

[54] MIXER PUMP

[75] Inventor: Wilton W. Weltmer, Wauwatosa, Wis.
[73] Assignee: Allis-Chalmers Corporation, Milwaukee, Wis.
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[58] Field of Search 259/7, 8, 95, 97, 5, 6, 259/23, 24, 43, 44, 66, 67, 96; 417/430, 478

[56] References Cited

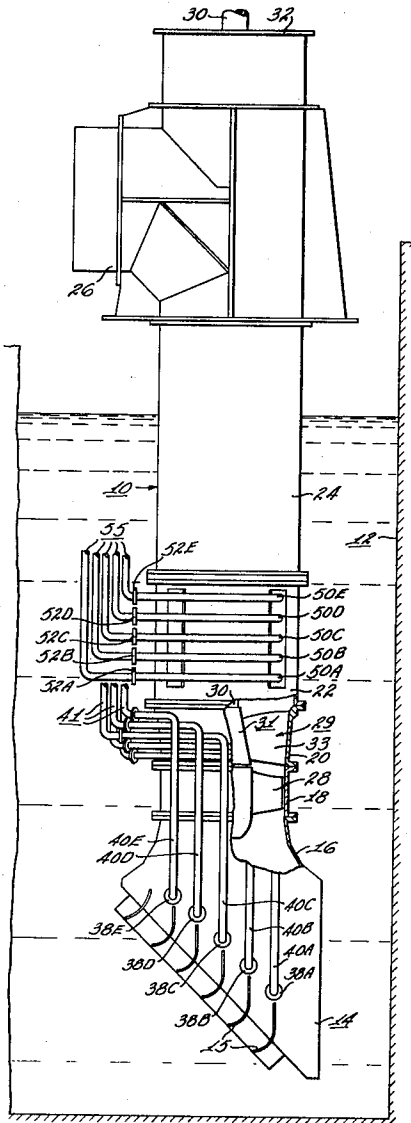
UNITED STATES PATENTS			
2,772,863	12/1956	Harney	259/95
3,243,268	3/1966	Handlos	259/8
3,378,236	4/1968	Tatusi	259/95
3,684,251	8/1972	Bowling	259/8

Primary Examiner—Robert W. Jenkins
Attorney, Agent, or Firm—Robert C. Sullivan

[57] ABSTRACT

A mixer pump suitable for, but not restricted to, use in pumping water from a receiving tank in a municipal water supply system or the like and including means for separately injecting a plurality of chemical treating agents or the like into the water being pumped. In the illustrated embodiment, means are provided for separately injecting a plurality of chemical treating agents each at a plurality of spaced locations into the water stream on the suction side of the pump impeller whereby the chemical treating agents in passing through the impeller are intimately mixed with the water; and means are additionally provided for separately injecting a plurality of additional chemical treating agents each at a plurality of spaced locations into the interior of the pump housing on the discharge side of (i.e., downstream of) the impeller, particularly on the discharge side of the pump diffuser if there is a pump diffuser.

