

[54] QUICK-DISCONNECT MANIFOLD
ASSEMBLY

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abandoned.

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141/286, 299, 380-389; 222/193; 289/40,
220, 130, 137, 305; 277/112; 137/587, 588;
285/DIG. 22

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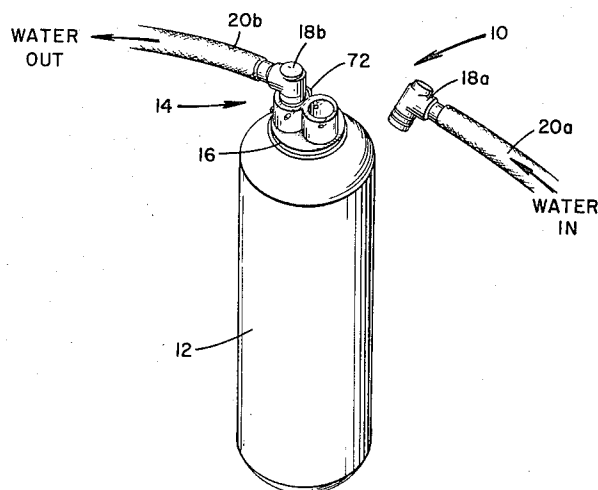
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[57] ABSTRACT

A quick-disconnect manifold assembly for a water conditioning or treatment service unit or the like which can be readily adapted from normal treatment flow operation to allow quick and easy removal and replenishment of water conditioning ingredients from the unit. The manifold or manifold portion of the assembly is assembled as part of the top of a service unit. The manifold has an inlet opening through which untreated water is introduced into the unit for treatment therein and an outlet opening for directing the treated water from the unit, the flow of water being channelled through identical male adapters removably and sealably fitted into the openings. The male adapters are rapidly and easily disjoined from the manifold to allow alternate installation into the inlet opening of evacuative and filler adapters for removing and replenishing the water conditioning ingredients contained in the unit.

