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(54) Fluid injection system

System zum Injizieren von Flüssigkeit

Système d'injection de fluide

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(73) Proprietor:
Fluid Technology Limited
Perth Western Australia, 6000 (AU)

(72) Inventor: **Down, Raymond Lawrence**
Doubleview Western Australia 6018 (AU)

(74) Representative:
Pacitti, Pierpaolo A.M.E. et al
Murgitroyd and Company
373 Scotland Street
Glasgow G5 8QA (GB)

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Description

The present invention relates to a fluid injection system for injecting a first fluid into a body of a second fluid.

Prior art fluid injection systems are known, for example, from US-A-2,563,211, which discloses a large fixed apparatus for use in supplying water flow to swimming pools or drinking supply. US-A-3,166,096 discloses a fluid injection system in which a disposable bag containing detergent may be placed inside a vessel which is connected to a fixed metering apparatus which is mounted within a washing machine.

In accordance with the present invention there is provided a fluid delivery and metering apparatus for delivering a metered flow of a second fluid into a first fluid, said apparatus comprising:

a tubular member arranged to form part of a fluid flow line through which the first fluid flows under pressure;

a venturi contained within the tubular member defining high and low pressure sides thereof;

a first volume arranged to contain the first fluid;

a second volume arranged to contain the second fluid;

a conduit providing communication between the high pressure side of said venturi and said first volume;

a metering line providing communication between said second volume and the low pressure side of said venturi whereby, on a pressure differential being created across said venturi as a result of a flow of said first fluid through said tubular member, said first fluid is caused to flow into said first volume thereby reducing said second volume and consequently displacing the second fluid into the metering line; and

a bypass conduit provided between the high pressure side of the venturi and the metering line to allow the delivery of the first fluid into the metering line intermediate of the second volume and the tubular member;

wherein one volume comprises a first chamber and the other volume comprises a second chamber, one of said first and second chambers being disposed substantially within the other of said first and second chambers, said first and second volumes being separated one from the other by pressure responsive means comprising a movable element received within the outer one of said first and second chambers and defining at least a portion of the walls of the inner one of said first and second chambers, the outer one of said first and second chambers comprising a rigid enclosure having an opening;

and whereby said flow of said first fluid into said first volume displaces the pressure responsive means

thereby reducing said second volume and consequently displacing the second fluid into the metering line;

said apparatus being characterised in that:

the inner one of said first and second chambers comprises a flexible bag-like enclosure received within the rigid enclosure;

said tubular member being part of a closure element, said closure element also comprising said conduit, said metering line and said bypass conduit, each end of the tubular member being adapted for fitting within a flow line to a hand wand; and

said closure element is adapted to be permanently sealingly engaged with the opening of the rigid enclosure.

The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig 1 is a schematic view of a prior art fluid injection system illustrating the principle of operation of the present invention;

Fig 2 is a schematic view of the fluid injection system utilised by the apparatus of the present invention;

Fig 3 is a side elevation of an apparatus according to the invention;

Fig 4 is a view of a bottle neck sealing arrangement of the apparatus of Fig 3;

Fig 5 is an upper perspective view of a part of the apparatus of Fig 4;

Fig 6 is a perspective view of a knap sack wand for use with the apparatus of Fig. 3;

Fig 7 is a perspective view of an adaptor of the wand of Fig 6; and

Fig 8 is a side elevation of part of the adaptor of Fig 7 showing the spring mounting of a tube member.

In Fig 1 of the accompanying drawings, which shows a prior art fluid injection system, there is shown a fluid line 10 through which, in use, a fluid flows under pressure. Coupled within the fluid line 10 is a tubular member 12. Each end of the fluid line 10 is connected to the adjacent end of the tubular member 12 by any convenient means.

The tubular member 12 contains a venturi 14 arranged to cause a pressure drop in fluid flowing through the fluid line 10 in the direction shown by the arrow 16. The tubular member 12 also contains two orifices 18 and 20 on the high and low pressure sides of the venturi 14 respectively.

A first conduit 22 extends from the orifice 18 to a pressure tank 24. The pressure tank 24 is of rigid construction.

The pressure tank 24 is bucket shaped having a base 26 with an upstanding peripheral wall 28. The conduit 22 enters the pressure tank 24 through its base 26.