22 Claims, 9 Drawing Figures



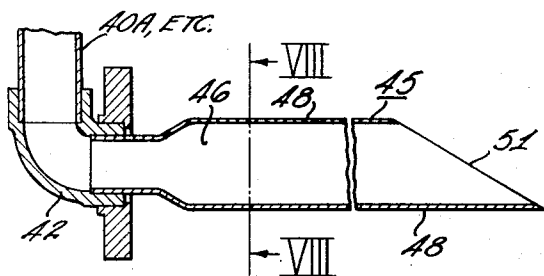


Fig. 7

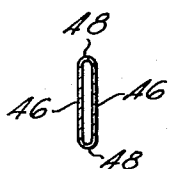


Fig. 8

Fig. 1

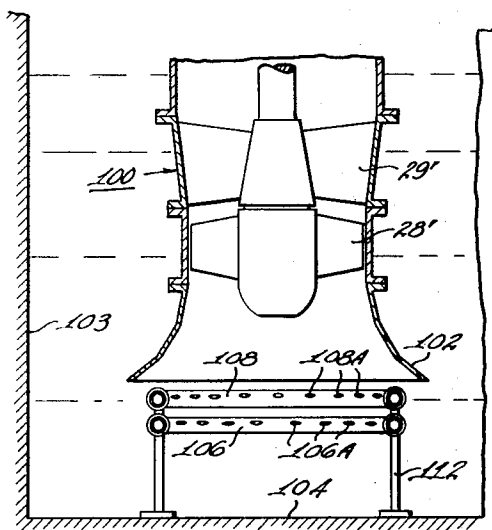