33 Claims, 8 Drawing Figures



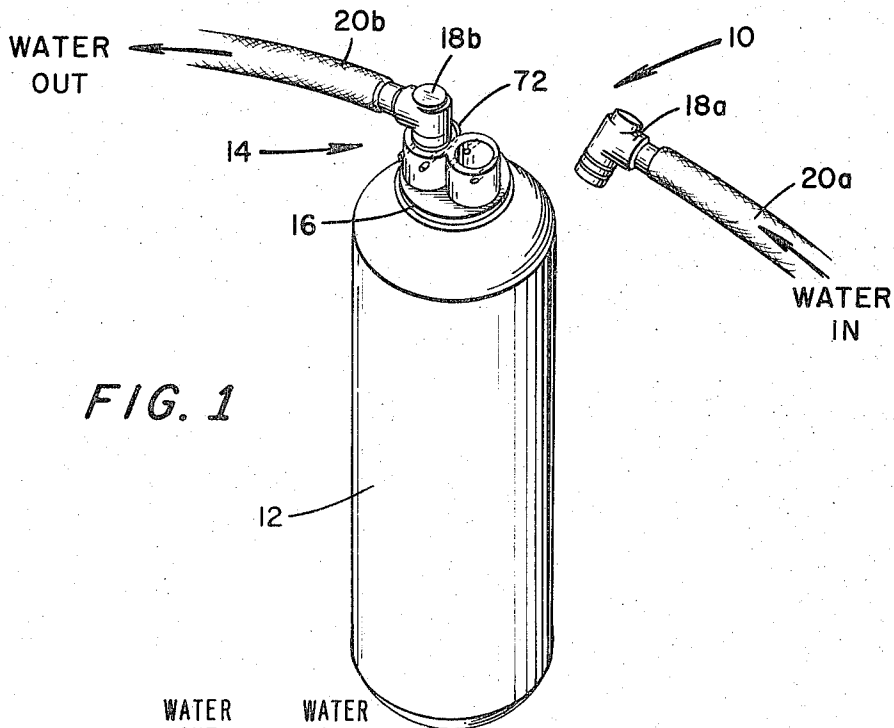


FIG. 1

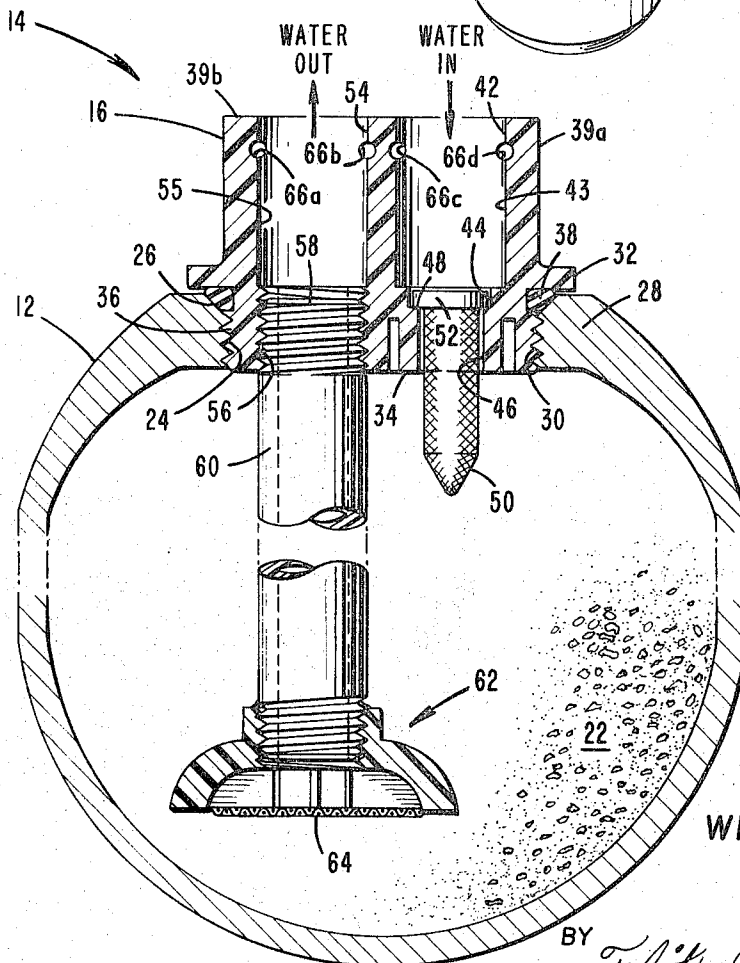
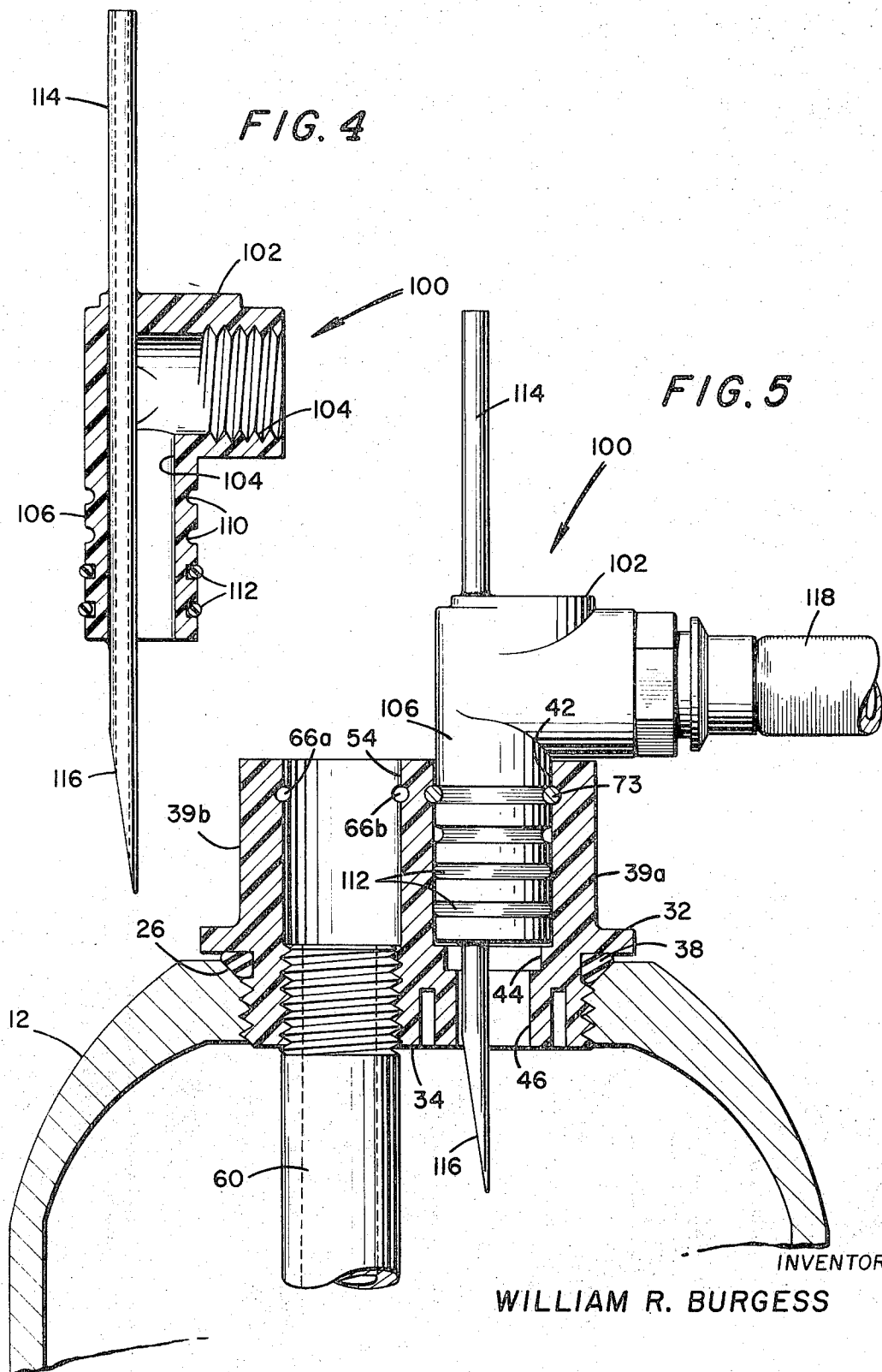


FIG. 2a

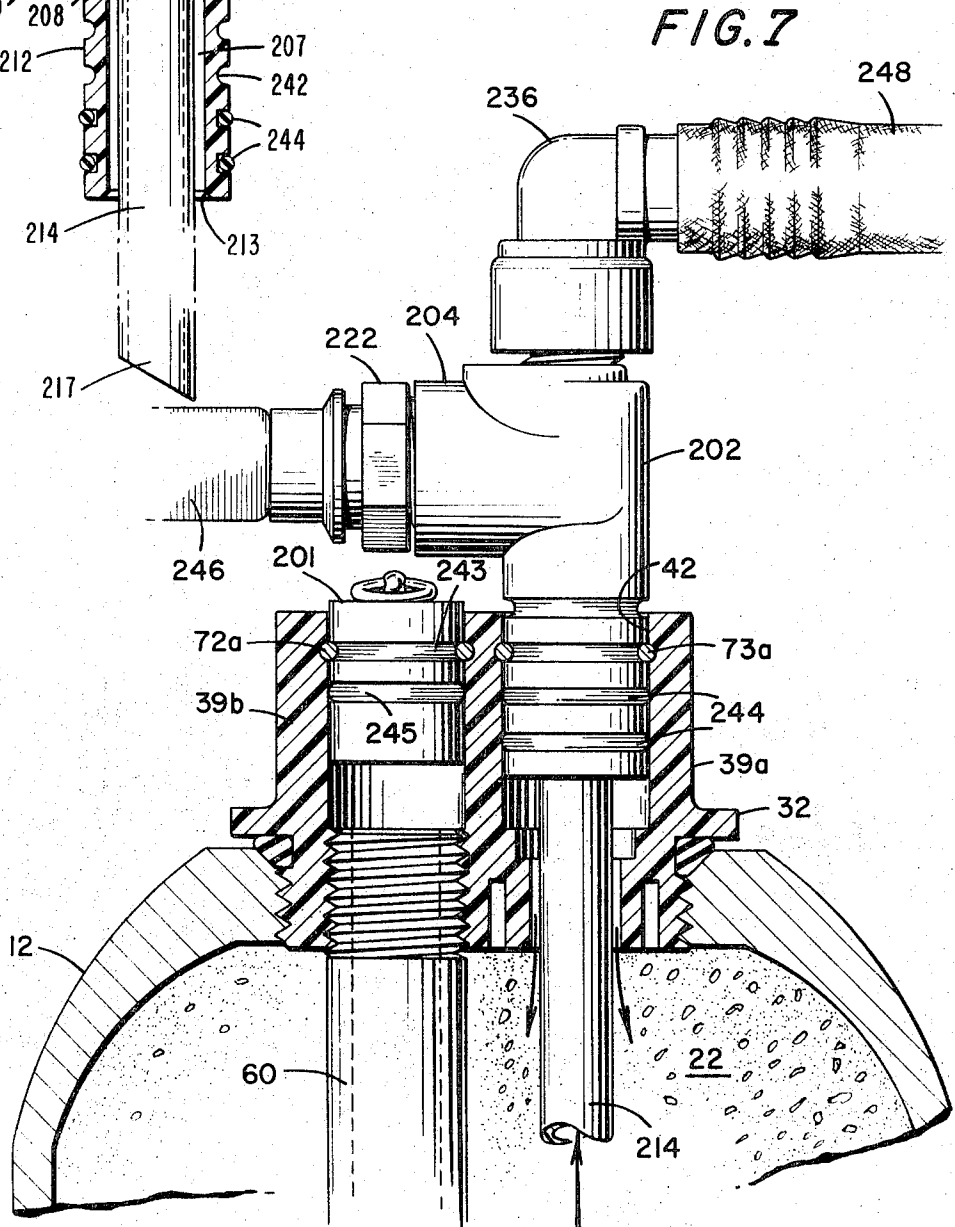
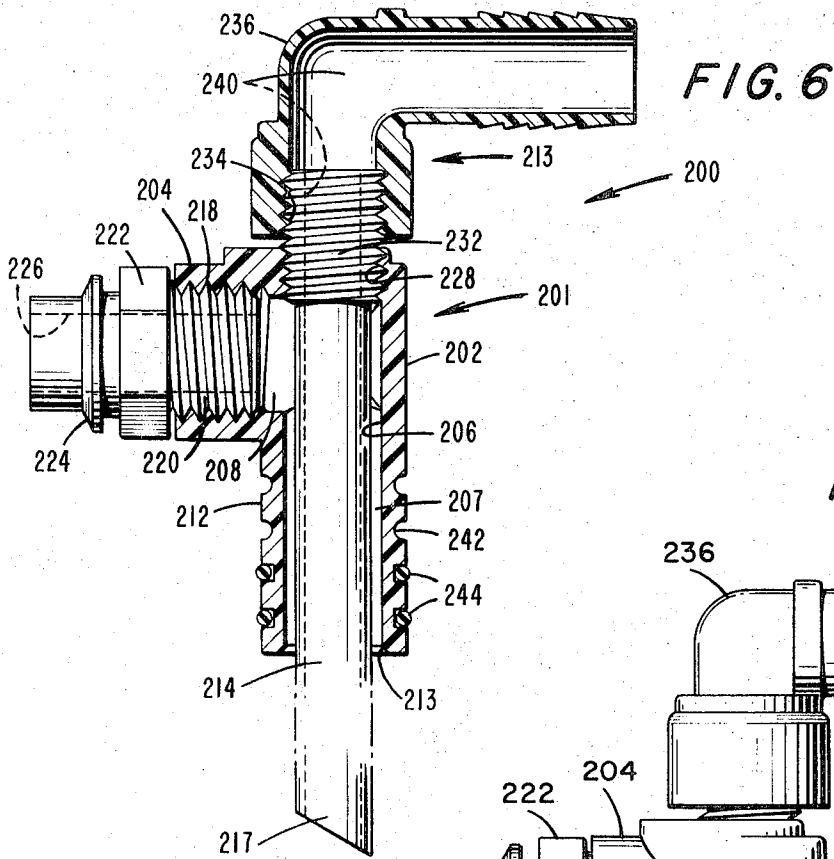
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QUICK-DISCONNECT MANIFOLD ASSEMBLY