Further, the pressure tank 24 also contains a bladder or diaphragm or membrane 30 which is of similar shape to the pressure tank 24 and is thus also bucket shaped. Typically, the bladder 30 has an upper peripheral flange remote from its base. This flange is clamped between an upper outwardly flared end of the peripheral wall 28 of the pressure tank 24 and a lid 32 by any suitable means such as threaded bolts. The bladder 30 has a resilient wall. The bladder 30 may be formed of neoprene or rubber or any flexible material not degraded by the fluids. A first volume is defined by the pressure tank 24 and the bladder 30 and a second volume is defined by the bladder 30 and the lid 32. A shuttle valve 34 is mounted above the lid 32. The shuttle valve 34 communicates with the interior of the pressure tank 24 through a short pipe 36 which passes through the lid 32. Further, the shuttle valve 34 is in communication with a reservoir 37 through a pipe 38 which passes through the underside of the reservoir 37. The reservoir 37 is provided with a breather 39. A metering line 40 also extends from the shuttle valve 34. In use, the shuttle valve 34 performs such that when no bulk fluid is passing through the fluid line 10 fluid passes under gravity from the reservoir 37 through the pipes 38 and 36 to fill up the bladder 30. This causes the bladder 30 to expand and to move outwardly towards the base 26 and wall 28 of the tank 24. Thus, the second volume is increased and the first volume is correspondingly decreased until the bladder 30 is full. When fluid flows through the fluid line 10 and the tubular member 12, a pressure differential is created across the venturi 14. This closes off the supply from the tank 24 and causes fluid from the fluid line 10 to pass through the orifice 18 and the conduit 22 into the pressure tank 24 and exert pressure on the wall of the bladder 30. The bladder 30 moves inwardly causing the second volume to contract as the first volume is increased. Fluid in the bladder 30 is thus expelled through the line 40. The fluid passing through the line 40 enters the tubular member 12 via the orifice 20 and is injected into the stream of the fluid line 10.

It is found over a wide range of flow rates in the fluid line 10 that the rate of injection varies approximately according to the rate of flow. Thus, the amount of second fluid injected per volume of first fluid remains substantially constant. Preferably, the minimum flow rate in the fluid line 10 is sufficient to generate a driving pressure differential that will displace the second fluid. If desired, the tank 24 can be connected in reverse whereby the bladder 30 is in fluid communication with the conduit 22 and the tank 24 is in fluid communication with the conduit 40. In this case, the bladder 30 expands to expell the second fluid from the tank 24. Furthermore, the separator, instead of being in the form of a flexible member, could be in the form of a piston or other member that moves displacing the first and second fluids.

The rate of injection of the second fluid into the first fluid may be varied by means of a by-pass conduit 50 which interconnects the conduit 22 with the line 40. The

presence of the conduit 50 causes the first, bulk fluid to flow from the conduit 22 into the line 40 as an alternative to the flow of the second fluid. This inhibits or proportionately displaces the flow of the second, additive fluid into the venturi.

The by-pass conduit 50 contains an adjustable valve 52. The valve 52 controls the rate of flow of the first, bulk fluid in the conduit 50. As the valve 52 is opened to increase the rate of flow of the first fluid, the rate of flow of the second fluid through the line 40 is decreased and vice versa.

Once the desired rate of addition of the second fluid has been established, this rate of addition will be maintained and the second fluid will flow into the venturi 14 partly pre-mixed with the bulk fluid and will be admixed with the main body of bulk fluid in the desired proportion. The valve 52 may be substituted by a fixed constriction calibrated to a desired rate.

The constriction may be a plug partially restricting the by-pass flow. It may also be a multiposition plug for multiple, pre-set rates of flow.

The system may be extended further to incorporate adjustment to the venturi or constriction the purpose of which is to modify the pressure differential (for a given flow rate) and thereby change the range over which the second fluid line and by-pass control the rate of dosing. The means of adjusting the venturi could be by mechanical adjustment of a flexible surfaced opening, by sphincter action, or by pumping additional volume of the first fluid into the eye of the venturi. This latter has been found to control the venturi constriction.

The system of Figure 1 has a wide variety of uses.

It may, for example, be used for adding aromatic materials in small volumes as a catalyst to hydrocarbon fuels of low quality to increase the thermal output rating. The system of the present invention provides a safe method of handling highly flammable bulk fluids.

The system of Figure 1 may also be used for metering liquid additives into bulk fluids in gaseous form such as the adding of lubricating oil to compressed air flowing to energise pneumatic tools that require constant lubrication such as pneumatic hammers on drilling machinery.

The system shown in Figures 1 and 2 of the drawings is arranged for operation with fluids in the form of liquids but the present invention can be readily adapted for operation with gases. The system can be extended to have multiple second fluid lines and storage volumes and by-pass controllers feeding a single venturi or multiple venturis in series or parallel.

In Fig 2 of the accompanying drawings there is shown schematically the fluid injection system utilised by the apparatus of the present invention. The system of Fig. 2 is a modification of the system of Fig 1. Like reference numerals are used to denote like parts between Figs 1 and 2.

The major difference from the system of Fig 1 is that the reservoir 37, the pipe 36 and 38 and the shuttle

valve 40 are omitted. Further, the metering line 40 leads directly from the bladder 30 through the lid 32 of the tank 24 to the orifice 20. As for the system of Fig. 1, the system of Fig. 2 may have a venturi orifice of adjustable size.

The system of Fig 2 operates in essentially the same manner as that of Fig 1 as described above.