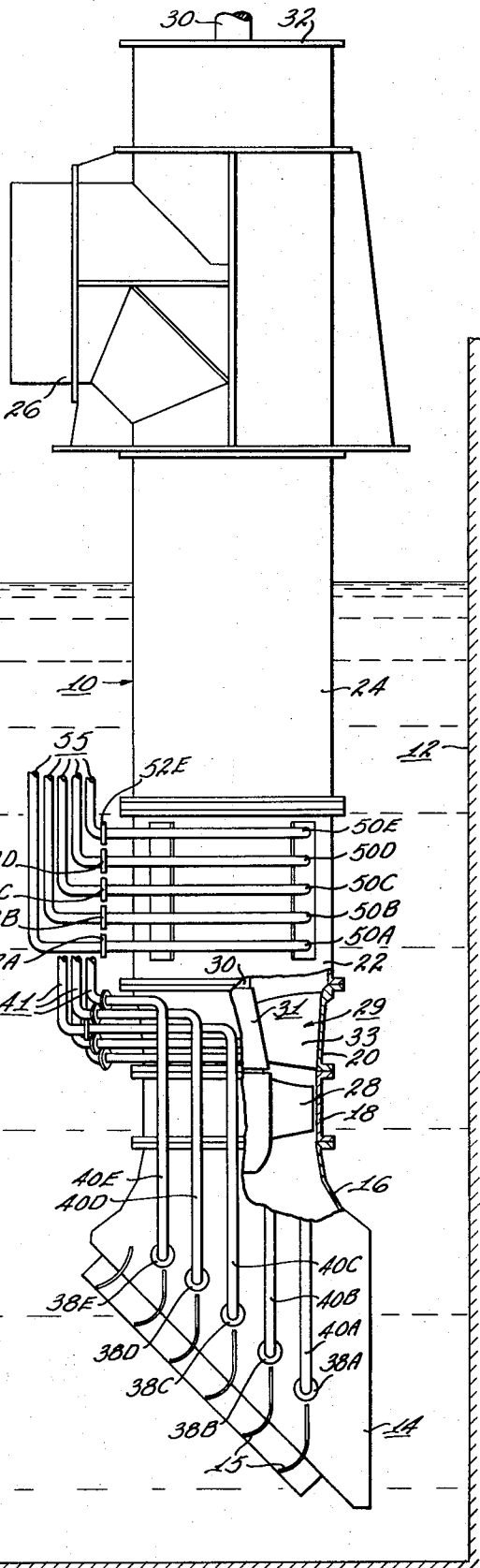
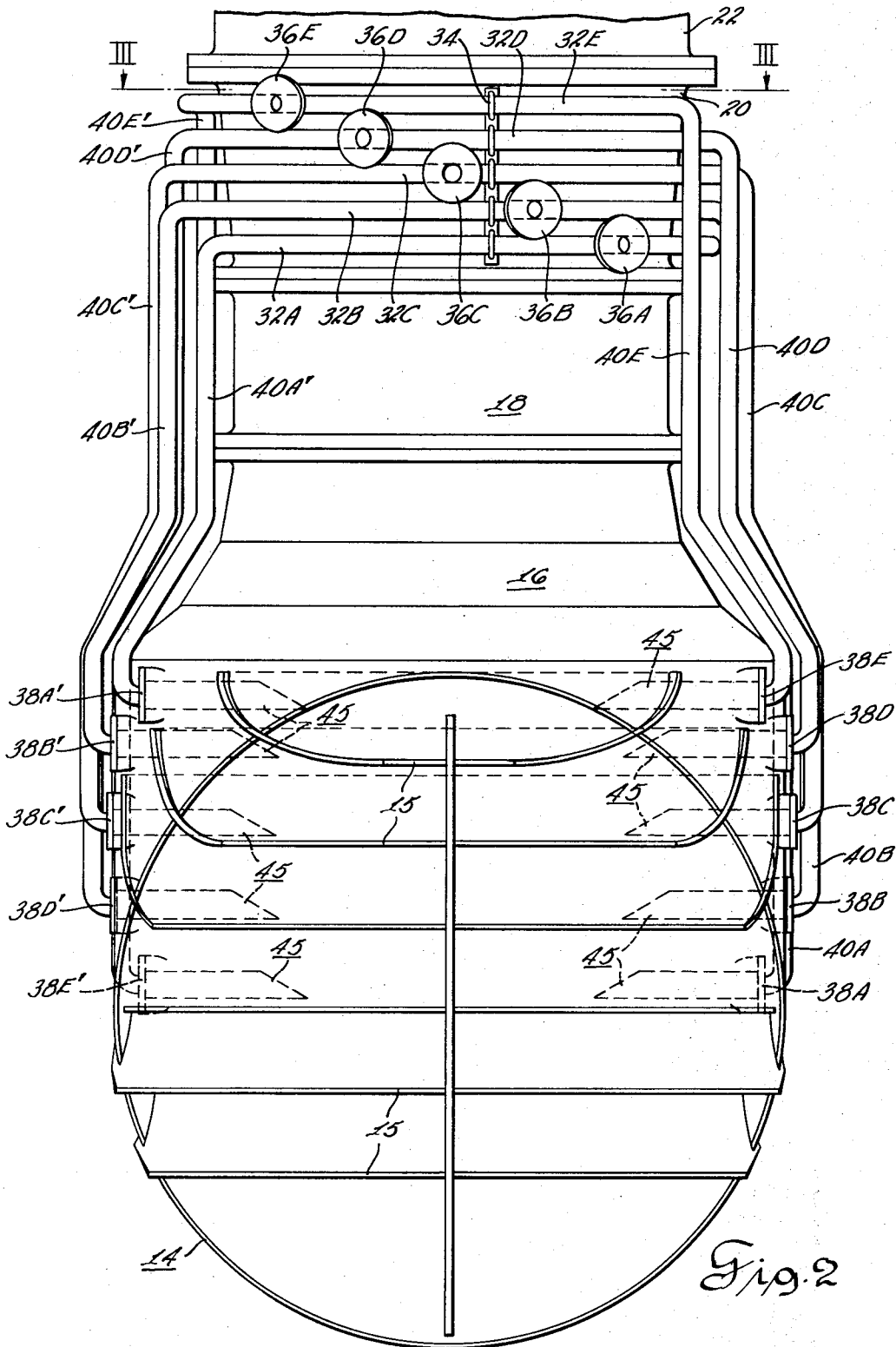
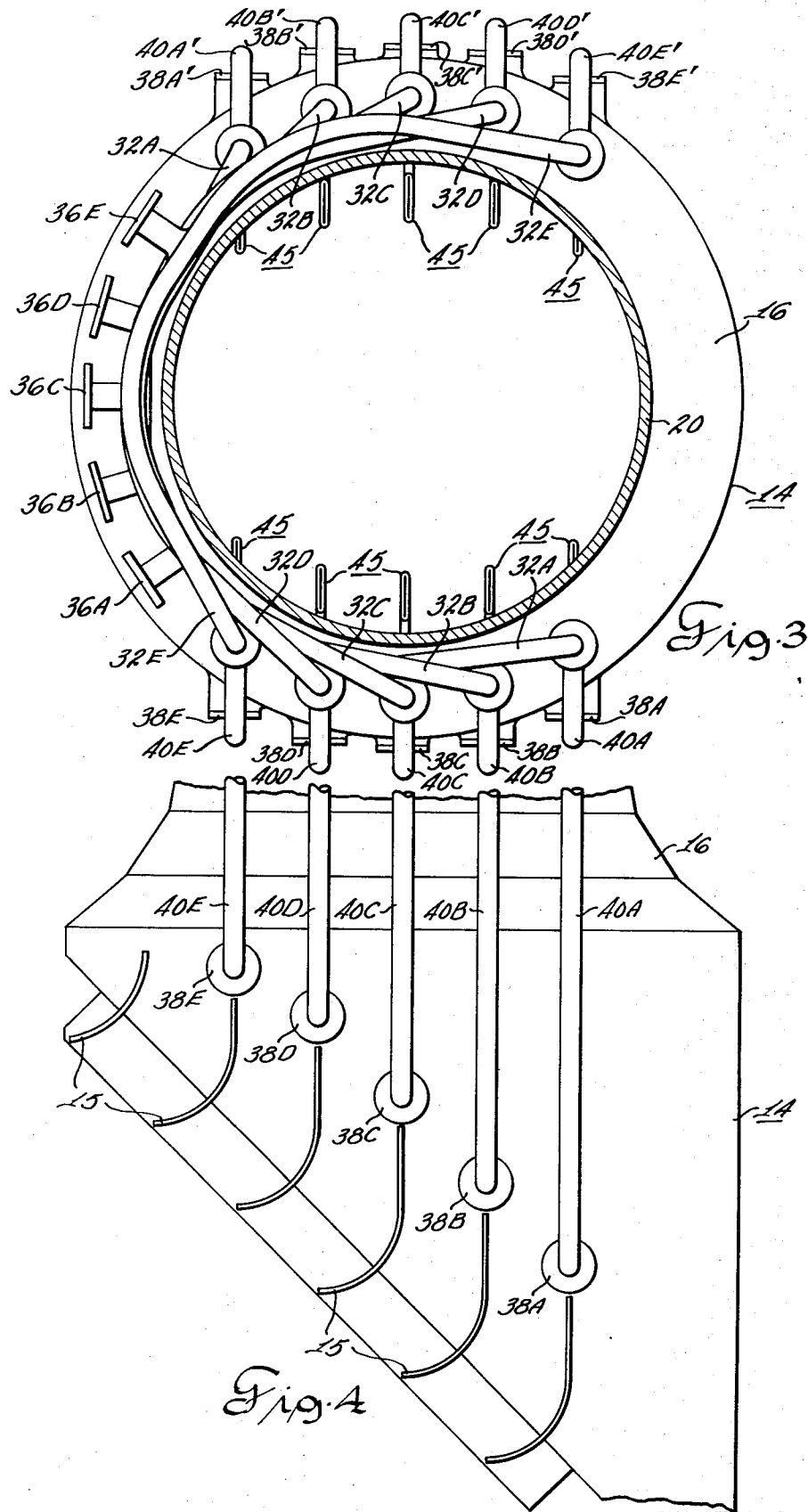
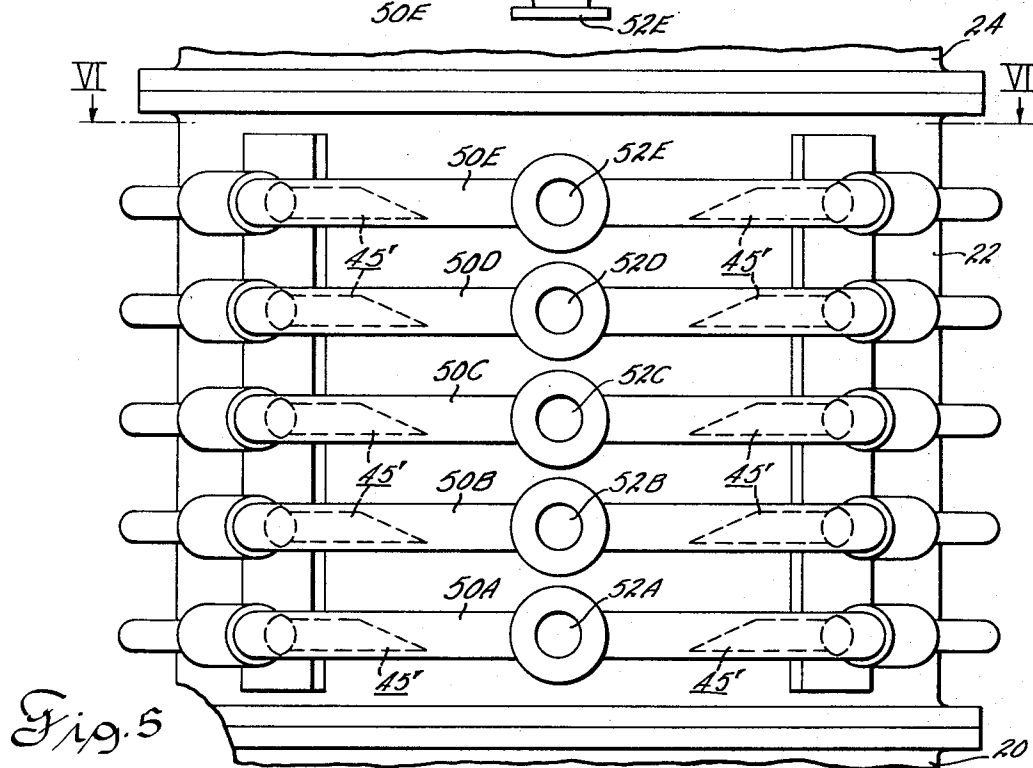
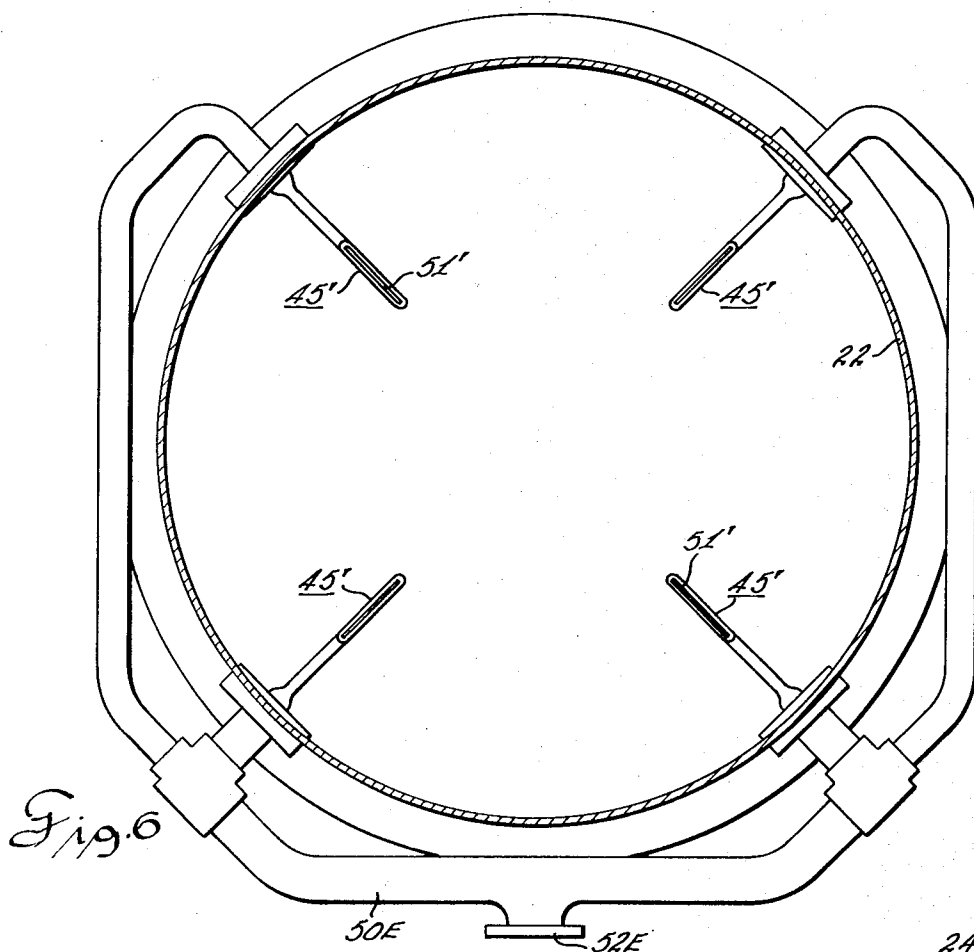