This is a continuation of application Ser. No. 56,549, filed July 20, 1970, now abandoned.

BACKGROUND AND SUMMARY OF THE INVENTION

The utility of on-site generation of quality, mineral-free water has been established for commercial, laboratory and domestic applications. According to usual practice, water purification service units containing a quantity of water conditioning ingredients, usually a bed of ion exchange resins, are conveniently located in proximity to the point of intended use of the purified water. Unpurified water from a suitable source is channelled through either a single service unit or a plurality of service units joined in series. Purified water exiting from the unit or units is then used according to the consumer's needs.

When the water conditioning ingredients of the service unit become exhausted, one practical method of continuing service without significant interruption is to replace the exhausted unit at the point of use with one containing fresh or regenerated ingredients. This technique of continued service makes it most desirable that the service units be capable of rapid and facile water inlet and outlet connection thereby allowing quick, convenient and simple exchange of service units at the point of use.

Moreover, once the water conditioning ingredients of the service unit, such as ion exchange resins, have become exhausted and the unit removed or replaced, it becomes necessary to regenerate the exhausted resins contained therein for reuse. This is most conveniently done by removing the exhausted resins from the service unit for regeneration in separate equipment. After regeneration of the ion exchange resins and cleansing of the emptied service unit, the unit is then filled again with regenerated resins.

Accordingly, provision must be made for convenient removal of the exhausted ingredients and for ready replenishment into the unit of active conditioning ingredients. The ingredient removal and replenishment operations should not only be simply and easily performed, but must also be efficiently accomplished to prevent the possible introduction of contaminants to the ingredients and to eliminate loss of the costly ingredients due to poor removal or resupply techniques.

Consistent with the requisites stated above, the present invention provides a manifold assembly for a water treatment service unit which simplifies connection of the unit to a source of untreated water and to a point of use of the water treated by the unit. The present apparatus is especially susceptible to rapid and facile series connection of the units. The rapid disconnecting capability of the lines of water supply to and from the unit further allows ready access to the interior of the unit for removing and replenishing the water conditioning ingredients contained within the unit.

Previous water conditioning service units, such as the one disclosed in U.S. Pat. No. 3,190,320, comprise a resin-containing tank having three openings, one for water inlet, one for water outlet, and one for removing and replenishing the water conditioning ingredients from and to the unit. Moreover, the prior units have required cumbersome and time-consuming screwthreaded couplings and basic connections between the

openings and the various connections for water and resin transfer.

The manifold of the present invention, on the other hand, utilizes only two openings. The evacuation and resupply of the conditioning ingredients is accomplished through one of the two openings, in particular, the water inlet opening. The present invention eliminates the trouble and complexity involved with a third opening in the manifold during normal operations and sealing or securing the inlet and outlet openings during evacuation and filling of the unit. These operations are simplified by the provision in the manifold assembly of a quick-attach and disattach feature, allowing simple and rapid connection and disconnection of male adapters into and from the inlet and outlet openings of the manifold. The male adapters are fitted to flexible hoses or pipes which function as lines of supply to and from the service units. Further, the male adapters are quickly removable from the manifold to allow the insertion into the unit of either a resin removal attachment or a resin replenishment attachment to accomplish removal or resupply of the conditioning ingredients.

Accordingly, the adaptive manifold assembly of the present invention provides efficient and simple means for channelling water into and from a water treatment service unit.

It is another object of the invention to provide a simple, durable manifold for a resin-containing water treatment unit which allows ready connecting and disconnecting of the water supply exit lines and convenient adaptation for resin removal and replenishment functions.

A further object of the invention is to provide a manifold for a water treatment service unit having only water access and egress openings, said access opening also serving to accept resin removal and replenishment attachments.

Other objects and advantages of the invention will be more readily apparent in light of the following description of the details of construction and operation of a preferred apparatus, especially regarding the convenient adaptation of the invention from normal functioning of the service unit to removal and replenishment of the water conditioning ingredients for the unit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a water conditioning service unit embodying the manifold assembly of the present invention during set-up for normal operation.