The system of Fig 2 is envisaged to be a disposable system whereby once all of the second, additive fluid has been expelled from the bladder 30 the entire apparatus will be discarded and replaced by a fresh apparatus in which the bladder 30 is filled with the second additive fluid. The system of Fig 2 may be used in the same applications as that of Fig 1. However, because of its disposable characteristics it is useful in other applications. For example, the system of Fig 2 is particularly envisaged for use with knap sack sprays which are typically used for spraying herbicides or pesticides. With the system of Fig 2, the active ingredient to be sprayed would be contained in concentrated form in the bladder 30 and the bulk fluid would be water carried in a portable tank. The bladder 30 could be so designed that the operator need never contact the concentrated active ingredient. Further, the bladder 30 could be incorporated in a cheap disposable assembly including the entire system of Fig 2 which would be discarded when the bladder 30 was empty.

In Figure 3, there is shown a particular embodiment of an apparatus according to the invention constructed utilising the injection system of Figure 2. Like reference numerals denote like parts.

In Figure 3 the tank 24 is in the form of a clear plastics bottle and the bladder 30 is in the form of a plastics bag or the like. The bottle is sealed off at the neck by a moulded plastics cap 160. The cap 160 is permanently sealed to the bottle 24.

The cap 160 comprises a female end 164 for fitting to a hand wand (not shown) and a male end 162 for fitting to a hose or knap sack of known type (not shown). An apertured tube 166 depends from the cap 160. The tube 166 ensures that the bag 30 is unfurled in the bottle 24 and also acts as a feed tube in use.

The cap 160 also comprises an on-off cock 168.

The cock 168 must be on and water must be flowing through the cap 160 from the male end to the female end to cause chemicals to be released from the bag 30. The cap 160 also comprises a chemical filler port 170 through which chemical is inserted into the bag 30. After the bag 30 is full the port 170 is permanently sealed. The cap 160 contains all of the components 12, 14, 18, 20, 22, 40, 50 and 52 of Figure 2.

Thus, when water flows from a hose or knap sack through the cap 160 from the end 162 to the end 164, the concentrate in the bag 30 is expelled into the water at a desired, consistent concentration as determined by the setting of the valve 52. In this embodiment the valve 52 may be permanently set at a particular desired setting. It is also envisaged that in some applications the

valve 52 could have, say two positions which could be obtained by a manual switching device.

A particular neck construction for the apparatus of Figure 3 is shown in Figure 4. In this case the bag 30 is sealed to the tube 166 by means of an "O" ring 179. Further, a neck plug 182 with the tube 166 extending through it, rests on the neck 180 and closes it off and is sealed to the bottle 24.

A sealing collar 186 is then clamped around the neck 189 and the assembly. The open end of the bag 30 is sealed to the tube 166 by means of the "O" ring 179 or other seal so that once the filler port 170 is sealed the concentrate cannot escape except by rupture of the bottle 24. In this connection, the bottle 24 may be made of impact resistant plastics material. Also, the clear nature of the bottle enables a visual observation to be made of the amount of chemical remaining in the bag 30. Also, shown in Figure 4 is the dosing line 40, the by-pass 50 or the valve 52 which can be seen more clearly in Figure 5. The by-pass line 50 and the valve 52 serve to displace the concentrate thereby changing the dose rate from the line 40. The control valve 52 may be replaced by specific plugs that restrict the flow in the by-pass line 50 to a desired rate of control.

In Figure 6, there is shown a knap sack spray head 190 fitted with an adapter 192 which is shown to an enlarged scale in Figure 7. The spray head 190 comprises a wand 194 into which the adapter 192 is fitted.

The adapter 192 comprises a first internally threaded end tube 196 and a second externally threaded end tube 198. The tubes 196 and 198 are arranged to be fitted to outer and inner ends of the knap sack wand 194 respectively. The tubes 196 and 198 are rigidly interconnected by a bridging member 200 such that under the bridging member 200 there is a gap between the tubes 196 and 198.

Further, as can be seen in Figure 8, the tube 198 is spring biased by a coil spring 202 to a rest position.

The cap 160 of the apparatus of Figure 4 can be engaged with the tubes 196 and 198 by pressing the tube 198 against the spring 202 to widen the gap between the tubes 196 and 198 and then inserting the cap 160 into the gap. Then the tube 198 can be released so that the tube 198 sealingly engages with the female fitting 164 and the tube 196 sealingly engages with the male fitting 162. In this way, the bottle 24 of Figure 3 can be readily clipped into a knap sack wand or a hose line and used until the concentrate is exhausted at which time the bottle 24 is removed by the reverse of the procedure described above and replaced by a fresh bottle.

Modifications and variations such as would be apparent to a skilled addressee are deemed within the scope of the present invention. For example, in the embodiment of Figure 4, with a spring and orifice part, the plug 170 may be used as a "dead-mans-hand". That is, unless the plug 170 is depressed, the plug 170 rises to cut off the flow in the concentrate flow tube 166.

Further, venturi could be in the form of an invert venturi in which a solid member is disposed in the centre of a pipe or tube to form a constriction.