Fig. 9







BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a mixer pump for pumping a fluid such as water or the like and including means for injecting one or more chemical treating agents or the like into the fluid stream passing through the pump.

Although not restricted to such use, the invention has particular utility when applied in connection with a mixer pump used for pumping water in a municipal water supply and including means associated with the pump for injecting chemical treating agents or the like into the stream of water passing through the pump. However, in its broader aspects, the invention is applicable to any application, such as a chemical process or the like, for example, in which a mixer pump might be used to inject chemical treating agents or the like into a fluid stream being pumped by the mixer pump.

A mixer pump in accordance with an embodiment of the invention may be of the order of magnitude of 37 feet high, for example, and be capable of pumping 96,000 gallons of water per minute. The chemical injection apparatus associated with the pump may for example, be capable of injecting a plurality (such as five) different treating agents each at a plurality (such as two) different injection locations in the region of the suction end of the pump; and also be capable of injecting an additional and different plurality (such as five) different treating agents each at a plurality (such as four) different injection locations within the pump structure on the discharge side of (i.e., downstream of) the pump impeller, particularly on the discharge side of the pump diffuser if there is a pump diffuser. In the example just cited, five different treating agents may be injected at a total of ten different injection locations on the suction side of the pump impeller; and five additional and different treating agents may be injected at a total of 20 different injection locations on the discharge side of the pump impeller.

2. Description of the Prior Art

In purifying the water of a municipal water supply it is known to inject one or more chemical treating agents into the water where the water flows into a receiving tank or pool from a reservoir or the like. In at least one municipal water supply installation of which I am aware the water having the chemical treating agent or agents therein is conducted to a large area receiving basin having a number of labyrinth-like flow passages for the water. These labyrinth-like flow passages, combined with a long residence time of the water in the labyrinth basin, promotes molecular diffusion of the treating agents through the water being treated. An installation of the type just described requires a large area for its installation, such as one-half acre, for example. Thus, the prior art type of water purification system of the type just mentioned is objectionable (1) because it is time consuming by reason of the long residence time required for the water in the labyrinth basin to promote molecular diffusion of the treating agent into the water; and (2) the space requirement for a prior art installation of the type just described is frequently undesirable in an urban area where real estate prices are a factor to be considered.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the invention to provide a mixer pump adapted for, but not restricted to, use in a municipal water supply system or the like, including means for injecting at least one chemical treating agent or the like on the suction side of the pumping element of the pump, whereby to promote intimate diffusion of the chemical treating agent with the liquid being treated.

It is another object of the invention to provide a mixer pump which is adapted to pump a fluid such as water and further including means for injecting at least one chemical treating agent or the like into the fluid stream passing through the pump on the suction side of the pump impeller and also for injecting at least one chemical treating agent into the fluid stream on the discharge side of the pump impeller, particularly on the discharge side of the pump diffuser if there is a pump diffuser.

It is another object of the invention to provide a mixer pump which is adapted to pump a fluid such as water, and further including means for separately injecting a plurality of chemical treating agents into the fluid stream passing through the pump on the suction side of the pump impeller and also for separately injecting a plurality of chemical treating agents into the fluid stream within the pump housing on the discharge side of the pump impeller, particularly on the discharge side of the pump diffuser if there is a pump diffuser.

It is a further object of the invention to provide a mixer pump adapted for, but not restricted to, pumping water in a municipal water supply system or the like which is adapted to permit injection into the water of at least one chemical treating agent or the like on the suction side of the pump impeller and to permit the injection into the water of at least one chemical treating agent or the like on the discharge or downstream side of the pump impeller, particularly on the discharge side of the pump diffuser if there is a pump diffuser.

It is a further object of the invention to provide a mixer pump which is adapted to permit injection into the fluid being pumped of at least one chemical treating agent or the like, either on the suction side of the pump impeller, or on the discharge side of the pump impeller, or on both sides of the pump impeller, and further including means for insuring circumferential and inward distribution of each treating agent into the fluid being pumped.

In achievement of these objectives, there is provided in accordance with an embodiment of the invention a mixer pump suitable for, but not restricted to, use in pumping water from a receiving tank in a municipal water supply system or the like and including means for separately injecting a plurality of chemical treating agents or the like into the water being pumped. In the illustrated embodiment, means are provided for separately injecting at least one chemical treating agent into the water stream on the suction side of the pump impeller whereby the chemical treating agent in passing through the impeller is intimately mixed with the water; and means are additionally provided for separately injecting at least one additional chemical treating agent into the interior of the pump housing on the discharge side of the impeller, (i.e., downstream of the impeller), particularly on the discharge side of the pump diffuser if there is a pump diffuser.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a view in vertical elevation, partially broken away, of the mixer pump assembly of the invention;

FIG. 2 is a fragmentary view in vertical elevation showing details of the chemical injection piping contiguous the suction end of the pump assembly;

FIG. 3 is a view in horizontal section along line III—III of FIG. 2, rotated 90° in a clockwise direction;

FIG. 4 is a view in side elevation of the vaned scoop portion of the assembly of FIG. 2 showing the chemical injection assembly mounted thereon;

FIG. 5 is a view in side elevation of the chemical injection piping mounted on the pump housing on the discharge side of the pump impeller, and, more specifically, on the discharge side of the diffuser;

