

[54] **APPARATUS FOR EFFECTING CHEMICAL TREATMENT OF A LIQUID FLOWING THROUGH A PIPE**

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[58] Field of Search **137/101.11, 205.5, 137/268, 564.5, 599, 599.1, 604; 239/313, 315, 317, 318**

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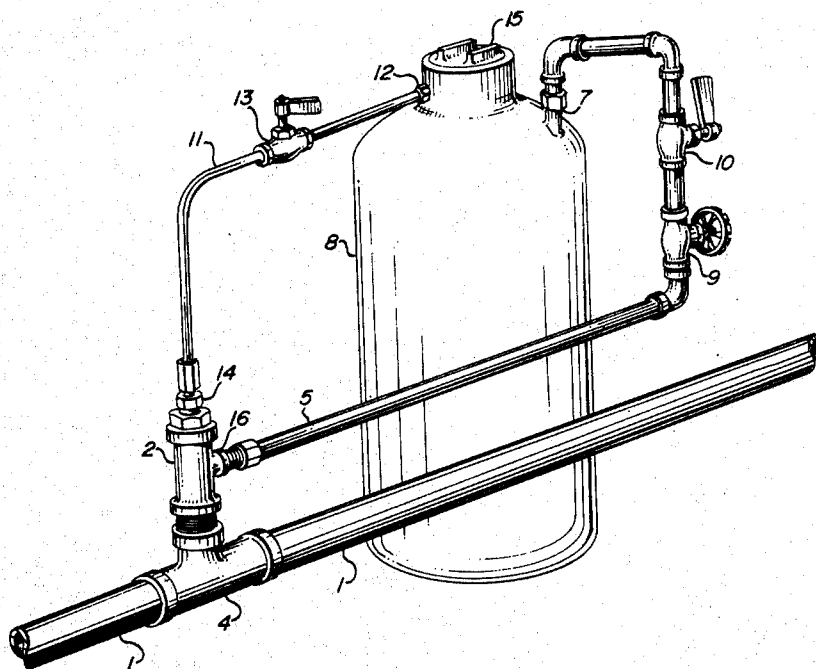
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[57] **ABSTRACT**