Claims

1. A fluid delivery and metering apparatus for delivering a metered flow of a second fluid into a first fluid, said apparatus comprising:

a tubular member (12) arranged to form part of a fluid flow line through which the first fluid flows under pressure;

a venturi (14) contained within the tubular member (12) defining high and low pressure sides (18,20) thereof;

a first volume arranged to contain the first fluid; a second volume arranged to contain the second fluid;

a conduit (22) providing communication between the high pressure side (18) of said venturi (14) and said first volume;

a metering line (40) providing communication between said second volume and the low pressure side (20) of said venturi (14) whereby, on a pressure differential being created across said venturi (14) as a result of a flow of said first fluid through said tubular member (12), said first fluid is caused to flow into said first volume thereby reducing said second volume and consequently displacing the second fluid into the metering line (40); and

a bypass conduit (50) provided between the high pressure side (18) of the venturi (14) and the metering line (40) to allow the delivery of the first fluid into the metering line (40) intermediate of the second volume and the tubular member (12);

wherein one volume comprises a first chamber (24) and the other volume comprises a second chamber (30), one of said first and second chambers (24, 30) being disposed substantially within the other of said first and second chambers (24, 30), said first and second volumes being separated one from the other by pressure responsive means (30) comprising a movable element received within the outer one of said first and second chambers (24, 30) and defining at least a portion of the walls of the inner one of said first and second chambers (24, 30), the outer one of said first and second chambers (24, 30) comprising a rigid enclosure having an opening (180);

and whereby said flow of said first fluid into said first volume displaces the pressure responsive means (30) thereby reducing said second volume and consequently displacing the second fluid into the metering line (40);

said apparatus being characterised in that:

the inner one of said first and second chambers (24, 30) comprises a flexible bag-like enclosure received within the rigid enclosure;

said tubular member (12) being part of a closure element (160), said closure element also comprising said conduit (22), said metering line (40) and said bypass conduit (50), each end of the tubular member (12) being adapted for fitting within a flow line to a hand wand or a hose line; and

said closure element (160) is adapted to be permanently sealingly engaged with the opening (180) of the rigid enclosure.

2. A fluid injection apparatus as claimed in Claim 1 wherein said bypass conduit (50) includes flow control means (52) which determines the rate of delivery of the first fluid into the metering line (40).
3. A fluid injection apparatus as claimed in Claim 1 or Claim 2 wherein the bypass conduit (50) extends between the conduit (22) and the metering line (40).
4. An apparatus as claimed in any preceding Claim wherein said first chamber (24) comprises a bottle-like enclosure and said second chamber (30) comprises a flexible bag-like enclosure received within the bottle-like enclosure.
5. An apparatus as claimed in any of Claims 1 to 3 wherein said second chamber (30) comprises a bottle-like enclosure and said first chamber (24) comprises a flexible bag-like enclosure received within the bottle-like enclosure.
6. An apparatus as claimed in any preceding Claim wherein said venturi (14) has an orifice which is of adjustable size.

Patentansprüche

1. Eine Flüssigkeitsabgabe- und Abmessungsvorrichtung zur Abgabe einer abgemessenen Menge einer zweiten Flüssigkeit in eine erste Flüssigkeit, wobei die Vorrichtung:

ein Röhrenteil (12), das so ausgeführt ist, daß es einen Teil einer Wasserflußleitung bildet, durch welche die erste Flüssigkeit unter Druck fließt;

ein Venturirohr (14), das in dem Röhrenteil (12) beinhaltet ist, welches dessen Hoch- und Niederdruckabschnitte (18, 20) definiert;

ein erstes Volumen, das eingerichtet ist, die erste Flüssigkeit zu beinhalten;

ein zweites Volumen, das eingerichtet ist, die zweite Flüssigkeit zu beinhalten;

eine Leitung (22), die eine Verbindung zwischen dem Hochdruckabschnitt (18) des Venturirohrs (14) und dem ersten Volumen herstellt;

eine Meßleitung (40), die eine Verbindung zwischen dem zweiten Volumen und dem Niederdruckabschnitt (20) des Venturirohrs (14) herstellt, wodurch, wenn als Folge des Fließens der ersten Flüssigkeit durch das Röhrenteil (12) eine Druckabweichung im Venturirohr (14) erzeugt wird, die erste Flüssigkeit dazu veranlaßt wird, in das erste Volumen zu fließen, dadurch das zweite Volumen zu verringern und infolgedessen die zweite Flüssigkeit in die Meßleitung (40) zu verdrängen; und

eine Umgehungsleitung (50), die zwischen dem Hochdruckabschnitt (18) des Venturirohrs (14) und der Meßleitung (40) angebracht ist, um die Abgabe der ersten Flüssigkeit in die Meßleitung (40) zwischen dem zweiten Volumen und dem Röhrenteil (12) zu erlauben, umfaßt;

wobei ein Volumen eine erste Kammer (24) umfaßt und das andere Volumen eine zweite Kammer (30) umfaßt, wobei eine der ersten und zweiten Kammern (24, 30) sich im wesentlichen in der anderen der obengenannten ersten und zweiten Kammern (24, 30) befindet, wobei das erste und zweite Volumen durch ein Druckübertragungsmittel (30) voneinander getrennt werden, welches ein bewegliches Element enthält, das von der äußeren der obengenannten ersten und zweiten Kammern (24, 30) aufgenommen wird und zumindest einen Teil der Wandung der inneren der obengenannten ersten und zweiten Kammern (24, 30) darstellt, wobei die äußere der ersten und zweiten Kammern (24, 30) eine starre Hülle mit einer Öffnung (180) umfaßt;