FIG. 6 is a view in horizontal section along line VI—VI of FIG. 5;

FIG. 7 is a detail view in section of one of the chemical injection nozzles of FIGS. 1—6, inclusive;

FIG. 8 is a view in section along line VIII—VIII of FIG. 7; and,

FIG. 9 is a view in elevation, partially cut away, showing a modified arrangement of the chemical injection assembly contiguous the suction end of the pump.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and more particularly to FIG. 1, there is shown a mixer pump assembly in accordance with an embodiment of the invention which is adapted to serve as a mixer pump in the water supply system of a large municipality. The pump assembly generally indicated at 10 in a typical embodiment may have a vertical dimension, for example, of the order of magnitude of 37 feet, an internal diameter of the order of magnitude of 5 feet in the portion thereof above the suction bell, and may have a pumping capacity of the order of magnitude, for example, of 96,000 gallons of water per minute, with a propeller rotating at 300 RPM. The pump 10 is immersed at least at the lower portion thereof in a receiving tank or pool generally indicated at 12 which may be hydraulically connected to one or more remotely located water reservoirs which supply water to receiving tank or pool 12.

The lower end of the pump housing which is immersed in the body of water within receiving tank or pool 12 terminates in an open ended vaned scoop 14 through which water in receiving tank 12 flows to the interior of the pump housing. Vanes 15 mounted on vaned scoop 14 at the inlet end thereof direct water upwardly into the vaned scoop 14. The upper end of vaned scoop 14 is connected to a suction bell 16. Vertically positioned above and suitably joined to suction bell 16 is impeller wearing cylinder 18 within which the pump impeller or propeller 28 is mounted for rotation. Vertically positioned above and suitably joined to the upper end of wearing cylinder 18 is the housing 20 within which the stationary vanes 33 of the diffuser generally indicated at 29 and the pump drive shaft bearing assembly 31 are mounted. Vertically positioned above and suitably connected to the upper end of the housing 20 are lower and upper pipe columns 22

and 24 respectively. A discharge elbow 26 is secured to the upper end of upper pipe column 24. The vaned scoop 14, suction bell 16, impeller wearing cylinder 18, diffuser and bearing assembly housing 20, upper and lower pipe columns 22 and 24 and the discharge elbow 26 when assembled together constitute what may be referred to as the "pump housing." The water which is pumped by pump assembly 10 due to the action of propeller 28 enters the pump housing through vaned scoop 14, passes upwardly through the pump housing, and discharges through discharge elbow 26 into a suitable conduit or the like connected to discharge elbow 26.

Propeller or impeller 28 is suitably mounted for rotation within the interior of impeller wearing cylinder 18. The impeller or propeller 28 is connected to a shaft 30 which is connected to a drive means such as a drive motor mounted on the motor pedestal 32 which is mounted at the upper end of the upper pipe column 24.

Diffuser 29 comprises a plurality of stationary diffuser vanes 33 mounted in circumferentially spaced relation to each other on the interior of the diffuser and bearing assembly housing 20 at the discharge end of impeller 28 for the purpose of reacting with the water discharged from the impeller to change some of the kinetic energy in the water to potential energy, in a manner well known in the art.

Description of Chemical Injection Assembly for Suction End of Pump

Means are provided which will now be described for injecting chemical treating agents or the like at a plurality of spaced locations at the suction end of the pump assembly.

In the embodiment shown in FIGS. 1, 2, 3 and 4, manifold, piping, and discharge nozzle means are provided for injecting a total of five different chemical treating agents each at two different spaced locations at the suction end of the pump assembly. Thus, manifolds indicated at 32A, 32B, 32C, 32D and 32E are mounted in vertically superposed spaced relation to each other on the outer wall of diffuser and bearing assembly housing 20 by means of suitable support brackets 34. Each of the manifolds 32A—32E, inclusive, is provided with a corresponding inlet port 36A, 36B, 36C, 36D and 36E, respectively, through which the chemical treating agent corresponding to each respective manifold is admitted from a source not shown. Thus, the use of five separate manifolds each having its own corresponding inlet port permits each of the five manifolds 32A—32E, inclusive, to be separately connected to a source of a separate and distinct chemical treating agent, if desired. Pipes generally indicated at 41 (FIG. 1) connect the respective manifolds 32A—32E, inclusive, to their corresponding sources of treating agent.

In the illustrated embodiment, each of the manifolds 32A—32E, inclusive, extends in a horizontal plane peripherally of the pump housing by an angle of substantially 180°. Corresponding ends of the plurality of manifolds 32A, etc., are offset or spaced from each other circumferentially of the pump housing. Each of the manifolds 32A—32E, inclusive, communicates at each of the two opposite circumferential ends thereof with a corresponding vertical pipe connected at its lower end to an inlet port to which is connected a corresponding chemical injection nozzle 45. Each injection

nozzle 45 extends a substantial distance inwardly into the hollow interior of the vaned scoop and thus into the path of water flow through vaned scoop 14. Thus, in the illustrated embodiment, each manifold 32A - 32E, inclusive, supplies a chemical treating agent to two injection nozzles 45.

More specifically, in the illustrated embodiment, as seen in FIG. 4, the side wall of the vaned scoop 14 is provided with five circumferentially and vertically spaced flanged inlet ports for the injection of chemicals or other treating agents for the water supply. These inlet ports are indicated at 38E, 38D, 38C, 38B and 38A, respectively. The inlet port 38E is positioned at the highest level of the five ports just mentioned, and the other ports are arranged at progressively lower levels with respect to the vertical axis of the pump structure.

On the opposite wall portion of the vaned scoop, as best seen in the views of FIGS. 2 and 3, similar ports 38A', 38B', 38C', 38D' and 38E' are respectively positioned in the same relative positions as the respective ports 38E, 38D, 38C, 38B and 38A, in the order named. Manifold 32A is connected at the opposite ends thereof through downwardly extending vertical pipes 40A and 40A' to the respective injection inlet ports 38A and 38A'. Similarly, manifold 32B is connected at the opposite ends thereof by vertical pipes 40B and 40B' to injection inlet ports 38B and 38B'; manifold 32C is connected at the opposite ends thereof to injection inlet ports 38C and 38C' by vertical pipes 40C and 40C'; manifold 32D is connected at the opposite ends thereof to the injection inlet ports 38D and 38D' by vertical pipes 40D and 40D'; and manifold 32E is connected at the opposite ends thereof to injection inlet ports 38E and 38E' by vertical pipes 40E and 40E'. Each of the vertical pipes 40A - 40E, inclusive, and 40A' - 40E', inclusive, is connected at the lower end thereof to a corresponding elbow 42 which is received in the corresponding ported opening in the wall of the vaned scoop.