Simplified apparatus is provided for injecting con-

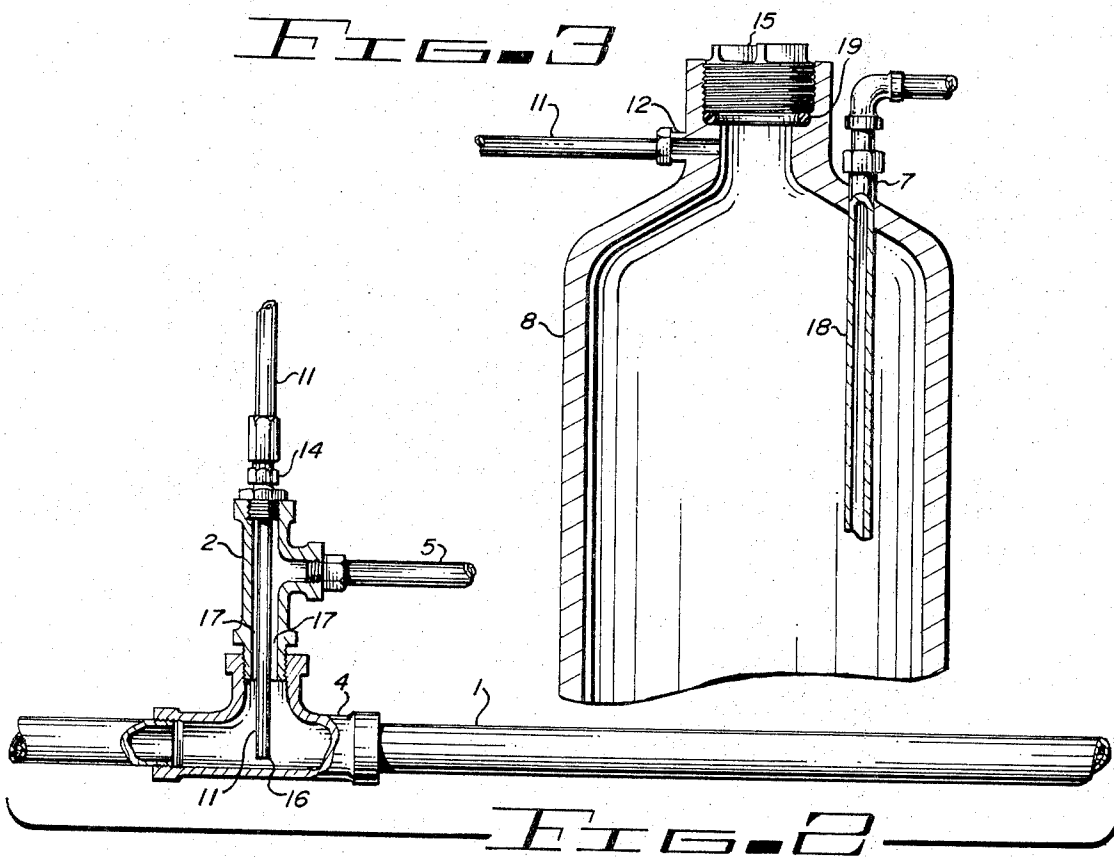
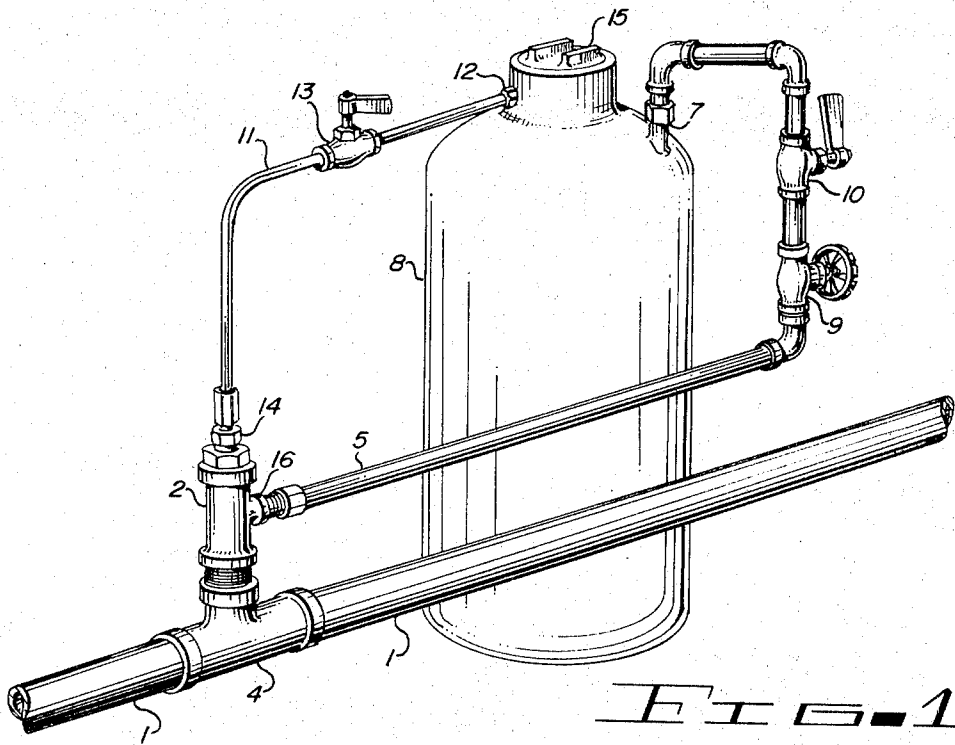
trolled amounts of a chemical housed within a container into a liquid, such as water, flowing through a pipe. A "T" fitting is coupled into the pipe through which the liquid is flowing by means of a second T fitting or in any other convenient manner. A length of tubing coupling the output from a container holding the chemical to be injected extends coaxially through the T and into the pipe through which the liquid is flowing, terminating just short of the opposite side thereof. A second length of tubing is coupled between the right angle extension from the T to the inlet of the container. The area at the outlet of the tubing extending through the T is smaller than the area surrounding the tubing through which the liquid in the pipe may pass to communicate with the second piece of tubing which leads to the container inlet. Thus, in effect, a suction is observed at the outlet terminal which draws liquid flowing through the pipe into the container, where it mixes with the chemical therein, and back into the pipe conveying the liquid. Flow rate through the container, and hence the concentration of chemical injected into the liquid flowing through the pipe, is controlled by a conventional valve on the inlet side to the container. Additionally, a second conventional valve may be added to the inlet side to the container and a third conventional valve to the outlet side of the container to permit complete isolation of the container to facilitate replenishing the chemical contained therein. If necessary to conform to building codes, a check valve may be inserted into the line on the inlet side of the container.

