Fig. 2
J. MÜLLER
APPL. FOR SPRAYING AND APPLYING
AT LEAST ONE CHEMICAL LIQUID

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APPARATUS FOR SPRAYING AND APPLYING AT LEAST ONE CHEMICAL LIQUID

Jörg Müller, Korb, Württemberg, Germany, assignor to Alfred Kocher, Winnenden, Württemberg, Germany

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4 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for spraying and applying at least one chemical liquid, which comprises containers for receiving chemical liquids and also a conduit for conveying superheated water, which latter leaves said conduit in the form of a jet containing water and steam, while feeding lines for the chemical liquid or liquids are connected to said conduit.

The present invention relates to an apparatus for spraying and applying at least one chemical liquid, which comprises containers for receiving chemical liquids and also a conduit for conveying superheated water, which latter leaves said conduit in the form of a jet containing water and steam, while feeding lines for the chemical liquid or liquids are connected to said conduit.

With the heretofore known apparatuses of the type involved, a separate container adapted to be placed under pressure is provided for each individual chemical fluid. By means of this pressure and a suitable control means in the feeding line leading from the container to the conduit for superheated water, the respective liquid is in a desired quantity conveyed to the flow of superheated water. It is an object of the present invention to provide an apparatus for spraying and applying at least one chemical liquid, in which the pressure container for the individual liquids will be replaced by a pressureless container. It is another object of the present invention to provide an apparatus as set forth in the preceding paragraph which will reduce the cost thereof while affording greater flexibility with regard to the arrangement and design of the containers.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIGURE 1 diagrammatically illustrates an embodiment of the present invention of an apparatus for successively spraying two chemical liquids by means of a single spray pipe.

FIGURE 1a illustrates on a larger scale than that of FIG. 1 and in more details that portion of FIG. 1 which is located within the dot-dash circle thereof.

FIGURE 2 illustrates the electric control circuit for the apparatus of FIG. 1.

FIGURE 3 shows an embodiment of an apparatus for successively spraying four different chemical liquids through two spray pipes.

FIGURE 4 diagrammatically illustrates an embodiment with a twin mixing path, in which one chemical liquid is sprayed through one spray pipe while at the same time a different chemical liquid is sprayed through another spray pipe.

FIGURE 5 illustrates an electric control circuit for use in connection with the apparatus of FIG. 4.

The above objects have been realized according to the present invention by storing the chemical liquid or chemical liquids in pressureless containers and by providing a volumetrically working pump for feeding the chemical liquid to the conduit for superheated water.

By means of such volumetrically working feeding pumps, any desired mixing ratio can be maintained at high precision without the necessity, in view of the employment of such metering pumps, of an initially to increase the cost for the spraying apparatus. When employing such pumps at the feeding station, it is advisable to design the feeding station as a mixing path which in addition to a feeding station for the superheated water, will for each intended chemical liquid have a feeding station with check valve and a discharge station for the chemical liquid.

In order to prevent two different chemical liquids from simultaneously admixing to the flow of superheated water and to be sprayed, the present invention provides that each chemical liquid has a separate pump associated therewith and that all pumps will have a control device in common which control device is equipped with a control member for each pump. This common control device is adapted, when turning on one of the control members, to bring about a stopping of all other pump drives and also a starting of the engaged pump drive after a time delay with regard to the turning on time.

The temporary delay of the start of the turned on pump drive with regard to the turning on time is provided in order to make sure that after admixing a liquid till the admixing of another liquid, the flow of superheated water will pass in a nonmixed condition through the mixing path and the succeeding conduits thereby effecting a cleaning, rinsing action. Therefore, no residues of the first sprayed liquid which remained in the conduits can intermix with the successively sprayed liquid.

In this connection it is particularly advantageous when the control includes means for varying the time delay.

Referring now to the drawings in detail, and FIG. 1 thereof in particular, the arrangement shown therein comprises a container 10, for receiving and storing a chemical liquid A, while a container 20 is provided for receiving and storing another chemical liquid B. Both containers are open and thus are under atmospheric pressure only and may, if so desired, consist of corrosion-resistant material as, for instance, any suitable synthetic material such as polyethylene or polyester with glass fibers, or polyamide.