FIGS. 2a and 2b are sectional views of a water conditioning service unit fitted with the adaptive manifold portion of the present invention shown before and after attachment of male adapters, the adapters being shown in elevation in FIG. 2b.

FIG. 3 is a top plan view of the assembly shown in FIG. 2b.

FIG. 4 is a sectional view of a filler adapter according to the present invention for adding water conditioning ingredients to a service unit.

FIG. 5 is a detailed sectional view illustrating the filler adapter assembled with the manifold of the present invention for adding water conditioning ingredients to a service unit, the filler adapter being shown in elevation.

FIG. 6 is a detailed sectional view of a removal adapter which may be used according to the present invention for removing water conditioning ingredients from a service unit.

And FIG. 7 is a detailed sectional view illustrating the removal adapter assembled with the manifold for removing water conditioning ingredients from a service unit, the removal adapter being shown in elevation.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring specifically to the drawings, a water conditioning service unit is seen at 10 to comprise a tank 12 fitted with the manifold assembly 14 of the present invention. The tank 12 contains water conditioning ingredients, such as mixed-bed of cation exchange and anion exchange resins. In FIG. 1, the service unit 10 is shown being prepared for normal water treatment operation. The manifold assembly 14 comprises an adaptive manifold 16 which is sealably attached to the tank 12 and which receives identical non-deformable male adapters 18a and 18b into openings in the manifold 16. The male adapter 18a, shown prior to attachment to the manifold 16, joins flexible water hose 20a to serve as a channel for conducting untreated water into the unit 10. The adapter 18a is quickly and simply attached into or disattached from the manifold 16 as will be more fully described hereinafter.

Water treated by the water conditioning ingredients within the unit 10 passes out of the unit through the male adapter 18b and attached hose 20b. The treated water may then be directed to a point of use or may pass into a second service unit (not shown) for further treatment. The structure of the adapters 18 and manifold 16 facilitate series connection of a number of the service units 10.

The structure of the manifold 14 of the present invention can be more easily seen in FIGS. 2a and 2b. FIG. 2a illustrates the manifold 16 prior to the connection of the male adapters 18 thereto, and FIG. 2b depicts the assembly during normal operation of the service unit 10. The tank 12 comprises the major portion of the service unit 10 and can be fabricated of any suitable material which is economical and resistant to chemical or other reaction with the water conditioning ingredients 22 contained within the tank. Such materials are fiberglass, polyvinyl chloride, stainless steel and the like. The wall thickness of the tank 12 gradually enlarges toward its upper end portion, finally forming an enlarged collar 28 which surrounds the opening 24. The collar 28 has a threaded annular surface 30 for receiving the adaptive manifold 16, and a recess 26 which encircles the opening 24 to receive O-ring 38 associated with the manifold 16.

Referring particularly to FIGS. 1 and 2a, the adaptive manifold 16 is seen to comprise a circular base 32 having an annular extension 34 axially projecting below the base 32. The adaptive manifold 16 is secured to the tank 12 by means of annular threads 36 impressed around the annular extension 34. Attachment of the adaptive manifold 16 to the tank 12 is simply accomplished by mating the threads 30 and 36 on the tank and manifold respectively. The manifold 16 is screwed onto the tank 12 sufficiently to press O-ring 38, which encircles the threads 30 where they meet the bottom of the base 32, against the recess 26, thereby sealing the

connection of the adaptive manifold 16 to the tank 12.

Mounted above the base 32 of the adaptive manifold 16 are two cylindrical heads 39a and 39b. A longitudinal opening extends through each head 39a and 39b as well as the base 32 and the extension 34 to provide access to the interior of the tank 12. The first opening 42, hereinafter sometimes referred to as the inlet opening is associated with cylindrical head 39a. The opening 42 has a cylindrical smooth wall 43 throughout its upper portion which receives the adaptive components, such as male adapter 18. The lower portion is successively reduced in diameter at 44 and 46 to form an annular recessed ridge 48. When the inlet opening 42 receives the male adapter 18a, as shown in FIG. 2b, untreated water can be directed into the tank 12 through the inlet opening 42. To prevent the introduction of particulate impurities into the tank 12 and to prevent loss of the conditioning ingredients 22 through the opening 42, a screen 50 having a cylindrical body portion and a conical end portion blocks the inlet opening 42. The screen is fitted with a supporting flange 52 which seats on the recessed ridge 48 and can be easily removed, when desired, by lifting said screen from the opening 42 after any adaptive component has been disengaged from the opening.

Referring still to FIG. 2a, a second opening 54, hereinafter sometimes referred to as the outlet opening, is associated with cylindrical head 39b. The opening 54 also has a cylindrical smooth-walled bore throughout its upper portion but annular female threads 56 in its lower portion. The female threads 56 mate with male threads 58 on the end of an exit pipe 60 disposed in the tank 12 to thereby secure the exit pipe 60 to the adaptive manifold 16. The exit pipe 60 extends through the water conditioning ingredients 22 within the tank 12, terminating in an enlarged circular diffuser 62 near the bottom of the tank. The inlet to the diffuser 62 has a screen 64 which prevents the water conditioning ingredients from entering the diffuser 62 or the pipe 60.

Untreated water entering the service unit 10 through opening 42 and past screen 50 filters through the conditioning ingredients 22 contained in the tank 12 and thereby becomes demineralized or otherwise treated. Water reaching that region of the bottom of the tank 12 in which the diffuser 62 is located, is either sufficiently treated for immediate use or has been subject to at least one step of the multi-treatment purification operation. Water thus treated enters the pipe 60 through the diffuser 62, and the conditioning ingredients 22 are prevented from flowing into the pipe by screen 64. Referring again to FIGS. 1 and 2b, the male adapter 18b is seen to be disposed in the smooth-walled upper portion of the outlet opening 54 for channelling the treated water to a consumer's point of use or to a subsequent treatment.

As has been previously emphasized, it is an important aspect of the instant invention to effect a quick and simple connection of the male adapters 18 to and from the adaptive manifold 16. To this end, four holding pin receiving channels 66a, 66b, 66c and 66d are disposed in the cylindrical heads 39a and 39b of the manifold 16. The channels 66 are perpendicular to the longitudinal axis of the manifold 16 and extend, excepting interruptions caused by communication of the channels with the inlet and outlet openings 42 and 54, through the cylindrical heads of the manifold.

As can best be seen in FIGS. 2*b* and 3, channels 66*a* and 66*b* are situated in tangential alignment on either side of opening 42, and channels 66*c* and 66*d* are similarly situated in tangential alignment on either side of opening 54. Fitted in channels 66 are a pair of two pronged holding pins 72 and 73. Holding pin 72 has prongs 72*a* and 72*b* which fit in channels 66*a* and 66*b* on either side of opening 54. Holding pin 73 has prongs 73*a* and 73*b* which fit in channels 66*c* and 66*d* on either side of opening 42.

