 60. The rear end of the housing is open and has a small internally formed lip 77 providing a stop means in the manner of lip 25 above. The outer portion of the housing 60 is formed with ribs 66 and 67 which provide means for easy grasping and retaining of the housing in the hands of the user.

Within this housing there is a plunger member which, in this embodiment, includes a glass test tube 70 whose open end is closed by a rubber stopper and piston combination 72. The rear or left end portion of the stopper-piston is sized to close and seal the open end of the test tube 70 while the foreportion of the piston is formed with three fluid-sealing ring portions preferably substantially equally spaced. A fluid passageway 74 is provided between the first and second rings 75 reading from the right to the left as seen in the FIG. 5 and a third ring adjacent the test tube provides an extended sealing means. The fluid passageway extends from the interior of the test tube to the outer surface between the first and second sealing rings.

In use, the test tube 70 may have stored within it one or more fluids or other materials used for making blood determinations. Among such materials are potassium oxalate; sodium heparin; lithium oxalate; sodium oxalate; potassium oxalate and sodium fluoride; ammonium oxalate or mixtures of the above, and mineral oil may be used for other determinations. The quantities and selection of material that may be combined within the test tube 70 is merely a suggestion of the various anticoagulants or other materials used for determining blood tests. These materials are now customarily provided in measured quantities in test tubes so as to be combined with blood at the time of taking of the blood sample specimens. The test tube, of course, in many tests is sterilized in the customary manner and has nothing in it and may be used for other tests. The storing of anticoagulants, etc., in a test tube for use in certain test determinations is not to be implied as novel but is illustrative of one use for this embodiment.

OPERATION OF THE TEST TUBE SYRINGE

It is contemplated that the syringe apparatus of FIG. 5 will be shipped assembled for use and with the stopper-piston portion 72 moved to the forward part of the outer housing 60 and with the plug 40 in an air sealing relationship with the passageway 64. Whether the test tube 70 also contains anticoagulants and the like or not is merely a matter of selection as determined by the intended use of the syringe. Prior to the use of this assembly as a syringe the test tube is grasped and moved leftwardly until piston 72 approaches the rear of the housing and the passageway 74 is brought in the way of a fluid bypass in the housing. As the piston moves leftwardly the air in the housing expands so that reduced pressure is developed in the forepart of the outer housing 60. As the front ring 75 of the piston comes in the way of the fluid bypass, the reduced pressure in the housing is allowed to communicate itself to the test tube 70 to provide a determined vacuum or reduced pressure in the test tube. The test tube is then pushed forward or rightwardly into the closed position, whence, as the front sealing ring is moved forwardly of the bypass, the vacuum within the test tube 70 is maintained. The test tube is advanced forwardly into the forward end of the housing after which the plug 40 is removed and a needle is mounted on the reduced front end 62.

The needle may then be inserted into a vein and, in the manner of a syringe and with the test tube acting as the plunger, it is pulled rearwardly so that the piston 72 acts in a usual manner to draw blood from the vein. After the desired amount of blood is drawn within the outer housing 60 the plunger is stopped and the needle is withdrawn from the vein. The plunger then may be moved to provide an exact determination of the amount of blood within the forward portion of the housing 60, as for example, by expelling a small amount of blood through the needle. After the quantity of blood is provided in the housing portion, the test tube is pulled rearwardly until the passageway 74 of the plunger is brought in the way of the fluid bypass, whereupon the reduced pressure in the test tube causes the blood to be drawn from the housing 60 and into the test tube 70.

After the transfer of blood from the housing to the test tube is completed, the piston portion and test tube is pushed forwardly within the container housing 60 and in this condition the test tube with the outer housing 60 acting as a shield may be transferred to the laboratory for the determination of the blood test. At the laboratory, with the housing passageway 64 open, the test tube is drawn to the back end of the housing 60. The piston is moved past a lip 77 of the rear of the housing and is removed therefrom with the housing 60 being discarded.

The stopper and piston portion **72** is drawn from the test tube opening and discarded after which the material in the test tube is tested in the usual manner. The test tube is preferably of conventional fire-resistant glass and after the test may be discarded.