Liquid A is withdrawn from container 10 through a suction conduit 11 by means of a volumetrically working pump 12. Interposed in conduit 11 is a shut-off valve 11a and a filter 11b. Pump 12 is drivenly connected to an electric motor 12a to be driven thereby. If desired, also other driving means may be employed, such as internal combustion engines, fluid operable motors or pneumatic operable motors. Pump 12 is preferably a slowly rotating piston pump which is infinitely variable and the delivery of which may be adjusted in a stepless manner from zero to full delivery. Pump 12 delivers the fluid through pressure containers 13 to a mixing path 14. Pump 12 must be able to produce a pressure which is somewhat higher than the pressure of the superheated water flowing in conduit 14a, 14c, 15, 16.

The feeding of liquid A into the mixing path 14 takes place via a check valve 14d into a mixing chamber 14c. Into the said mixing chamber 14c through an inlet 14a is also pressed the water which comes from a heating apparatus, preferably a so-called through-flow heater, which is not shown and which is provided with a delivery pump. The mixing chamber 14c is, for purposes of obtaining definable flow conditions in the chamber, preceded by a straight pipe 14b and is followed by a straight pipe 14e. The mixture composed of liquid A and the superheated water will at the discharge 14f leave the mixing path and flows through conduit 15 to a spray pipe 16. The free end of spray pipe 16 has connected thereto, a nozzle 16a from which the said mixture escapes in the
form of a jet containing water and water steam. In this way, a spraying action will be obtained during which the spray pipe is guided manually by grasping the handle 16b. Conduit 15 preferably forms a flexible hose. Nozzle 16a may, if desired, be connected to a fixed conduit or may be designed as an independent mechanically movable nozzle.

The second chemical liquid B is withdrawn from container 20 by a pump 22 through a conduit 21 and is then conveyed through a conduit 23 to the mixing path 14. The conduit section 20, 21, 22, 23 is, as far as its parts are concerned, built up in a manner analogous to the conduit system 10, 11, 12, 13, and is provided correspondingly with a shut-off valve 21a, a filter 21b, and a motor 22a. The liquid is fed into the mixing chamber 14c through a check valve 14g. With the drive by means of electric motors, as shown in the embodiment of FIG. 1, an electric control of the motors 12a and 22a may be employed as shown in the diagram of FIG. 2. The diagram is laid out for a three-phase alternating current with the phases RST and the center point conductor Mp. For turning on pump 12, there is provided a depressible key 31. When closing key 31, the coil 32a of a relay 32 and the coil 33a of a time delay relay 33 is energized. When closing the key 33b, a coil 34a of a contactor 34 is energized and closes its contacts 34b, 34c, and 34d. As a result, pump 12 starts and begins the feeding of a process liquid A which in the form of a constant mixture at nozzle 16a is sprayed in the form of a uniform mixture with superheated water while steam is being formed.

When it is desired to spray the other treatment liquid B, a pressure key 41 is actuated. As a result thereof, coil 42a of a relay 42 and coil 43a of a time delay relay 43 is energized. Coil 42a immediately attracts, and opens a contact 42c while closing switch 42b. When opening switch 42c, relay 32 and in a manner described further below, also motor 12a become de-energized.

Coil 42a in addition to receive current through key 41 also receives current via the now again closed contact 32c and contact 42b. Thus, nothing changes when key 41 is again opened. A control contact 43b closes only after a time delay when key 41 is depressed. In this way a coil 44a is energized and contacts 44b, 44c, 44d close so that motor 22a again starts.

The control of the two pumps 12 and 22 with which, when turning on one pump, all other pump drives are blocked, and with which the delivery of the turned on pump starts only after a delay with regard to the turning on time, could also be effected in a different way. Thus, for instance, clutches with delayed turning on action or hydraulic or pneumatic controls and control members may be provided. When installing electromagnetic operating clutches, for instance, a single drive motor could be employed for all pumps in common.

The according to FIG. 3 is intended for use for spraying of four different chemical solutions C, D, E, and F. The various conduits leading from the containers 50, 55, 60, 65, respectively, through suction conduits 51, 56, 61, 66 to pumps 52, 57, 62, 67, and from there through pressure conduits 53, 58, 63, 68, to the check valves 54, 69, 64 and 69 to a mixing path 70, correspond in a simplified way to the conduits 10, 11, 12, 13, and 14, of FIG. 1. The mixing chamber 70c of the mixing path 70 is provided with two discharge stations 70a and 70b so that the mixture can simultaneously be sprayed by two nozzles 71a and 72a. The mixture at both nozzles is composed of superheated water and one and the same solution selected from the four solutions C, D, E, F. The control for this modification may be designed in a way similar to that of FIG. 2 while the various parts, with the exception of the key 30 have to be provided four times. Furthermore, instead of a single blocking control, for instance, 42c three serially arranged controls have to be provided.