4 Claims, 3 Drawing Figures



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APPARATUS FOR EFFECTING CHEMICAL TREATMENT OF A LIQUID FLOWING THROUGH A PIPE

This invention relates to the chemical injection arts, and, more particularly, to means for controllably injecting a chemical into liquid flowing through a pipe.

It is often necessary to controllably add chemical to liquid flowing through a pipe such as, by way of example only, is necessary in making drinking water safe, making water used in the feeding of plants have the proper nutrient composition, etc. A number of different types of apparatus for carrying out this function are known in the art. Typical of the prior art is apparatus which requires metering orifices and some means for setting up a positive pressure, as compared to the pressure of the liquid flowing through the pipe and which is to be treated, in order to establish proper flow rate of the additive. Such apparatus has proved unreliable and inaccurate over long periods of use because the orifice tends to become clogged and because flow rate varies to an unacceptable degree due to pressure changes in the liquid being treated.

It is therefore a principal object of my invention to provide improved apparatus for controllably injecting chemicals into liquid flowing through a pipe.

It is another principal object of my invention to provide such apparatus which is very simple and yet completely reliable in operation.

It is yet another object of my invention to provide such apparatus which may be finely adjusted and which will maintain its adjustment during long periods of use without the necessity for correction or servicing except for replenishing the chemical supply.

The subject matter of the invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. The invention, however, both as to organization and method of operation, may best be understood by reference to the following description taken in connection with the accompanying drawing of which:

FIG. 1 is a perspective pictorial illustrating the external appearance of exemplary apparatus incorporating my invention;

FIG. 2 is a partially cutaway, partial cross-sectional view illustrating the apparatus portions which couple the chemical supply to the liquid being treated and which develops the pressure differential necessary for achieving flow through the chemical container; and

FIG. 3 is a cross-sectional view of the container of FIG. 1 illustrating certain aspects of the interior construction thereof.

Attention is now directed to FIG. 1 which depicts a pipe 1 through which liquid, such as water, may be deemed to be flowing under pressure. A vertically oriented first T2 is screwed into the upwardly projecting outlet 3 of a second T4 which is serially connected to sections of the pipe 1. Container inlet tubing 5 is connected to the horizontally oriented outlet 6 of the first T2 and leads, through various fittings according to a specific installation, to a container inlet 7 of the container 8. The fittings in series with the container inlet tubing 5 may include a flow rate valve 9 and an inlet shutoff valve 10 as well as a check valve (not shown) if the latter is necessary to conform to specific building codes.

A container outlet tubing 11, coupled to the container outlet 12, has an outlet shutoff valve 13 connected in series therewith and passes through fittings 14 in a specific manner to be described in conjunction with FIG. 2, below.

The container 8 may be of any type suitable for holding the chemical being injected and the pressures contemplated. Normally, such containers are provided with a cap 15 which, when closed, seals the interior of the container and which may be opened, after the container has been isolated by closing the valves 10 and 13, for replenishing the supply of chemicals contained therein.