An injection nozzle 45 best seen in FIG. 7 of the drawings, is secured at the radially outer end thereof in the respective elbow fitting 42 of each of the inlet ports 38A - 38E, inclusive, and 38A' - 38E', inclusive, the radially outer end portion of the nozzle being of circular cross section in the region where it is secured to elbow fitting 42. The nozzle 45 is flattened for most of its length to include two flat spaced opposite walls 46 connected by arcuate top and bottom portions 48 as best seen in FIG. 8. By elongating the cross section of the nozzle in the direction of the main fluid flow through the pump as seen in the cross sectional view of FIG. 8, hydraulic losses in the liquid being pumped are reduced. The radially inner end portion of the nozzle is cut at a bias so that the upwardly open discharge end 51 of the nozzle makes an angle of approximately 30 degrees relative to the longitudinal edges 48 of the nozzle. The elongated upwardly open discharge end 51 provides a distribution along a substantial distance inwardly into the fluid stream passing through the pump of the treating agent which flows through each respective nozzle, the upwardly open discharge end 51 of the nozzle causing the treating agent to be discharged in a downstream direction relative to the direction of flow of the fluid being pumped.

It can be seen from the foregoing description and from the drawings, particularly FIGS. 2, 3 and 4, that

there is provided in the illustrated embodiment means for injecting five different chemical treating agents into the water flowing into the vaned scoop end of the pump structure at the suction end of the pump since a total of five separate manifolds for the different chemicals being injected are provided at 32A - 32E, inclusive, each manifold being connected to two diametrically opposite injection ports on opposite wall portions of the vaned scoop and thus to two diametrically opposite injection nozzles 45 which extend inwardly into the interior of the vaned scoop and thus inwardly into the fluid stream passing through the vaned scoop. The various chemical treating agents or the like injected into the fluid stream on the suction side of the impeller as well as on the discharge side of the impeller (to be described) may be in liquid state or be carried by a liquid carrier medium. The various treating agents injected through any of the nozzles 45 on either side of the impeller may be suitably pressurized, as required.

Since the chemical treating agents introduced into the water flow through the plurality of manifolds and inlet ports at the suction end of the pump, as just described, must pass through the impeller or propeller 28, any chemicals introduced through the inlet ports just described on the suction side of the impeller 28 are thoroughly mixed into the liquid stream by the action of the rotating impeller 28, to thereby promote molecular diffusion of the treating agents into the water being treated. For this reason, in determining which chemicals are to be introduced into the water flow on the suction side of the pump impeller and which chemicals are to be introduced into the water flow on the discharge side of the pump impeller, it is advantageous to select from the chemical treating agents which it is desired to inject into the water, those chemical treating agents which require more thorough mixing for injection on the suction side of the pump.

Means are also provided for separately injecting a plurality of different chemical treating agents or the like within the interior of the pump structure but on the discharge side of, (i.e., downstream of) the impeller 28, and more specifically in the illustrated embodiment, on the discharge side of diffuser 29. Thus, as best seen in FIGS. 1, 5 and 6, a plurality of fluid manifolds 50A, 50B, 50C, 50D and 50E are suitably mounted on the outer wall surface of lower pipe column 22 which forms part of the pump housing structure, the fluid manifolds 50A - 50E, inclusive, each respectively lying in a separate horizontal plane which is vertically spaced from the planes of the other manifolds in this group. Each of the manifolds 50A - 50E, inclusive, is provided with an inlet port respectively designated at 52A, 52B, 52C, 52D and 52E through which separate and distinct chemical treating agents from different sources may be admitted by one of the pipes 55 (FIG. 1) for distribution by the respective manifolds 50A - 50E, inclusive. Each of the respective manifolds 50A - 50E, inclusive, extends for substantially 270° around the periphery of the lower pipe column 22. At each opposite end of each manifold, and also at 90° circumferentially spaced peripheral locations on each manifold, each manifold is provided with a suitable fitting which extends through an inlet passage in the wall of the lower pipe column 22 at a height corresponding to the respective manifold, and a chemical injection nozzle 45' of the type previously described and shown in detail in FIG. 7, and which extends radially inwardly a substantial dis-

tance into the path of fluid flow through lower pipe column 22, is suitably connected in fluid communication with the corresponding manifold at each such inlet fitting. Thus, each manifold 50A - 50E, inclusive, is connected to four injection nozzles 45' to permit injection through the elongated discharge opening 51' of the respective nozzles of the particular chemical treating agent supplied by the respective manifolds, 50A - 50E, inclusive, into the stream of water within the pump housing at 90° circumferentially spaced locations in a given horizontal plane corresponding to each respective manifold 50A - 50E, inclusive, the treating agent being discharged from the nozzle in a downstream direction relative to the direction of flow of the fluid being pumped. It can be seen, therefore, that on the discharge or downstream side of the pump impeller, and more particularly, at a location downstream of, but contiguous the discharge end of diffuser 29, means are provided for separately injecting five different chemical treating agents or the like, each at four different injection locations for a total of twenty different injection locations on the discharge side of the pump impeller. More specifically, the location of injection nozzles 45' downstream of but contiguous the discharge end of diffuser 29 insures that the treating agents are injected into the fluid passing through the pump at a region where the fluid being pumped is sufficiently turbulent to insure good mixing of the respective treating agents with the fluid being pumped.

It can be seen from the foregoing, that there is provided in accordance with the present invention, a mixing or blending pump which is particularly suitable for, although not restricted to, pumping water in a municipal water supply and at the same time for mixing and blending chemical treating agents with the water as required. In accordance with the invention, means are provided for separately injecting a plurality of different chemical treating agents into the stream of water on the suction side of the impeller so these chemicals will be thoroughly mixed into the water stream by the action of the impeller; and also for separately injecting a plurality of chemical treating agents into the stream of water within the pump housing but on the discharge side of (i.e., downstream of), the impeller, particularly on the discharge side of the pump diffuser if there is a pump diffuser.