und wodurch das Fließen der ersten Flüssigkeit in das erste Volumen das Druckübertragungsmittel (30) verdrängt, dadurch das zweite Volumen verringert und folglich die zweite Flüssigkeit in die Meßleitung (40) verdrängt;

wobei die Vorrichtung dadurch gekennzeichnet ist, daß:

die innere der ersten und zweiten Kammern (24, 30) eine flexible beutelartige Hülle umfaßt, die sich innerhalb der starren Hülle befindet;

das Röhrenteil (12) Teil des Verschlußelements (160) ist, wobei das Verschlußelement ferner die Leitung (22), die Meßleitung (40) und die Umgehungsleitung (50) umfaßt, wobei jedes Ende des Röhrenteils (12) so ausgeführt ist, daß es in die Flußleitung zu einem gehaltenem Stab oder einem Wasserschlauch paßt; und

das Verschlußelement (160) so ausgeführt ist, daß es mit der Öffnung (180) der starren Hülle auf Dauer versiegelnd verbunden werden kann.

2. Vorrichtung zum Injizieren von Flüssigkeiten nach Anspruch 1, wobei die Umgehungsleitung (50) ein Flußsteuerungsmittel (52) beinhaltet, welches die Abgaberate der ersten Flüssigkeit in die Meßleitung (40) regelt.
3. Vorrichtung zum Injizieren einer Flüssigkeit nach Anspruch 1 oder Anspruch 2, wobei sich die Umgehungsleitung (50) zwischen der Leitung (22) und der Meßleitung (40) erstreckt.
4. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die erste Kammer (24) eine flaschenartige Hülle umfaßt und die zweite Kammer (30) eine flexible, beutelartige Hülle, die sich innerhalb der flaschenartigen Hülle befindet, umfaßt.
5. Vorrichtung nach einem der Ansprüche 1 bis 3, wobei die zweite Kammer (30) eine flaschenartige Hülle umfaßt und die erste Kammer (24) eine flexible, beutelartige Hülle, die sich innerhalb der flaschenartigen Hülle befindet, umfaßt.
6. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei das Venturirohr (14) eine Öffnung hat, deren Größe verstellbar ist.

Revendications

1. Un appareil pour la distribution et le dosage d'un fluide pour distribuer un écoulement dosé d'un second fluide dans un premier fluide, ledit appareil comprenant:

un élément tubulaire (12) disposé pour faire partie d'une ligne d'écoulement de fluide à travers laquelle le premier fluide s'écoule sous pression;

un venturi (14) placé à l'intérieur de l'élément tubulaire (12) définissant ses côtés (18, 20) de haute et de basse pression;

un premier volume disposé pour contenir le

premier fluide;

un second volume disposé pour contenir le second fluide;

une conduite (22) établissant une communication entre le côté de haute pression (18) du dit venturi (14) et ledit premier volume;

une ligne de dosage (40) établissant une communication entre ledit second volume et le côté de basse pression (20) du dit venturi (14) par laquelle, lorsque l'on crée un différentiel de pression à travers ledit venturi (14) dû à un écoulement du dit premier fluide à travers ledit élément tubulaire (12), ledit premier fluide vient s'écouler dans ledit premier volume diminuant ainsi ledit second volume et déplaçant par conséquent le second fluide dans la ligne de dosage (40); et

une conduite de dérivation (50) fournie entre le côté de haute pression (18) du venturi (14) et la ligne de dosage (40) pour permettre la distribution du premier fluide dans la ligne de dosage (40) intermédiaire du second volume et de l'élément tubulaire (12);

dans lequel un volume comprend une première chambre (24) et l'autre volume comprend une seconde chambre (30), l'une des dites première et seconde chambres (24, 30) étant disposée considérablement à l'intérieur de l'autre des dites première et seconde chambres (24, 30), lesdits premier et second volumes étant séparés l'un de l'autre par un moyen sensible à la pression (30) comprenant un élément mobile placé à l'intérieur de la chambre externe des dites première et seconde chambres (24, 30) et définissant au moins une partie des parois de la chambre interne des dites première et seconde chambres (24, 30), la chambre externe des dites première et seconde chambres (24, 30) comprenant une enceinte rigide ayant une ouverture (180);

et par laquelle ledit écoulement du dit premier fluide dans ledit premier volume déplace le moyen sensible à la pression (30) diminuant ainsi ledit second volume et déplaçant par conséquent le second fluide dans la ligne de dosage (40);

ledit appareil étant caractérisé en ce que:

