

[54] **DOUBLE CYLINDER LAVAGE SYRINGE**

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[57]

ABSTRACT

A syringe for stomach lavage is described having dual cylinders and pistons with a common handle for operating the pistons. A check valve system causes discharge from one cylinder for injection purposes and from the other cylinder for discharge purposes when the pistons are moved simultaneously inward, and allows filling of the one cylinder for injection purposes and filling of the other cylinder for discharge purposes when the pistons are simultaneously withdrawn.

6 Claims, 2 Drawing Figures

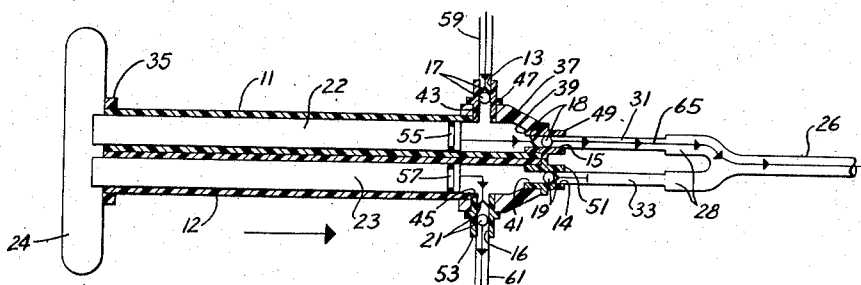


Fig. 1

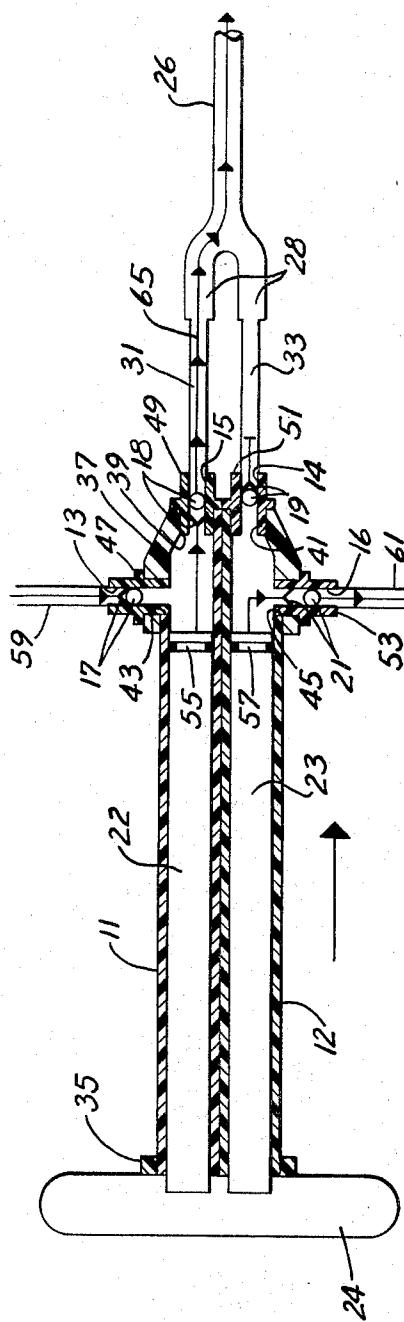
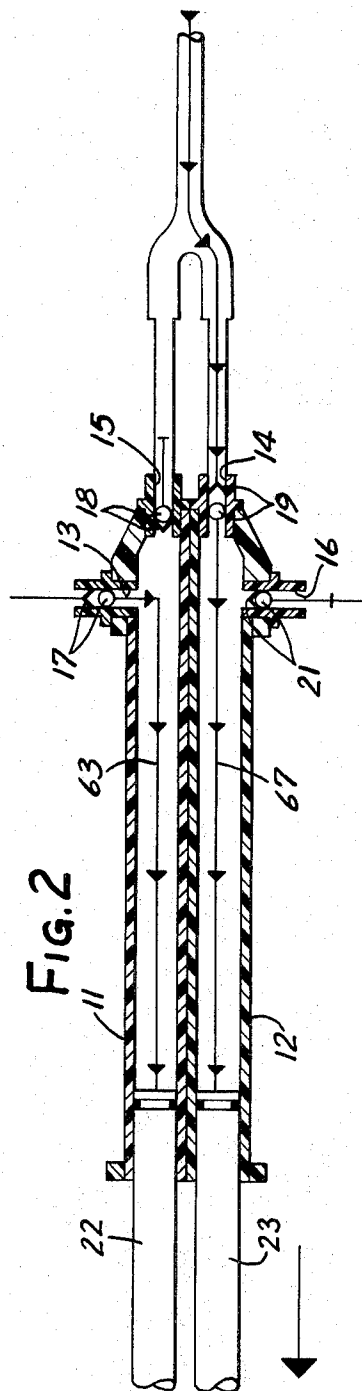


Fig. 2



DOUBLE CYLINDER LAVAGE SYRINGE

This invention relates generally to syringes and, more particularly, to an improved syringe suitable for internal lavage such as in performing fluid lavage of the stomach.