FIG. 2 illustrates the relationship of the container outlet 11 to the first T2 and a second T4 which may be considered a portion of the pipe 1 insofar as function is concerned. It will be observed that the outside diameter of the container outlet tubing 11 is substantially smaller than the inside diameter of the vertically oriented portion of the T2 and is coaxially therewith such that it may extend well into the lower half of the second T4 where it terminates in an open end 16. The area 17 around the outside of the outlet tubing 11 within the T2 is larger than the area of the opening at the end 16 of the tubing 11 which contributes to a pressure differential set up within the tubing 11, as compared to the tubing 5 which is in direct liquid communication with the area 17. The pressure differential in effect causes a suction at the open end 16 of the outlet tubing 11 which pulls untreated liquid through the area 17, the container inlet tubing 5, the container 8 where the liquid is mixed with the chemical contained therein, and the outlet tubing 11 which injects the liquid and chemical mixture back into the line. Flow rate of the concentrated mixture into the untreated stream is readily adjusted by means of a flow rate valve 9 which, once set, need not be readjusted except as may be necessary to accommodate different conditions such as effecting a deliberate increase or decrease in the amount of chemical injected.

As shown in FIG. 3, the interior construction of the container 8 is quite simple. It is desirable, in order to achieve uniform mixing, that the container inlet 7 extend, as a tubing 18, to the lower portion of the interior of the container 8 whereas it is desirable that the container outlet 12 communicates directly with a high point in the container. To insure a good seal for the cap 15, an O ring 19 or other comparable gasket device is normally provided.

FIGS. 1 and 2 both illustrate the first T2 coupled into a second T4 which is in series with the pipe 1. Those skilled in the art will appreciate that if the pipe 1 is sufficiently large, a threaded tap may be made directly therein to dispense with the T4. It is still necessary, however, that the end 16 of the tubing 11 should be well within the lower half of the pipe 1 and preferably less than half an inch from the inside wall of the pipe. An average gap of one-quarter inch has been found to function satisfactorily virtually regardless of the size of the pipe 1.

While the principles of the invention have now been made clear in an illustrative embodiment, there will be immediately obvious to those skilled in the art many modifications of structure, arrangement, proportions, the elements, materials, and components, used in the practice of the invention which are particularly

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adapted for specific environments and operating requirements without departing from those principles.

I claim:

1. Apparatus for injecting one or a mixture of chemicals into liquid flowing through a pipe comprising:
 - a. a T fitting having first and second aligned openings and a third opening;
 - b. means for placing said first opening in a liquid communication with the liquid flowing through the pipe;
 - c. a container for chemicals, said container having an inlet opening, an outlet opening, and a refill opening for replenishing the chemical supply therein;
 - d. cap means for sealing off said refill opening;
 - e. inlet tubing means coupling said third opening in said T to said inlet opening in said container;
 - f. flow rate control means in line with said inlet tubing for regulating the flow there through;
 - g. outlet tubing means connected at one end thereof to said outlet opening in said container, said outlet tubing passing through a liquidtight fitting at said second opening in said T, coaxially through said T and into the pipe, terminating in the opposite half thereof and within less than one-half inch from the

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opposite side of the pipe; and

- h. the dimensional proportions of said T and said outlet tubing being such that the area defined by the inside diameter of said outlet tubing is less than the area defined by the outside diameter of said outlet tubing and the inside diameter of said T.

2. The apparatus of claim 1 in which said flow rate control means comprises a first valve serially disposed in said inlet tubing.

3. The apparatus of claim 2 which further includes:

- a. a first shutoff valve serially disposed in said inlet tubing; and
- b. a second shutoff valve serially disposed in said outlet tubing

whereby said container may be isolated to permit replenishment of the chemicals contained therein by removing said cap means.

4. The apparatus of claim 3 in which said means for placing said first opening in liquid communication with the liquid flowing through the pipe comprises a second T with first and second aligned openings arrayed as a constituent of the pipe and a third opening for threadably joining with said first opening in said first T.

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