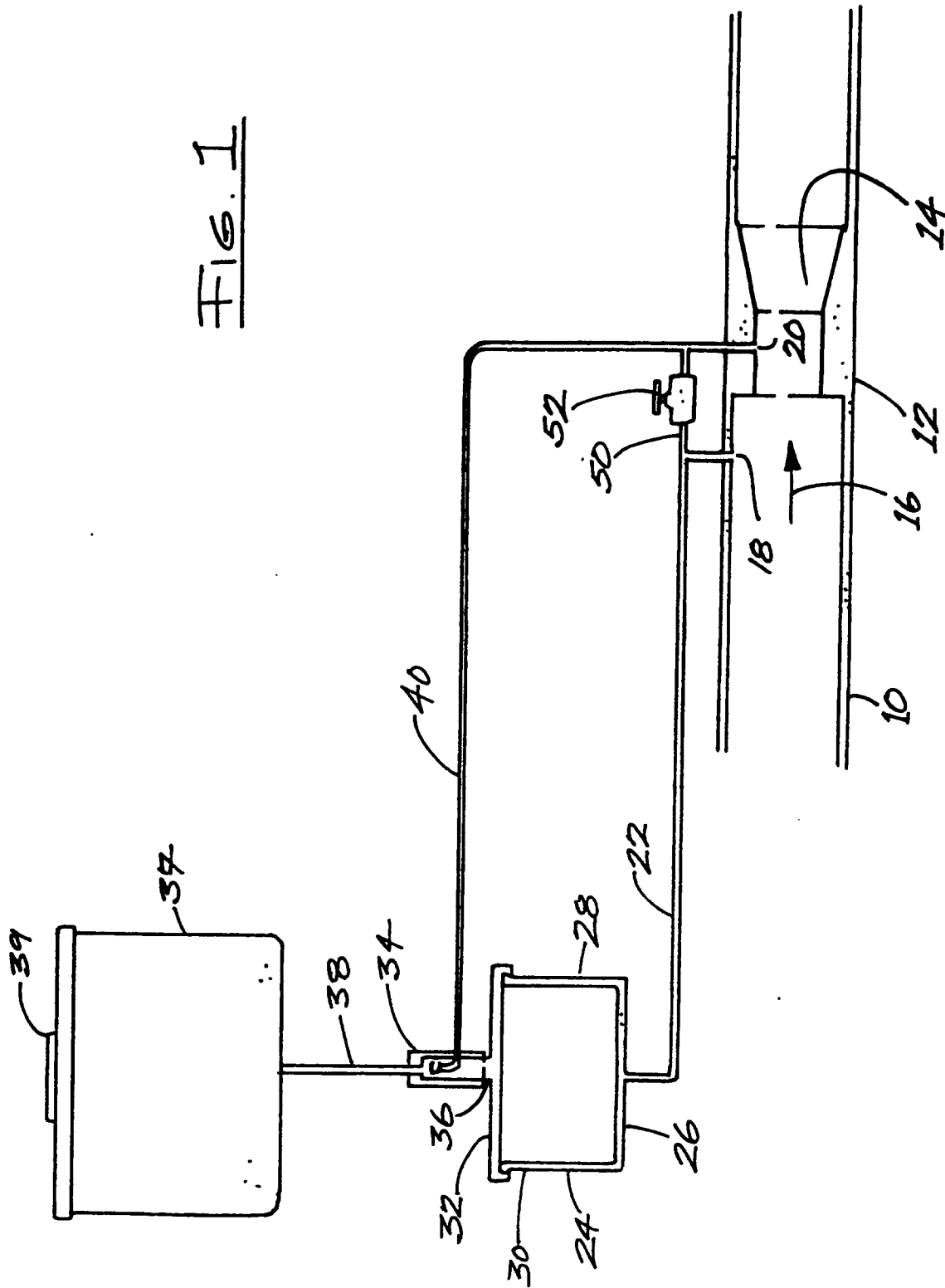
la chambre interne des dites première et seconde chambres (24, 30) comprend une enceinte flexible en forme de sac placée à l'intérieur de l'enceinte rigide;

ledit élément tubulaire (12) faisant partie d'un élément de fermeture (160), ledit élément de fermeture comprenant aussi ladite conduite (22), ladite ligne de dosage (40) et ladite conduite de dérivation (50), chaque extrémité de l'élément tubulaire (12) étant adaptée pour pouvoir être connectée sur une ligne d'écoulement à un lecteur manuel ou à un tuyau flexible; et

ledit élément de fermeture (160) est adapté pour être emboîté de façon étanche et permanente dans l'ouverture (180) de l'enceinte rigide.

2. Un appareil d'injection de fluide selon la revendication 1 dans lequel ladite conduite de dérivation (50) comprend un moyen de contrôle de l'écoulement (52) qui détermine le taux de distribution du premier fluide dans la ligne de dosage (40).
3. Un appareil d'injection de fluide selon la revendication 1 ou la revendication 2 dans lequel la conduite de dérivation (50) s'étend entre la conduite (22) et la ligne de dosage (40).
4. Un appareil selon l'une quelconque des revendications précédentes dans lequel ladite première chambre (24) comprend une enceinte en forme de bouteille et ladite seconde chambre (30) comprend une enceinte flexible en forme de sac placée à l'intérieur de l'enceinte en forme de bouteille.
5. Un appareil selon l'une quelconque des revendications 1 à 3 dans lequel ladite seconde chambre (30) comprend une enceinte en forme de bouteille et ladite première chambre (24) comprend une enceinte flexible en forme de sac placée à l'intérieur de l'enceinte en forme de bouteille.
6. Un appareil selon l'une quelconque des revendications précédentes dans lequel ledit venturi (14) a un orifice de taille réglable.