Certain medical conditions are treated by lavage of an internal member such as the stomach by the use of fluids. For example, in the treatment of upper gastrointestinal bleeding, ice water lavage is typically used.

In the treatment of upper gastrointestinal bleeding by ice water lavage, prior art techniques have involved the insertion of a nasogastric tube into the stomach. A standard 50cc syringe or 100cc bulb syringe containing the ice water is adapted to the nasogastric tube and the water is introduced. This, of course, necessitates the constant attaching and detaching of several syringes to and from the tube or the constant filling and emptying of the bulb syringe. Often, this means that the pumping action and therefore the flow of fluids into and out of the stomach must be interrupted. Moreover, in the time that it takes to rotate or refill a syringe, the normal homeostatic mechanisms of the body may partially warm the water previously introduced into the stomach. All of these factors may contribute to a lengthening of the time in which it takes to control the hemorrhage.

In addition, the person performing the lavage over an extended period of time, e.g. several hours, is discomforted by constantly inserting his hands into the ice water during filling of the bulb syringe and by the repetitive squeezing operations to fill and to discharge the ice water. Although there have been mechanical devices proposed in prior art patents for lavage, these devices for one reason or another have not been adopted on any widescale commercial basis. Thus, a more efficient stomach lavage syringe to eliminate the discomfort of the physician is still needed.

Other applications of internal lavage may include the treatment of accidental or intended overdose of potentially lethal medications, particularly in the case of patients in a semicomatose or fully comatose state. Also, where intentionally induced vomiting is contraindicated, internal lavage may be preferable.

It is an object of the present invention to provide an improved syringe for internal lavage.

Another object of the invention is to provide a syringe for internal lavage which may be operated to both introduce and withdraw fluid without the necessity of detaching the syringe from an inserted tube.

It is another object of the invention to provide a syringe for internal lavage which provides operation superior to prior art devices.

Other objects of the invention will become apparent to those skilled in the art from the following description, taken in connection with the accompanying drawings wherein:

FIG. 1 is a full section view of a syringe constructed in accordance with the invention; and

FIG. 2 is a full section view of the syringe of FIG. 1, with part broken away, in a different operating condition.

Very generally, the syringe of the invention comprises an injection cylinder 11 and a discharge cylinder 12. Each cylinder has an inlet 13 and 14, respectively, and each cylinder has an outlet 15 and 16, respectively. Each of the inlets and outlets has a check valve 17, 18, 19 and 21 therein. These check valves may be ball

valves as illustrated somewhat diagrammatically. An injection piston 22 is provided in the injection cylinder 11, and a discharge piston 23 is provided in the discharge cylinder 12. The pistons each have an inward stroke wherein the respective check valves 17 and 19 are closed and the respective check valves 18 and 21 are open, and each piston has an outward stroke wherein the respective check valves 18 and 21 are closed and the respective check valves 17 and 19 are open. Handle means 24 are provided for manually operating the pistons simultaneously.

Referring now more particularly to the drawings, the syringe of the invention is shown used in connection with a nasogastric tube 26 inserted into the stomach of a patient for the purpose of treating upper gastrointestinal bleeding by ice water lavage. The tube 26 has a forked end 28, from each branch of which projects a respective reduced diameter connector portions 31, 33. As will be explained, ice water is injected through the connector portion 31 and through the tube 26 into the stomach of the patient. On the alternate stroke of the syringe, explained below, ice water, blood and other discharge products pass up the tube 26 from the stomach and through the connector portion 33. The respective injection and discharge flows are indicated by the arrows in FIGS. 1 and 2, respectively. The injection and discharge flows occur automatically without the necessity for the physician to continually insert his hands into the cold ice water as with prior art syringes and without the accompanying hand fatigue caused by the repetitive squeezing operations, i.e., first squeezing for filling the tube with ice water, secondly squeezing the tube to discharge the ice water into the stomach, thirdly squeezing the bulb to discharge the stomach discharge liquid. The illustrated tube 26 has but a single passageway but it may be provided with two separate discrete passageways with one connected to the cylinder 11 and the other connected to the cylinder 12. The tube 26 is soft, flexible and is adapted to be swallowed or otherwise inserted through the throat into the stomach. Rather than the tube forked section 28 and connectors 31 and 33, suitable passages could be provided internally of the syringe itself so that only a single tube connector need be utilized.