Complementary to the channels 66 as they are interrupted when communicated with the inlet and outlet openings 42 and 54 and adapted to receive the prongs of holding pins 72 and 73 when inserted in place within channels 66 are a plurality of annular grooves 68 located on a grooved extension 70 of the male adapters 18. Male adapters 18 are shown in place in FIG. 2*b* in the inlet and outlet openings 42 and 54 of the manifold 16. This is accomplished by the prongs 72*a*, 72*b*, 73*a* and 73*b* of holding pins 72 and 73 received within the channels 66 which mate with one of the grooves 68 in adapters 18 to thereby retain the adapters in place in the manifold. A plurality of grooves 68 may be formed in the extension 70 to allow positioning of the adapters 18 at different vertical heights. This flexibility allows for adjustment when, for examples, an uneven tank height is encountered in a series connection of water conditioning service units 10. FIG. 2*b* shows adapter 18*a* positioned lower than adapter 18*b*.

The annular grooves 68 are concavely formed in the grooved extension 70 to provide a more positive fitting with the prongs of holding pins 72 and 73. Other grooves 74 in the extension 70 receive one or more O-rings 76 which sealably press against the interior smooth surfaces of the inlet and outlet openings 42 and 54, thus providing a seal to prevent fluid loss through said openings.

External body portion 78 of the male adapter 18 surmounts the grooved extension 70 and is formed with a large-mouthed conduit 80 which enters the portion 78 at right angles to the extension 70. The conduit 80 executes a right-angle turn and extends through the extension 70 to provide a flow path either into or from the service unit 10. The walls of the conduit 80 disposed immediately interior of the external opening of the conduit are preferably formed with threads 82 to securely receive a threaded end portion 84 of one of the hoses or pipes 20.

The male adapter 18*b* may be fitted with a deionizer endpoint light (not shown) for signalling the end of the useful life of the conditioning ingredients 22 which are in the tank 12. An indicator which can be readily utilized with the present invention is that disclosed in U.S. Pat. No. 3,334,745, issued to W. R. Burgess et al. Such fitting is accomplished by simply machining a longitudinal threaded bore through the flat wall portion 79 to receive the threaded base of the light and project the electrodes of the light into the water flow in conduit 80.

From the foregoing description and related drawings, it can readily be seen that the manifold assembly of the instant invention requires for normal water treatment a minimum of parts, is simple and is adapted for rapid and facile connection and disconnection. With holding pins 72 and 73 removed from channels 66, the identical male adapters 18*a* and 18*b* can be inserted into the smooth-walled portions of openings 42 and 54. It is

then necessary only to align the desired height of the male adapters and insert holding pins 72 and 73 so that prongs 72*a* and *b* and 73*a* and *b* fit into their appropriate channels 66 and engage the desired groove 68 in the extension 70 of each male adapter 18. Disconnection can be accomplished by following the simple reverse procedure; removing pins 72 and 73 from channels 66 disengages the prongs thereof from the grooves 68 and the male adapters 18 are then free to be removed from the smooth-walled openings 42 and 54. It is now apparent from the foregoing description that the manifold and water supply apparatus of the service unit 10 may be quickly and simply assembled and operated to allow individual or series use of said units 10 without time-consuming set-up procedures or accessory tools.

The importance of rapid and facile water conditioning ingredient removal and replenishment has been previously referred to. The invention provides cooperating means for expeditiously accomplishing these operations. The means and concomitant method used for filling the service unit 10 will now be described, FIGS. 4 and 5 showing the apparatus used and the manner of its use. Referring particularly to FIG. 4, the assembly for filling the service unit 10 with water conditioning ingredients 22 is shown and is referred to hereinafter as adaptive filler 100. The non-deformable filler 100 includes an arcuate elbow body portion 102, which has a curved conduit 104 disposed throughout and a cylindrical extension 106 at its lower end portion. Annular grooves 110 are disposed externally on the cylindrical extension 106 and perform a function analagous to that of the annular grooves 68 in the male adapters 18. That function is more readily seen by reference to FIG. 5, wherein the adaptive filler 100 is seen to be inserted into the inlet opening 42 of the adaptive manifold 16. The holding pin 73 is received by groove 110 in the filler 100 and retains said filler within the inlet opening 42. Sealing of the filler 100 into the opening 42 is accomplished by two O-rings 112 disposed in two of the grooves 110. The structure of the adaptive filler 100 is completed by a tubular vent 114 which extends through the wall of the elbow body portion 102, into the conduit 104, and ends by projecting below the extension 106. A mesh screen 116 is fitted over the open interior end portion of the vent 114.

Prior to the filling operation shown in FIG. 5, the tank 12 has previously been evacuated of all water conditioning ingredients 22 and water. Prior to insertion of the filler 100, the screen 50 is removed to allow the filling operation to proceed. As seen in FIG. 5, the adaptive filler 100 is retained in the inlet opening 42 by the holding pin 73 to prevent its disengagement during the filling operation and is sealed by O-rings 112 which engage the smooth-walls of the opening. A source of water conditioning ingredients 22 is fed to conduit 104 of the filler 100, and the ingredients 22 are allowed to flow into the tank 12. A source of ingredients 22 could take the form of the resin transfer plant disclosed in U.S. Pat. No. 3,190,320, issued to W. R. Burgess et al.

Although the transfer plant of Burgess et al is intended for use with a service unit having an additional opening for ingredient replenishment and removal, a valved filler tank such as is disclosed by Burgess et al could be connected to conduit 104 of the filler 100 for discharging the ingredients 22 into the service unit 10.

Water is simultaneously discharged into the tank 12 to facilitate flow of the ingredients into the tank and ingredient settlement therein. When working with deionization resins, only mineral-free water should be used during the filling operation so that the capacity of the ingredients being transferred into the unit 10 will not be diminished.

Air in the tank 12 is displaced from the tank through the vent 114, the screen 116 preventing access into the vent of the conditioning ingredients 22. After the tank 12 has been nearly filled, the carrier water which has flowed into the tank with the ingredients 22 will also be vented from the tank through the tubular vent 114. Water may also flow through the outlet opening 54 in the adaptive manifold 16. Although the male adapter 18b and associated hose 20b is not shown to be connected to the service unit in FIG. 5, this connection can advantageously be maintained to provide a drainage path for the overflowing water. To insure complete filling of the tank 12, the service unit 10 may be vibrated during the filling operation to cause the conditioning ingredients 22 to pack more densely into the tank.

Upon completion of the filling operation, the adaptive filler 100 is removed from the manifold 16. Removal of the filler 100 is readily accomplished by the previously described expedient of removing the holding pin 73 from its receiving channel 66. Since the unit 10 is now refilled, the screen 50 is again inserted in place and the male adapter 18a inserted into the opening 42 and retained therein by insertion of the holding pin 73 into the channels 66 to make the unit ready for operation. If male adapter 18bis not assembled, it should also be similarly connected.