With the embodiment according to FIG. 3, also the drive of each pump and the drive of the apparatus for producing superheated water for shifting to full and half speed may be provided so that when working with one jet pipe 71 only, the quantity of fluid sprayed through nozzle 71a is unaltered. It is also possible to provide means which when closing one of the shut-off valves 71b or 72b will automatically reduce the speed of the drive.

According to a further embodiment of FIG. 4, a U-shaped mixing path 109 may be provided with a central inlet 109a for the superheated water and two discharge stations 109b and 109c for one mixture each. In this way, two different solutions G and H from containers 101 and 105 may flow through conduits 102, 106, pumps 103, 107, and check valves 109b, 109h, mixing paths 109h, 109g, and discharge stations 109b, 109h. The control for this, instead of a single blocking control, for instance, when the object is passed by sequential stations. In this way, the same working method is realized as with successive spraying of a stationary object with different solutions.

For purposes of feeding superheated water to the two mixing chambers 109c and 109h, the mixing path 109 is provided with check valves 109d and 109e respectively.

The operation of motors 103c and 107a of FIG. 4 for driving the pumps 103 and 107 respectively may be controlled by a control circuit as illustrated in FIG. 5. The circuit for motor 103c, which drives pump 103, is controlled by key 111. When key 111 is engaged in its closing position, coil 112a of relay 112 is energized and closes line 112b thereby establishing a holding circuit for relay 112 to maintain the same energized when key 111 is open, releasing opens again. Energization of relay 112 also closes the contacts 112c, 112d and 112f so that the circuit for motor 103c is closed and motor 103 begins to drive pump 103. When motor 103c is to be stopped, it is merely necessary to open switch 110.

The control circuit for motor 107a drivingly connected to pump 107 is arranged in parallel with and is designed analogously to the circuit shown in FIG. 5. Switch or key 114 controls the energization of relay 115 with coil 115a and blades 115b, 115c, 115d, and 115e. The stop switch is designed with the reference numeral 113.

What I claim is:

1. An apparatus for spraying and applying chemical liquid means, which includes: a plurality of containers for respectively receiving different chemical liquids, a mixing chamber common to all of said containers, a plurality of separate first conduit means respectively leading from said containers to said common mixing chamber, a plurality of pumps respectively interposed in said first conduit means between the respective container and said common mixing chamber, control means operatively connected to all of said pumps and operable to permit operation of any selected one of said pumps but only of that pump, and said control means includes time delay relay means, for permitting the operation of a selected pump after a set time only to thereby make sure that any non-selected pump will be out of operation when said selected pump starts its operation. 4
3. An apparatus according to claim 2, in which said time delay relay includes means for varying the time relay.

4. An apparatus for spraying and applying chemical liquid means, which includes: a plurality of containers for respectively receiving different chemical liquids, a plurality of mixing chambers corresponding in number to the number of said containers, a plurality of first conduit means respectively leading from said containers as separate lines to said mixing chambers, a plurality of pump means respectively interposed in said first conduit means, a plurality of check valves respectively associated with said mixing chambers and interposed between each mixing chamber and the pump of the respective first conduit means adapted to communicate therewith, second conduit means adapted to be connected to a source of superheated water, a plurality of third conduit means for respectively establishing communication between said second conduit means and each of said mixing chambers, a plurality of additional check valves interposed in said third conduit means between said second conduit means and the respective mixing chamber, and separate conduit means respectively connected to said mixing chambers and provided with nozzle means for simultaneously spraying liquid through said nozzle means.

References Cited

UNITED STATES PATENTS

2,979,075 4/1961 Hartley et al. 239—428
3,146,950 9/1964 Lancaster 239—304
3,118,610 1/1964 Techtler 239—304
3,246,845 4/1966 Techtler et al. 239—304

EVERETT W. KIRBY, Primary Examiner.

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239—428, 124, 304, 335