The syringe itself comprises two tubular cylinders 11 and 12 which are secured in parallel relationship with each other in any suitable fashion. A flange 35 is provided at one end of the tube, and at the other end the tubes terminate in a housing 37. The housing, with the walls of the tubes 11 and 12, defines openings 39 and 41 at the end of the housing towards the tube 26, and also defines openings 43 and 45 which are aligned with each other on opposite sides of the housing on an axis which extends transversely to the axes of the tubular cylinders 11 and 12. An orifice fitting 47 is provided in the opening 43 to define the inlet 13. An orifice fitting 49 is provided in the opening 39 defining the outlet 15. An orifice fitting 51 is provided in the opening 41 defining the inlet 14, and an orifice fitting 53 is provided in the opening 45 defining the outlet 16. The cylinder 11 defines the injection cylinder with the inlet 13 and the outlet 15 communicating therewith. Similarly, the cylinder 12 defines the discharge cylinder with the inlet 14 and the outlet 16 communicating therewith.

In order that the inlet 13 can operate only as an inlet, the check valve 17 is mounted therein in such a manner that fluid flow can take place only into the cylinder 11

through the inlet 13. The outlet 15 contains the check valve 18 oriented such that only fluid flow can take place through the outlet 15 out of the cylinder 11. The check valve 19 is placed in the inlet 14 and oriented such that fluid flow can take place only through the inlet 14 into the cylinder 12. The check valve 21 is placed in the outlet 16 such that fluid flow can take place from the cylinder 12 only out through the outlet 16. The check valves are operated by pressure such that when the pressure on the downstream side of the check valve exceeds the pressure on the upstream side, the valve will close and prohibit flow therethrough.

The piston 22 is provided in the cylinder 11 and is shown as a rod-like structure having an annular seal 55 at one end such that movement of the piston axially in the cylinder 11 either enlarges or diminishes the internal volume of the cylinder. Similarly, the piston 23 is a rod-like structure contained within the cylinder 12 and provided with an annular seal 57 at one end. Axial movement of the piston 23 within the cylinder 12 serves to either enlarge or decrease the internal volume of the cylinder 12. Both the piston 22 and the piston 23 are arranged parallel with each other within the respective cylinders 11 and 12 and are operable simultaneously by a handle 24 which is connected to the ends of the pistons at the ends thereof opposite the annular seals 55 and 57.

In operating the syringe of the invention, the inlet 13 is connected through a suitable tube 59 to a source of ice water, not shown. The outlet 15 is connected to the connector portion 31 of the tube 26, and the inlet 14 is connected to the connector portion 33 of the tube 26. The outlet 16 is connected through a suitable tube 61 to a discharge reservoir, not shown. The tube 26 may be a portion of the lavage syringe apparatus or it may be a separate tube adapted to be connected to lavage syringe apparatus at the time of insertion through the throat into the stomach.

In beginning operation, the handle 24 is operated to withdraw both of the pistons 22 and 23 to the position shown in FIG. 2. This serves to fill the interior of the cylinder 11 with ice water flowing through the inlet 13 as indicated by the arrows 63. The handle is then moved to force the pistons 22 and 23 inwardly, causing the valve 17 to close and the valve 18 to open. This forces the ice water from the cylinder 11 through the outlet 15 and into the tube 26 as shown by the arrows 65 in FIG. 1.

Once the handle is pushed to the full inward position shown in FIG. 1, the handle may then be withdrawn to simultaneously refill the cylinder 11 with ice water through the inlet 13 (the valve 18 closing) and fill the cylinder 12 with discharge fluids from the stomach through the inlet 14 (the valve 21 closing). The flow of ice water into the cylinder 11 is the same as previously described and is shown in FIG. 2 by the arrows 63. The flow of discharge fluids into the cylinder 12 is shown by the arrows 67 in FIG. 2.