It can also be seen from the foregoing that the arrangement of the manifolds 32A - 32E, inclusive, of injection inlet ports 38A - 38E and 38A' - 38E', and of the injection nozzles 45 corresponding thereto, is such that each treating agent of the manifolds just mentioned is injected into the fluid stream on the suction side of the impeller at substantially diametrically opposite circumferential locations when viewed in horizontal projection. Also, the laterally inward projection of nozzles 45 into the stream of fluid being pumped, together with the provision of the elongated upwardly open discharge end 51 of each nozzle 45, insures a laterally inward distribution of the treating agent into the fluid stream on the suction side of the pump impeller.

Also, the arrangement of the manifolds 50A - 50E, and of the injection nozzles 45' and nozzle discharge openings 51' corresponding thereto insures both circumferential and radially inward distribution of each respective treating agent into the fluid stream at the injection locations downstream of impeller 28, and, more

particularly, in the illustrated embodiment, on the discharge side of diffuser 29.

While the injection nozzles at the suction end of the pump in the illustrated embodiment have been shown and described as being mounted on the vaned scoop attached to the lower end of the suction bell, in certain applications, the vaned scoop may not be used, in which case, the chemical injection nozzles and ports on the suction side of the impeller may be mounted instead of the suction bell 16.

There is illustrated in FIG. 9 a modified mounting arrangement for the chemical injection means on the suction side of the impeller. Thus, in FIG. 9 there is shown the lower end of suction bell generally indicated at 102 of a pump 100 which may be similar to the one shown in FIG. 1 of the drawing except that no vaned scoop is provided at the lower end of suction bell 102. Pump 100 includes an impeller 28' and a diffuser 29'. The pump is suitably supported within a receiving tank 103 similar to the tank 12 described in connection with the embodiment of FIG. 1. Tank 103 has a floor or base portion 104 and the lower end of suction bell 102 is elevated a distance such as 4 feet, for example, above surface 104. In accordance with the modified arrangement shown in FIG. 9, the fluid manifolds schematically indicated at 106 and 108 having discharge orifices 106A and 108A which are in fluid communication with the interior of the respective manifolds 106 and 108, are suitably mounted on support structure 112 in the space between the lower end of suction bell 102 and tank surface 104. Manifolds 106 and 108 and the discharge orifices 106A and 108A thereof are so positioned as to be in the inlet flow stream of water entering the suction bell 102. Support structure 112 is supported by floor 104 of tank 103. Manifolds 106 and 108 may be connected to separate sources of different chemical treating agents or the like.

The pump 100 of the modified embodiment of FIG. 9 is otherwise similar to the structure shown in FIG. 1 and, as in the embodiment of FIG. 1, is also provided with chemical treating agent injection means within the pump housing on the discharge side of the pump impeller, as previously described.

The term "tank" as used in the specification and claims is intended to cover any means for holding a body of water which is acted upon by the pump, such as a tank, basin, reservoir, pool or the like.

The mixer pump constructions hereinbefore described and shown in FIGS. 1 - 9, inclusive, have the advantage when applied to a municipal water supply system or the like that they may be used with existing water supply systems to pump and to chemically treat the water, and serve to upgrade the quality of such existing systems while at the same time considerably reducing both the treatment time required and the size of the physical plant required.

While the mixer pump of the invention has been described as embodied in a mixer pump used in pumping and treating water in a municipal water supply system or the like, it is obvious that the mixer pump hereinbefore described is useful in any application or environment, such as a chemical process or the like, for example, in which a mixer pump might be used to inject chemical treating agents or the like into a fluid stream being pumped by the mixer pump.

From the foregoing detailed description of the present invention, it has been shown how the objects of the

invention have been obtained in a preferred manner. However, modifications and equivalents of the disclosed concepts such as readily occur to those skilled in the art are intended to be included within the scope of this invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A mixer pump for pumping and for treating a fluid comprising a pump housing through which the fluid may pass from an inlet end to an outlet end of said housing, a movable impeller located within said housing for pumping the fluid from said inlet end to said outlet end, said pump comprising a first plurality of separate manifolds supported by said housing on the exterior of said housing, each manifold of said first plurality being adapted to be connected to a separate source of treating agent for said fluid, separate injector means corresponding to each manifold of said first plurality, each of said separate injector means being mounted on said housing and being positioned to direct a treating agent into the fluid stream on the suction side of the pump impeller, means placing each of said separate injector means in fluid communication with its corresponding separate manifold of said first plurality; and a second plurality of separate manifolds supported by said housing on the exterior of said housing, each manifold of said second plurality being adapted to be connected to a separate source of treating agent for said fluid, additional separate injector means corresponding to each manifold of said second plurality, each of said additional separate injector means being mounted on said housing and being positioned to direct a treating agent into the fluid stream on the discharge side of the pump impeller, and means placing each additional separate injector means in fluid communication with its corresponding separate manifold of said second plurality.

2. A mixer pump as defined in claim 1 in which each manifold of said first plurality is connected to a plurality of corresponding injector means, and in which each manifold of said second plurality is connected to a plurality of corresponding injector means.

3. A mixer pump as defined in claim 1 in which each manifold of said first plurality is connected to a corresponding separate plurality of circumferentially spaced injection nozzles extending inwardly into the fluid stream passing through said pump and in which each manifold of said second plurality is connected to a corresponding separate plurality of circumferentially spaced injection nozzles extending inwardly into the fluid stream passing through said pump, whereby to provide circumferential and inward distribution of each treating agent into the fluid stream.

4. A mixer pump as defined in claim 3 in which the injection nozzles of said first and second plurality of manifolds are upwardly open for a substantial length of the respective nozzles to promote the inward distribution of the respective treating agents.

5. A mixer pump as defined in claim 3 in which the injection nozzles of said first and said second plurality of manifolds are open for a substantial length of the respective nozzles to discharge in the downstream flow direction of the fluid being treated, whereby to promote the inward distribution of the respective treating agents.

6. The mixer pump adapted for pumping and treating a fluid comprising a pump housing through which fluid may pass from an inlet end to an outlet end of said housing, said housing comprising an inlet end at one end of said housing and an outlet end contiguous an opposite end of said housing, a movable impeller located within said housing contiguous said one end of said housing, and means supported by said housing for injecting a plurality of treating agents into the fluid on the suction side of said impeller, whereby said treating agents are intimately mixed with the fluid by the action of said impeller as the fluid and treating agent pass through the impeller, said means supported by said housing comprising a plurality of separate manifolds mounted on the exterior of said housing, separate inlet port means in each manifold adapted to place each respective manifold in communication with a separate source of treating agent, an injector means corresponding to each manifold extending into the interior of said housing on the suction side of said impeller, and means placing each injector means in fluid communication with its corresponding manifold.