After a period of use, the water conditioning ingredients 22 lose their water conditioning capacity and must be regenerated to regain treatment efficiency. The present invention is adapted to remove the ingredients 22 from the service unit 10 in a simplified fashion without loss of the costly ingredients. The removed ingredients can then be regenerated in separate equipment. A means for removing the ingredients 22 is shown in FIGS. 6 and 7.

Referring particularly to FIG. 6, an assembly which may be used for removing the ingredients 22 from the service unit 10 is shown and is referred to hereinafter as adaptive evacuator 200. The non-deformable evacuator 200 includes an arcuate elbow body portion 201 comprising a cylindrical portion 202 and a cylindrical extension 204 projecting from cylindrical portion 202 at substantially a right angle. The body portion 201 has an axially disposed flow conduit 206 within the cylindrical portion 202 which is open at its lower end and communicates at its upper end with access conduit 208 axially formed in extension 204. The access conduit 208 enlarges at its outer end, forming a threaded recess 218 for receiving threaded connector 220. The connector 220 is securely joined by nut 222 to nipple 224. If desired, threaded connector 220, nut 222 and nipple 224 may be molded or formed as a single integral component. A water inlet part 226 extends through the nipple 224 and the connector 220 and communicably aligns with the access conduit 208.

The top of the body portion 201 has a threaded opening 228 therein which substantially aligns with conduit 206. A resin exit pipe generally designed at 213 has a male threaded connection 232 which at its top is threadedly engaged with the female threads 234 of the

lower end of an elbow member 236. The lower end of threaded connection 232 has mounted thereon, as by solvent welding, an exit tube 214. The male threads of connection 232 are designed to mate with the threaded opening 228 for mounting the exit pipe 213 onto and within the body portion 202. When so mounted, the exit tube 214 is concentrically disposed within and extends through the flow conduit 206. The exit tube 214 has an outer diameter which is smaller than the inner diameter of the conduit 206, thus providing a space 207 suitable for maintaining a volume of water flow through the said conduit 206. Conduit 206 has a bevelled portion 213 at its exit end to provide substantially uniform water flow out of extension 210 around exit tube 214. Exit tube 214 is of sufficient length to extend substantially to the bottom of tank 10 when the threaded connection 232 is properly mated with opening 228.

Conduit 240 formed in the threaded connection 232 and the elbow member 236 establishes a flow passage with opening 217 in exit tube 214 from the bottom of tank 10 to the exterior of the service unit. This arrangement establishes one flow path through the adaptive evacuator 200 by means of exit pipe 213 and another flow path through conduits 206 and 208 of the cylindrical body portion 201.

Adaptation of the adaptive manifold 16 to conditioning ingredient removal from the unit 10 is shown in FIG. 7. The adaptive evacuator 200 is inserted in the inlet opening 42 in the adaptive manifold 16. Annular groove 243 in the conduit sleeve portion 212 of body 201 is aligned with the receiving channels 66 to receive the prongs 73a and b of holding pin 73, thereby retaining the evacuator 200 in the opening 42. O-rings 244 seal the opening 42 from fluid loss through the assembly of the evacuator 200 within inlet opening 42. The outlet opening 54 is sealed, by means of plug 201 or similar device to maintain subsequently induced pressure in the tank, such as a plugged male adapter 18. Plug 201 is assembled in the same fashion as the other male elements using holding pin 72, groove 243 and O-ring 245. Removal of the water conditioning ingredients 22 is now accomplished by the forced introduction of water through the water inlet port 226.

Water supply line 246 is conveniently represented as the external water source. Water introduced into the inlet port 226 is directed into the tank 12 by the conduit geometry established in the evacuator 200. Specifically, water passes through the access conduit 208 into the flow conduit 206 and out of the evacuator 200 through the lower portion 212 of the body 202. The pressure of the water entering the tank 12 forces the conditioning ingredients 22 upwardly through the exit tube 214 and thereby through the exit conduit 240 to water conditioning ingredient disposal line 248. The ingredients 22 are subsequently directed to a suitable receiving vessel (not shown) for eventual regeneration. After complete removal of the ingredients 22, the tank 12 is emptied of the water remaining therein and is readied for replenishment with regenerated water conditioning ingredients.

It is also contemplated within the scope of the present invention that the water conditioning ingredients can be removed from the tank 12 without the necessity of utilizing the special evacuator adaptor 200. This removal can similarly be accomplished by inverting the unit 10 with male adaptors 18 mounted within both the

inlet opening 42 and exit opening 54 as previously described but without the screen 50 in place, and simply reversing the water flow. The water would enter the bottom of the tank (now at the top) through diffuser 62 and the water conditioning ingredients would flow out through conduit 80 of the male adapter 18 assembled in inlet opening 42. The ingredients could readily be directed to a suitable receiving vessel by conduit 20.

The present manifold assembly 14 is thus seen to be adaptive to normal water treatment operation, to removal of exhausted water conditioning ingredients contained within a service unit, and to replenishment of regenerated ingredients to the empty service unit. It is of importance that the same opening of the adaptive manifold 16, the inlet opening 42, is used in the performance of the resupply functions as well as for normal treatment functioning. The multiple use of the inlet opening 42 simplifies the structure and utility of the manifold assembly, together with the smooth-walled character of the inlet and outlet openings allowing more rapid completion of normal maintenance operations as described previously. In addition, it is of major significance in considering the economy resulting from the design of the instant invention that the basic parts can be molded or formed of any suitable material such as plastics, stainless steel, etc., and the basic component of each adaptor means is identical. In other words, the male adaptors 18, the arcuate elbow body portion 102 of the filler 100 and the cylindrical body portion 201 of the evacuator may be identical.

While the instant invention has been described with particular application to water treatment service units containing water conditioning ingredients, such as ion exchange resins, it is not believed that the invention and the quick disconnect adaptive manifold together with adaptive components thereof is necessarily limited to only such applications. Rather, it is believed that the adaptive manifold together with the adaptive components of this invention can be applied to any closed vessel system where a fluid passes into the closed vessel and exits therefrom after some chemical or physical reaction with the active ingredients in the vessel. For example, it is contemplated that this invention can be adapted not only to service-type water conditioning equipment where the closed vessel might contain carbon, organic removal resin, mixed-bed resins, separate-bed resins, diatomaceous earth, sand filters, water softeners, and the like, but also in permanent type equipment where the conditioning ingredients are removed and added on-site as well as in such divergent fields as treatment of gases and smoke.

Moreover, numerous structural modifications can be made in the components disclosed without departing from the spirit and scope of the invention. Accordingly, the foregoing is illustrative only of the principles of the invention and it is not desired to limit the invention to the construction and operation as described and shown, except as specified in the accompanying claims.