Once the pistons 22 and 23 have been withdrawn to the position shown in FIG. 2, the handle 24 is once again operated to return the pistons to the position shown in FIG. 1. This stroke both empties the cylinder 11 through the outlet 15 (the check valve 17 closing) and empties the cylinder 12 through the outlet 16 (the check valve 19 closing). Thus, by reciprocating the handle 24 and thus the pistons 22 and 23, alternate injection and discharge from the stomach may be accom-

plished without the necessity of changing connections to the tube 26. Moreover, the action of the double cylinder syringe provides that substantial injection and discharge occur positively on both strokes, for a strong and sure pumping action, as in contrast, for example, with squeeze syringes where injection is limited by the size and strength of the operator's handgrip and discharge is limited by the recovery of the squeeze mechanism without the aid of the operator. The operator need never stop the pumping action and interrupt flow and, as a result, more rapid control of hemorrhage is made possible. The operator also need not continually have his hands exposed to the cold of the ice water or experience the hand fatigue resulting from the multiple squeezing operations.

Although the invention has been described in connection with ice water lavage to control upper gastrointestinal bleeding, the syringe of the invention is applicable for other purposes. The lavage of the stomach for intended or accidental overdose of potentially lethal medications is possible by use of the syringe of the invention. Rapid removal of particulate matter with the invention is also feasible.

It may therefore be seen that the invention provides an improved syringe for internal lavage. The syringe of the invention provides positive injection and discharge action without the necessity of changing connection between strokes. This minimizes the delay in the treatment of many conditions, including the internal lavage of the stomach, maximizing the effects of the treatment.

Various modifications of the invention in addition to those shown and described herein will become apparent to those skilled in the art from the foregoing description and accompanying drawings. Such modifications are intended to fall within the scope of the appended claims.

What is claimed is:

1. A syringe for internal lavage, comprising, an injection cylinder and discharge cylinder, each cylinder having an inlet and an outlet, means for connecting a tube to be inserted into a patient to said outlet of said injection cylinder and to said inlet of said discharge cylinder to allow flow to and from the patient, each of said inlets and outlets having a check valve therein, an injection piston in said injection cylinder and a discharge piston in said discharge cylinder, said pistons each having an inward stroke wherein said check valves in said inlets of said cylinders are closed and said check valves in said outlets of said cylinders are open, said pistons each having an outward stroke wherein said check valves in said inlets of said cylinders are open and said check valves in said outlets of said cylinders are closed, and means for manually operating said pistons simultaneously.

2. A syringe according to claim 1 wherein said inlet in said injection cylinder is adapted for connection to a source of injection fluid, wherein said outlet of said injection cylinder is adapted for connection to a tube, wherein said inlet of said discharge cylinder is adapted for connection to a tube, and wherein said outlet of said discharge cylinder is adapted for connection to a discharge reservoir.

3. A syringe according to claim 1 wherein said cylinders are parallel with each other, a flexible tube is connected to said connecting means for insertion into a patient's stomach, and another tube is connected to said

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inlet of said injection cylinder to allow cold liquid to flow directly from a reservoir therefor into said injection cylinder.

4. A syringe according to claim 3 wherein said outlet of said injection cylinder and said inlet of said discharge cylinder are adjacent each other at the ends of said cylinders opposite said manual operating means.

5. A syringe according to claim 1 wherein said manual operating means comprise a handle.

6. A syringe for internal lavage of a patient's stomach with ice water, comprising, an injection cylinder and a discharge cylinder disposed adjacent each other and parallel with each other, said injection cylinder having a first orifice at one end thereof, said discharge cylinder having a second orifice at one end thereof adjacent said first orifice, a check valve in said first orifice arranged to allow ice water flow from said injection cylinder, a check valve in said second orifice arranged to allow stomach fluid flow into said discharge cylinder, a hol-

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low flexible tube means adapted to be swallowed by the patient connected to said first and second orifices to allow fluid into and from the stomach, a third orifice adjacent the end of said injection cylinder having said first orifice, and a fourth orifice in said discharge cylinder adjacent the end thereof having said second orifice, a check valve in said third orifice arranged to allow ice water flow into said injection cylinder, passageway means connected to said third orifice and extending to a reservoir of ice water for conveying ice water directly to said injection cylinder for injection into the stomach, and a check valve in said fourth orifice arranged to allow stomach fluid flow out of said discharge cylinder, a pair of pistons, each in a respective one of said cylinders disposed parallel with each other, and a handle connected to said pistons for manually moving same axially and simultaneously in said cylinders.

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