7. A mixer pump as defined in claim 6 comprising a plurality of spaced injector means corresponding to each manifold and extending into the interior of said housing on the suction side of said impeller, and means placing the plurality of injector means corresponding to each respective manifold in fluid communication with their corresponding manifold.

8. A mixer pump for pumping and treating a fluid, comprising a pump housing through which fluid may pass from an inlet end to an outlet end of said housing, a movable impeller located within said housing for pumping the fluid from said inlet end to said outlet end, a plurality of separate manifolds mounted on the exterior of said housing, each of said manifolds being adapted to be connected to a separate source of treating agent for said fluid, at least one injector means corresponding to each manifold mounted on said housing and positioned to direct a treating agent into the fluid stream on the suction side of the pump impeller, and means placing each injector means in fluid communication with its corresponding manifold.

9. A mixer pump as defined in claim 8 comprising a plurality of spaced injector means corresponding to each manifold and positioned to direct a treating agent into the fluid stream on the suction side of said impeller, and means placing the plurality of injector means corresponding to each respective manifold in fluid communication with their corresponding manifold.

10. A mixer pump for pumping and for treating a fluid comprising a pump housing through which the fluid may pass from an inlet end to an outlet end of said housing, a movable impeller located within said housing for pumping the fluid from said inlet end to said outlet end, an injection nozzle adapted to be connected to a source of treating agent and extending inwardly into said pump housing into the path of fluid flow through said housing, said injection nozzle being provided at the inner portion thereof with an elongated discharge opening whereby to spread the distribution of treating agent into said fluid in a direction inwardly of the periphery of said pump housing.

11. A mixer pump as defined in claim 10 comprising a manifold mounted on the exterior wall of said pump housing, said manifold being adapted to be connected to a source of treating agent, said injection nozzle being

connected at its outer end in fluid communication with said manifold.

12. A mixer pump as defined in claim 11 comprising a plurality of said injection nozzles positioned in circumferentially spaced relation to each other and connected in fluid communication with said manifold.

13. A mixer pump as defined in claim 10 in which said injection nozzle extends into the path of fluid flow on the suction side of said impeller.

14. A mixer pump as defined in claim 10 in which said injection nozzle extends into the path of fluid flow on the discharge side of said impeller.

15. A mixer pump as defined in claim 14 comprising a diffuser mounted within said pump housing downstream of said impeller, and in which said injection nozzle extends into the path of fluid flow on the discharge side of said diffuser.

16. A mixer pump as defined in claim 10 in which said injection nozzle has a cross section which is elongated in the direction of flow of the fluid being pumped through said pump housing.

17. In combination, a receiving tank for a fluid, a mixer pump for pumping fluid from said tank and for treating said fluid, said mixer pump comprising a pump housing through which the fluid may pass from a suction end to a discharge end of said housing, said suction end being adapted to be submerged in the fluid in said tank and being open for passage of fluid therethrough from said tank, a movable impeller located within said housing for pumping the fluid from said suction end to said discharge end, and means positioned in said tank in spaced relation to said pump and to said suction end of said pump but in proximity to said suction end for injecting at least one treating agent into the fluid which is drawn into the suction end of said pump, whereby said treating agent is injected into said fluid in close proximity to the region where said fluid enters said suction end, said means for injecting said treating agent being supported from a surface of said tank.

18. In combination, a receiving tank for a fluid, a mixer pump for pumping fluid from said tank and for treating said fluid, said mixer pump comprising a pump housing through which the fluid may pass from a suction end to a discharge end of said housing, said suction end being adapted to be submerged in the fluid in said tank and being open for passage of fluid therethrough from said tank, a movable impeller located within said housing for pumping the fluid from said suction end to said discharge end, and means positioned in said tank in spaced relation to said pump and to said suction end of said pump but in proximity to said suction end for separately injecting a plurality of separate treating agents into the fluid which is drawn into the suction end of said pump, whereby said treating agents are injected into said fluid in close proximity to the region where said fluid enters said suction end.

19. The combination defined in claim 18 including means supported by said housing for injecting at least one treating agent into the fluid within said housing on the discharge side of said impeller.

20. The combination defined in claim 18 including means supported by said housing for separately injecting a plurality of treating agents into the fluid within said housing on the discharge side of said impeller.

21. A mixer pump for pumping and for treating a fluid comprising a pump housing through which the fluid may pass from an inlet end to an outlet end of said housing, a movable impeller located within said housing for pumping the fluid from said inlet end to said outlet end, said pump comprising at least one first manifold supported by said housing on the exterior of said housing, each respective first manifold being adapted to be connected to a separate source of treating agent for said fluid, a separate plurality of circumferentially spaced injection nozzles corresponding to each respective first manifold mounted on said housing and extending inwardly into the fluid stream passing through said pump on the suction side of the pump impeller whereby to direct a treating agent into said fluid stream on the suction side of said impeller with inward and circumferential distribution of treating agent into the fluid being pumped, each nozzle of said separate plurality being connected in fluid communication with its corresponding respective first manifold; and at least one second manifold supported by said housing on the exterior of said housing, each respective second manifold being adapted to be connected to a separate source of treating agent for said fluid, an additional separate plurality of circumferentially spaced injection nozzles corresponding to each respective second manifold mounted on said housing and extending inwardly into the fluid stream passing through said housing on the discharge side of the pump impeller whereby to direct a treating agent into said fluid stream on said discharge side of said impeller with inward and circumferential distribution of treating agent into the fluid being pumped, each nozzle of said additional separate plurality being connected in fluid communication with its corresponding second manifold.

22. A mixer pump for pumping and treating a fluid, comprising a pump housing through which fluid may pass from an inlet end to an outlet end of said housing, a movable impeller located within said housing for pumping the fluid from said inlet end to said outlet end, at least one manifold mounted on the exterior of said housing, each respective manifold being adapted to be connected to a separate source of treating agent for said fluid, a separate plurality of circumferentially spaced injection nozzles corresponding to each respective manifold mounted on said housing and extending inwardly into the fluid stream passing through said pump on the suction side of the pump impeller whereby to direct a treating agent into said fluid stream on the suction side of said impeller with inward and circumferential distribution of treating agent into the fluid being pumped, each nozzle of said separate plurality being connected in fluid communication with its corresponding manifold.

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