Fig. 1



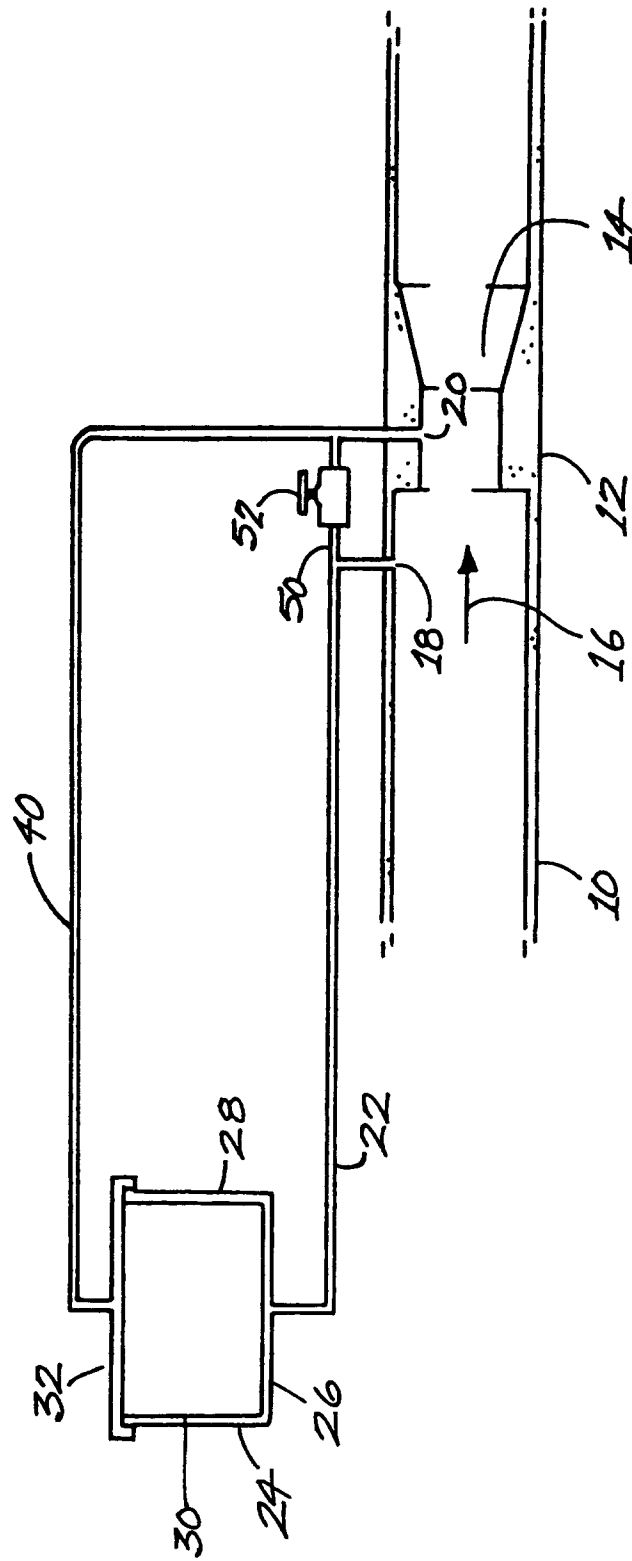


Fig. 2.