It is to be noted in FIGS. 8, 9 and 10, that a preferred fluid bypass as formed in the outer housing is a triangular shape recess which is embossed in only one portion of the interior surface of the housing. The housing may be the housing **60** of FIG. 5 with this embossure extending about one-quarter of an inch along the axis of the barrel and at its base at the rear of the housing being approximately one-quarter of an inch wide. The recess is preferably about ten or fifteen thousandths of an inch below the normal housing bore and generally throughout the triangular shape as shown. This fluid bypass provides the passage area generally necessary for the blood to be transferred from the housing to the interior of the test tube.

This triangular shape also provides a variable passageway whereby if the transfer to the test tube is to be very slow, the exposure of the forward ring to the triangular portion is made at the apex or forward end which is very small. When the piston is drawn further back its forward sealing ring portion is in the way of a larger portion of the bypass **80** and the blood or fluid will flow in a more rapid manner.

DESCRIPTION OF DROPPER-TYPE SYRINGE

Referring finally to FIGS. 6 and 7, there is illustrated a modification of the syringe of FIG. 1 wherein the forward portion of a housing **120** is provided with a male screw thread **121** instead of a needle receiving shank or taper. A screw cap **122** having a female thread portion is sized to engage and be advanced on the threaded end of the housing to seal the housing. In this arrangement the plug **40** is dispensed with or discarded, powder may be stored within the forepart **123** of the housing and fluid may be stored in a plunger portion **126** of the apparatus. It is to be noted that the rear of the plunger **126** is provided with a resilient bulb or diaphragm-type member **128** which is adapted to provide a means for pushing the fluid in drops from a discharge passageway **164** of the housing **120**.

OPERATION OF THE DROPPER-TYPE SYRINGE

In the manner as described in connection with the syringe of FIG. 1, the plunger **126** is pulled backwardly to allow the fluid within the plunger to be drawn forwardly through the bypass and into the reduced pressure portion of the fore-housing which contains the powder. After the mixing is accomplished, the mixed material is moved into the interior of the plunger portion. This is accomplished by causing a reduced pressure to be induced once again in the plunger by causing a piston **130** to be drawn back to bring the piston into a flow passing position with a recess and to permit the equalizing of pressure within the two members. After the piston is in the rearward position the screw cap is loosened to allow atmosphere to pass into the housing and, with the syringe pointed upward, the mixed material flows through the bypass into the plunger.

In certain applications it may be desirable to provide an additional bypass at the extreme forward portion of the housing so that the plunger, after being pushed all the way forward, will be in a flow communication with this additional forward bypass **180** to permit a fluid flow from the plunger. To discharge a drop of mixture the resilient diaphragm member **122** is pushed inwardly to cause a determined drop to flow through the passageway **132** of the piston **130** and into the bypass and then be discharged from the front passageway **164** in a manner of an eye dropper. With cap **122** in sealing engagement the mixed portion in the syringe may be carried around as a sealed eye dropper without the mixed material being accidentally expelled therefrom. When the screw cap is not in place, fluid flow sealing may be provided by pulling the plunger back sufficiently to bring all of the outwardly extending rings of the piston **130** into sliding and sealing relationship with the outer barrel portion.

In the above-described embodiments, it is to be noted that the piston is formed with its sealing surfaces arranged so that as the piston is brought in the way of a bypass the fluid within the interior of the plunger is sealed from flowing out the rear or open end of the housing as the piston is moved over the bypass. Transfer of fluid from the hollow plunger to the foreportion of the housing occurs only when the fluid passageway adjacent the front sealing ring is brought into alignment with some portion of the bypass. The piston may be formed as a constant diameter portion for the extent which is shown as between the two rear sealing rings. This portion may also be a series of rings. This rear sealing portion provides means for preventing contamination and loss of fluid rearwardly from the housing and for this reason the rear sealing portion of the piston is formed of a length sufficient to cause sealing of the housing rearwardly when the piston fluid passageway is brought in the way of any of the bypass recesses.

It is also of note that the recess is preferably spaced in the housing so that as the rear of the piston engages the retaining lip of the housing, which lip provides an outward stop for the plunger, a maximum or near maximum fluid flow relationship is provided between the piston and bypass.

Terms such as "left," "right," "in," "out," "fore," "rear" and the like are applicable to the embodiments as shown and described in conjunction with the drawings. These terms are merely for the purpose of description and do not necessarily apply to the various syringe embodiments shown and described and the manner in which they may be constructed or used.