What is claimed is:

1. A quick disconnect manifold assembly for a tank in which a fluid may be treated, which manifold assembly is adaptable to a variety of operating functions and which comprises:

- a. manifold means adapted to be sealably attached to the tank through a single opening therein, at one end thereof, and having only an inlet opening and

an outlet opening which extend through said manifold means and open into the interior of the tank;

- b. a first substantially rigid reusable adaptive means releasably disposed in an adjustable position in the inlet opening for establishing a flow path into the interior of the tank;
- c. sealing means for sealing said first substantially rigid reusable adaptive means in said inlet opening;
- d. a second adaptive means sealably disposed in an adjustable position in the outlet opening for establishing a second flow path from the interior of the tank;
- e. fluid conduit means connected to said manifold and communicating with said outlet opening, said fluid conduit means extending substantially to the other end of the tank for channelling fluid from within the tank into the outlet opening and the second adaptive means; and
- f. retaining means extending through the manifold means and engaging said first adaptive means for releasably retaining said first adaptive means in one of a number of selected positions within the inlet opening.

2. A quick disconnect manifold assembly for a tank in which a fluid may be treated, which manifold assembly is adapted to be connected to the tank to receive various adapters capable of performing a variety of operating functions comprising:

- a. manifold means adapted to be sealably attached to the tank through a single opening therein, at one end thereof, said manifold means defining an inlet opening having a smooth wall female portion and an outlet opening which extend through said manifold means and open into the interior of the tank;
- b. a first adaptive means sealably and releasably disposed in the inlet opening for establishing a flow path into the interior of the tank, said first adaptive means including a male portion which substantially conforms to the smooth wall of said female portion and has mounted thereon one or more O-rings, each of which sealably press against said smooth wall female portion to prevent fluid loss through said opening;
- c. a second adaptive means sealably disposed in the outlet opening for establishing a second flow path from the interior of the tank;
- d. fluid conduit means communicating with said outlet opening and extending substantially to the other end of the tank for channelling fluid from within the tank into the outlet opening and the second adaptive means; and
- e. retaining means extending through the manifold means and engaging said first adaptive means for releasably retaining said first adaptive means within the inlet opening.

3. A quick disconnect manifold assembly according to claim 2 wherein the manifold means includes one or more channels tangential to the smooth wall female portion, said retaining means includes one or more retaining elements which extend in said one or more channels of said manifold means, and said male portion of the first adaptive means includes a plurality of complementary grooves, each of which is constructed to be aligned by the movement of said first adaptive means

in said smooth wall female portion with one or more of said channels, to selectively receive said one or more retaining elements.

4. A quick disconnect manifold assembly according to claim 3, wherein said male portion of the first adaptive means includes a series of spaced complementary grooves to adjustably position the first adaptive means within the inlet opening.

5. A quick disconnect manifold assembly according to claim 1 wherein said first adaptive means has a fluid conduit for directing untreated water into the tank for treatment therein and the second adaptive means has a fluid conduit for directing treated water from the tank.

6. The manifold apparatus of claim 5 wherein the apparatus further includes a screen means disposed at the interior end of the inlet opening for preventing particulate contamination or loss of the water conditioning ingredients therethrough.

7. A quick disconnect manifold assembly according to claim 1 wherein said first adaptive means comprises a filler means to fill the tank with ingredients for treating fluid.

8. A quick disconnect manifold assembly according to claim 1 wherein said first adaptive means comprises an adaptive evacuator means having a conduit for introducing fluid under pressure into one end of said tank and a second conduit for allowing ingredients within the tank to be evacuated under the pressure of the entering fluid when the outlet opening is sealed by seal means, said second conduit extending into the interior of said tank for receiving the water conditioning ingredients pressureably forced therein to and for directing said ingredients from the tank through a conduit in the exit pipe.

9. A quick disconnect manifold assembly according to claim 5 wherein said second adaptive means is substantially identical to said first adaptive means and said outlet opening is substantially identical to said inlet opening.

10. A manifold apparatus for a water treatment unit, which apparatus is adaptable to a variety of operating functions, including the introduction of water conditioning ingredients into said unit, the apparatus comprising:

- a. manifold means sealably attached to the unit at one end thereof said manifold means having only two openings extending therethrough into the interior of the unit which serve as an inlet opening and an outlet opening for said unit; and

an adaptive filler means sealably inserted into one of said openings in said manifold means for directing water conditioning ingredients supplied externally of said filling means therethrough and into the unit, said adaptive filler means including a venting means for displacing air and excess water from the unit during the filling operation.

11. A manifold apparatus for a water treatment unit, which apparatus is adaptable to a variety of operating functions, including the introduction of water conditioning ingredients into said unit, the apparatus comprising:

- a. manifold means sealably attached to the unit at one end thereof, said manifold means having only two openings extending therethrough and opening into the interior of the unit to form an inlet opening and an outlet opening, and,

- b. an adaptive filler means sealably inserted into said inlet opening in said manifold means for directing water conditioning ingredients supplied externally of said filling means therethrough and into the unit, said adaptive means comprising a body portion having a conduit disposed therein or directing the water conditioning ingredients introduced at one end thereof into the service unit; and a tubular vent disposed within the conduit and which extends through said body portion with its outer end exterior of the body portion and communicating with the atmosphere and its inner end extending into the interior of the service unit below the conduit for displacing air and excess water from said service unit during the filling operation.

12. The manifold apparatus of claim 11 wherein said adaptive filler means is releasably retained within one of said openings by a retaining means which extends through the manifold means and engages the body portion of said filler means.

13. The manifold apparatus of claim 11 wherein the conduit disposed within the body portion has a right angular configuration and the tubular vent is substantially straight.

14. The manifold apparatus of claim 11 wherein the adaptive filler means is sealably inserted within said inlet opening in the manifold means by one or more O-rings which are retained on the exterior of said body portion and sealably engage the opening in the manifold means.

15. The manifold apparatus of claim 11 wherein said manifold means and said body portion are molded plastic parts.

16. A manifold apparatus for a water treatment unit, which apparatus is adaptable to a variety of operating functions including the removal of water conditioning ingredients from said unit, the apparatus comprising:

- a. manifold means sealably attached to the unit at one end thereof, said manifold means having two openings extending therethrough and opening into the interior of the unit, one of said openings being sealed by plug means to prevent pressure loss therethrough; and

- b. an adaptive evacutive means sealably inserted into the other opening for directing water under pressure into said unit through said evacutive means and for directing the water conditioning ingredients from the service unit through said evacutive means and for directing the water conditioning ingredients from the service unit through said evacutive means;

said adaptive evacutive means comprising:

- c. a body portion having a conduit therein for directing water under pressure into the service unit;

- d. an exit pipe extending through the body portion and into the interior of the unit for receiving the water conditioning ingredients pressureably forced thereinto and for directing said ingredients from the service unit through a conduit associated with the exit pipe; and

- e. adaptive evacutive means being releasably retained within said opening of the manifold means in one of a number of selected positions by a retaining means which extends through the manifold means and engages the adaptive evacutive means.

17. The manifold apparatus of claim 16 wherein said exit pipe extends substantially to the other end of the service unit.