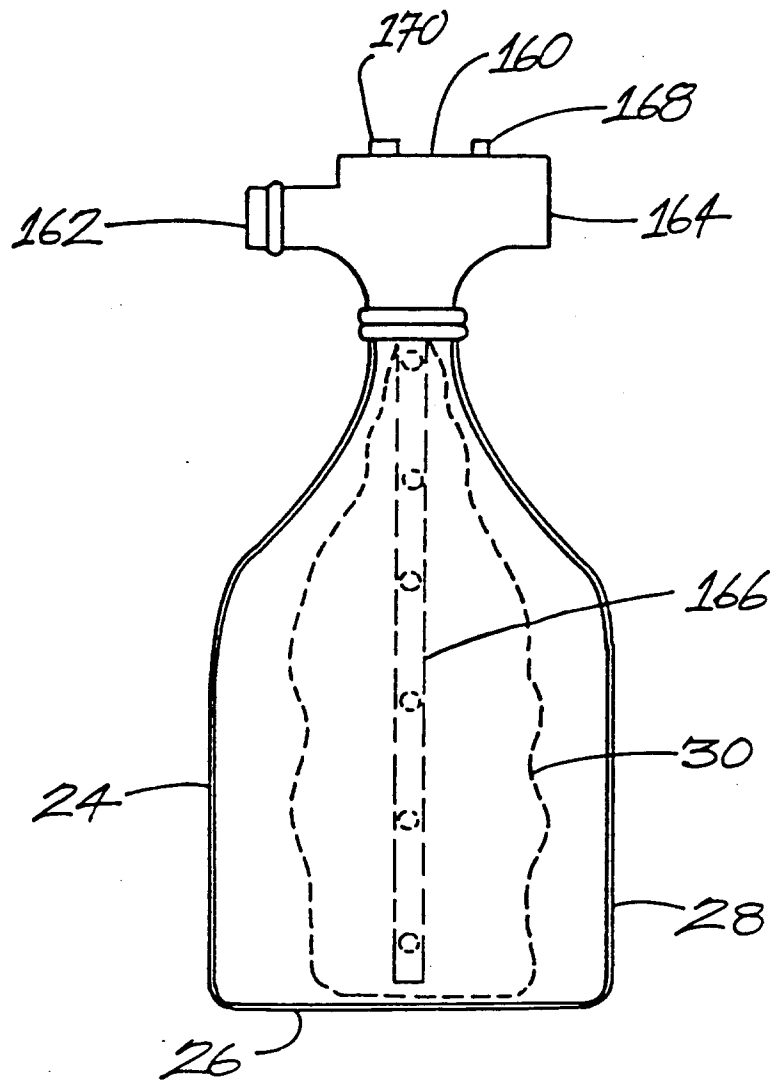


FIG 3

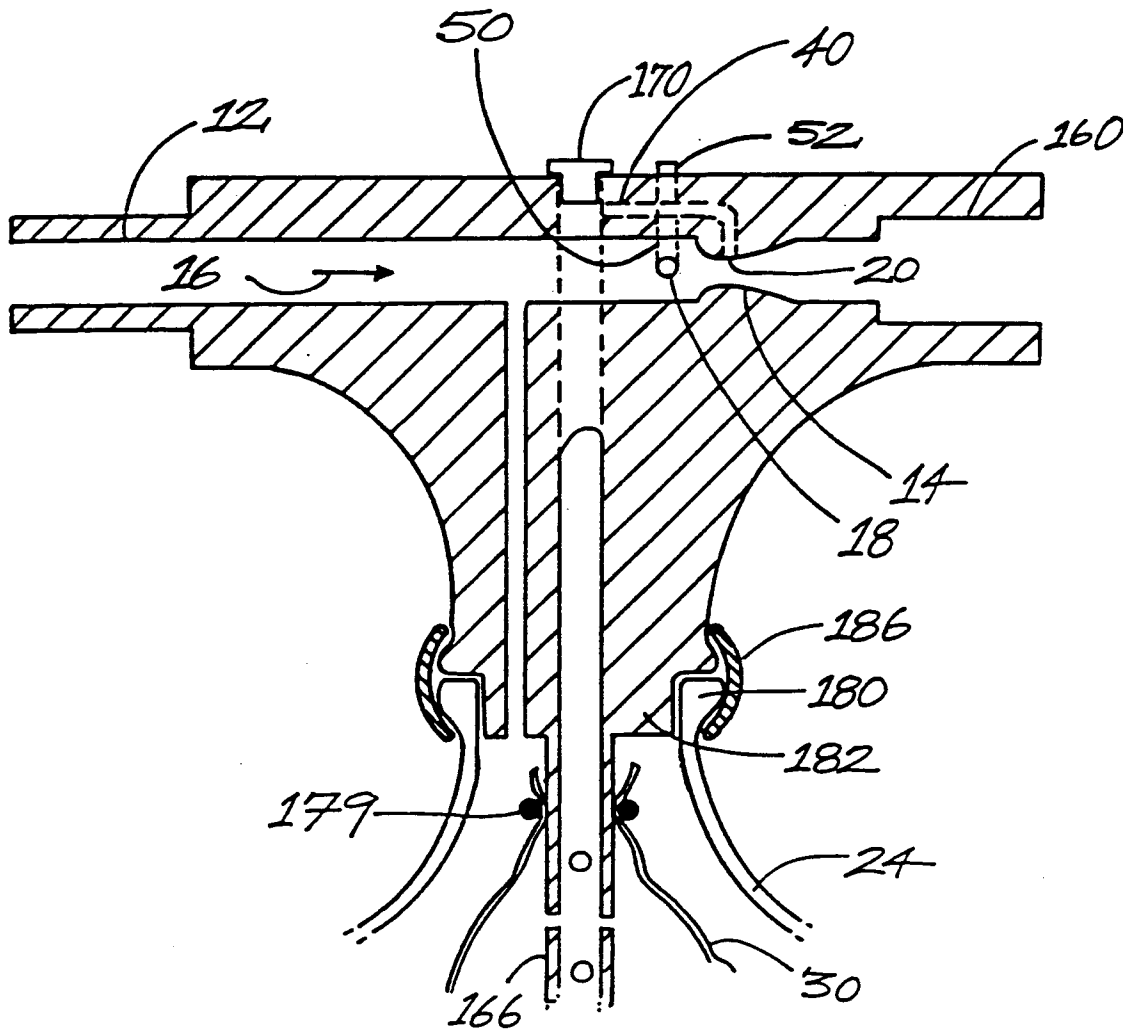


FIG. 4