The conception of the remote control signal system and its many applications is not limited to the specific embodiment shown but departures therefrom may be made within the scope of the accompanying claims and without sacrificing its chief advantages and protection is sought to the broadest extent the prior art allows.

What is claimed is:

1. An intermixing syringe for the isolated storage of at least two medicant portions and the like, the syringe including an outer housing having an open rear end and a partially closed front end with a passageway therethrough, and a hollow plunger having a piston portion slidable in the bore of the housing and in its hollow portion providing for the isolated storage of at least one of the portions, the syringe including means whereby at least one of the medicant portions may be selectively transferred from one of the storage positions to another storage position for the mixing of the portions, the syringe having means for bringing one of the storage portions into a condition of reduced pressure, the syringe comprising: (a) an outer housing of generally tubular configuration and having an inner bore of a generally constant cross-section and with at least one by-pass recess formed in the inner bore, the recess of a determined width, length and depth and positioned at a determined distance from an open rear end of the housing, the housing having a front partially-closed other end and a passageway therethrough; (b) means for closing the passageway of the partially closed front end of the housing so as to prevent the passage of air, fluids and the like; (c) a plunger having a main portion of generally tubular configuration and sized to easily move axially in the bore of outer housing without the sealing of the bore of the housing; (d) means providing for the closing of the rear end of the plunger and the hollow portion thereof to the passage of air, fluid and the like wherein said means is a movable piston slideable within and throughout the interior bore of the plunger and providing therewith a

fluid-tight sealing means, and (e) a resilient piston adapted for mounting in and closing the front end of the plunger, said piston formed with a plurality of ring-like sealing surfaces sized so as to be slidable in the bore of the housing while engaging said bore in a fluid-flow sealing manner, the piston having at least one flow passageway formed therein with one end of the passageway opening to the interior of the plunger and the other end terminating at the piston surface and between adjacent ring-like sealing surfaces, said sealing surfaces disposed and of an extent so that as the flow passageway terminating between the ring-like surfaces of the piston is brought in the way of the bypass recess so as to permit fluid flow from the plunger through the housing bypass said sealing surfaces of the piston that are beyond the flow passageway and adjacent the plunger main portion are disposed toward the housing open end to seal the housing and plunger from any unwanted flow of air, fluid and the like from the open end of the housing.

2. An intermixing syringe as in claim 1 in which the piston is made of a length so the axial extent of those rearwardly disposed sealing surfaces provided between the terminating flow passageway formed between ring-like sealing surfaces and the plunger main portion is at least slightly greater than the axial length of the bypass recess.

3. An intermixing syringe as in claim 2 in which the rearwardly disposed sealing surfaces include at least two outwardly extending ring-like sealing surfaces normally disposed to the axis of the piston.

4. An intermixing syringe as in claim 2 in which the adjacent ring-like sealing surfaces of the piston between which the flow passageway terminates are the forward pair of ring-like sealing surfaces of the piston.

5. An intermixing syringe as in claim 1 in which the means for closing the passageway in the housing front end is a resilient plug of plastic, rubber and the like, the plug having a shank portion sized for removable insertion into and closing of said passageway, and the front end of the housing formed with a hub portion adapted to receive and retain a needle.

6. An intermixing syringe as in claim 5 in which the housing bore at its open end is formed with a small internal lip providing a stop shoulder adapted to engage the rearward ring-like sealing surface of the piston to position the piston axially in the housing bore so as to bring the flow passageway of the piston into a flow conducting relationship with the bypass recess in the housing, and with a small internal lip formed in the plunger bore at its outer end providing a stop for limiting the outer movement of the movable piston in the plunger bore.

7. An intermixing syringe as in claim 3 in which the bypass recess is a plurality of arcuate cuts formed in the bore of the housing.

8. An intermixing syringe as in claim 3 in which the bypass recess is a triangular shaped recess formed in the housing bore and with the base of the triangular shape substantially parallel to the plane of the open rear end of housing.

9. An intermixing syringe as in claim 8 in which the housing bore at its open rear end is provided with a small internal lip providing a stop shoulder adapted to engage the rearward ring-like sealing surface of the piston to position the piston axially in the housing bore so as to bring the flow passageway of the piston into flow conducting relationship with the bypass recess in the housing.

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