18. A manifold apparatus kit for a water treatment unit which is quickly and simply adaptable to the functions of filling said unit with water conditioning ingredients, of directing water into the unit for treatment by said conditioning ingredients and removal of the treated water therefrom, and of removing the conditioning ingredients from said unit when the ingredients have lost their treatment capability, the apparatus comprising:

- a. manifold means sealably attached to one end of the unit, said manifold means having only inlet and outlet openings extending therethrough and opening into the interior of the unit.
- b. a plurality of interchangeable adaptive means for selective sealably insertion in the inlet or outlet openings, one adaptive means sized and shaped so that the filling of said unit with water conditioning ingredients can be accomplished, at least two second adaptive means sized and shaped so that untreated water can be directed into the unit and treated water can be removed from the unit, and a third adaptive means sized and shaped so that exhausted water conditioning ingredients can be removed from said unit;
- c. at least two retaining means, one retaining means adapted to extend through the manifold means and engage the adaptive means disposed in the inlet opening, and another retaining means adapted to extend through the manifold means and engage the adaptive means disposed in the outlet opening, each of said retaining means releasably retaining the adaptive means within its respective opening during performance of said function; and,
- d. water exit means associated with said outlet opening and extending to the other end of the service unit.

19. The manifold apparatus of claim 18 wherein the apparatus is adapted to directing water into the service unit for treatment therein and to removing the treated water from the unit, and wherein the adaptive means comprises a first male adaptor sealably disposed in the inlet opening for directing untreated water into the service unit, the manifold apparatus further comprising:

- a. a second male adaptor sealably disposed in the outlet opening for directing treated water from the service unit, and being retained in the outlet opening by said retaining means; and,
- b. screening means disposed at the interior end of the inlet opening for preventing particulate contamination and loss of the water conditioning ingredients therethrough.

20. The manifold apparatus of claim 18 wherein the apparatus is adapted to filling said service unit with water conditioning ingredients carried by demineralized water and wherein the adaptive means comprises an adaptive filler for directing water conditioning ingredients through the filler and into the service unit, the adaptive filler comprising:

- a. a body portion having a conduit disposed therein for receiving water conditioning ingredients at one end thereof; and,
- b. a cylindrical filler tube received in the other end of said conduit, said conduit extending through said filler tube and opening into the interior of the

service unit whereby water conditioning ingredients supplied into said conduit are directed into the service unit.

21. The manifold apparatus of claim 18 and further comprising:

- a. a tubular vent disposed in the conduit, said vent extending at one end through the body portion of the adaptive filler and exteriorly of said body portion, and extending at its other end into the interior of the service unit for displacing air and excess water from the service unit during filling thereof with the water conditioning ingredients; and,
- b. retaining means extending through the manifold means and engaging said adaptive filler for releasably retaining said adaptive filler within the inlet opening during supply of water conditioning ingredients into the service unit.

22. The manifold apparatus of claim 18 wherein the apparatus is adapted to removing the water conditioning ingredients from the service unit, and wherein the adaptive means comprises an adaptive evacuator for directing water under pressure into the service unit, thereby forcing water conditioning ingredients from the service unit through said adaptive evacuator, the adaptive evacuator comprising:

- a. a body associating with a conduit disposed therein for directing water therethrough and into the service unit; and
- b. an exit pipe extending through the conduit in the body portion and into the interior of the service unit for receiving the water conditioning ingredients pressurably forced theretinto and directing said ingredients from the service unit through a conduit in the exit pipe.

23. A water treatment service unit adapted to contain water conditioning ingredients, which unit comprises a tank, a manifold means sealably secured in an opening in one end of said tank, said manifold means including (a) only an inlet and an outlet opening extending therethrough and opening into the interior of the tank, at least said inlet opening having a smooth wall female portion for releasably receiving an adaptive means, and (b) one or more retaining channels extending through said manifold means and into at least the smooth wall inlet opening for receiving at least one retaining element inserted in one of said channels to releasably retain said adaptive means, and a water exit means extending from the interior end of the outlet opening to the other end of said tank.

24. The water treatment service unit according to claim 23 wherein both said openings have smooth wall female portions for releasably receiving adaptive means and wherein said retaining channels extend into both said openings for receiving retaining elements in said channels to releasably retain adaptive means therein.

25. The water treatment service unit according to claim 23 wherein said tank includes a quantity of water conditioning ingredients and a pair of adaptive means sealably disposed in the two openings, the adaptive means in the inlet opening directing untreated water into the service unit for treatment therein and the other adaptive means directing treated water from the service unit.

26. The water treatment service unit according to claim 25 wherein said pair of adaptive means are substantially identical and of molded plastic.

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27. The water treatment service unit according to claim 25 wherein the adaptive means sealably disposed in said inlet opening is retained in said opening by one or more retaining elements which extend through said manifold means in one or more retaining channels and engage a complementary groove defined by said adaptive means.

28. The water treatment service unit according to claim 27 wherein the adaptive means sealably disposed in said inlet opening defines a series of complementary grooves for receiving the retaining elements to thereby allow adjustable positioning of said adaptive means within said opening.

29. The water treatment service unit according to claim 25 wherein the adaptive means disposed within the inlet opening is sealed therein by one or more O-rings which are retained in grooves defined by said adaptive means and sealably press against the smooth walls of said opening.

30. A quick disconnect manifold assembly for a tank having an opening therein, which manifold assembly is adapted to a variety of operating functions and which manifold assembly comprises: manifold means adapted to be sealably secured in an opening of said tank, and having only a straight-bore inlet opening and an outlet opening which extend therethrough and which open into the interior of the tank; a first substantially rigid reusable adaptive means releasably disposed in the inlet opening for establishing a flow path into the interior of the tank; a second reusable adaptive means seal-

ably disposed in the outlet opening for establishing a flow path from the interior of the tank; sealing means for sealing said first substantially rigid reusable adaptive means in said straight-bore inlet opening; and retaining means for releasably retaining at least the first of said adaptive means in one of a number of selected positions within its opening.

31. A quick disconnect manifold assembly according to claim 30 wherein said first adaptive means takes the form of a fluid conduit for directing untreated water into the tank for treatment therein, and wherein the second adaptive means takes the form of a fluid conduit for directing treated water from the tank.

32. A quick disconnect manifold assembly according to claim 30 wherein said first adaptive means takes the form of a filler means for filling the tank with ingredients for treating a fluid.

33. A quick disconnect manifold assembly according to claim 30 wherein said first adaptive means takes the form of an adaptive evacuator having a conduit for the introduction of a fluid under pressure into one end of said tank, and having a conduit for the expulsion of exhausted treatment ingredients from the tank, the pressure of the entering fluid serving to develop the force for expelling the exhausted treatment ingredients when the outlet opening is sealed; and wherein said second adaptive means takes the form of a seal for blocking all flow through said outlet opening.

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