

[54] APPARATUS FOR RECYCLING A FLUID
FOR USE IN A DENTAL CUSPIDOR[76] Inventors: **Stuart L. Kahn; Carl G. Langbert,**
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Park, N.J. 08904[22] Filed: **Mar. 29, 1973**[21] Appl. No.: **345,976**

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[51] Int. Cl. A61c 17/04

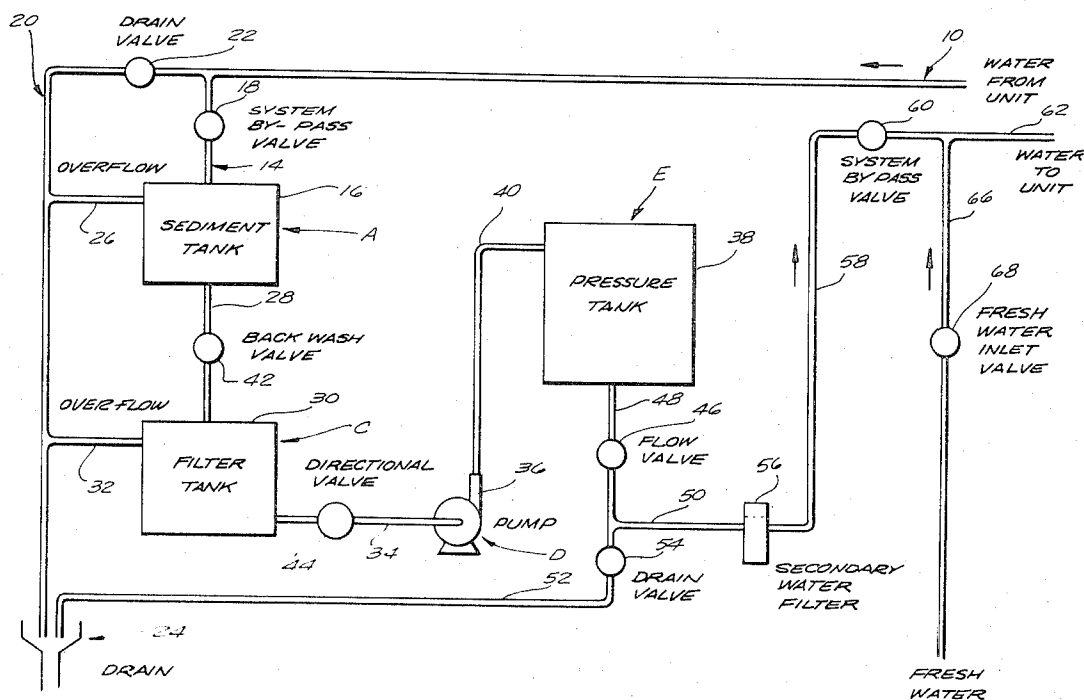
[58] Field of Search 4/263, 262, 264, 266, 115,
4/10, 90, 78, 76[56] **References Cited****UNITED STATES PATENTS**

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[57] **ABSTRACT**

Apparatus for recycling a fluid for use in flushing a dental cuspidor of the type having a bowl, a faucet for introducing the flushing fluid into the bowl and a drain in the bowl from which the fluid is conducted to the recycling system. The recycling system comprises means for separating sedimentary material from the fluid. After the sedimentary material has been separated from the fluid, the fluid is directed to a means for filtering the fluid. The filtered fluid is then pumped to a storage means which retains the fluid under pressure until it is conducted back to the cuspidor. The system includes means for backwashing the filter means as well as means for eliminating excess fluid from the sediment and filter means should fluid overflow occur therein. Also provided are means for partially or wholly bypassing the recycling portion of the apparatus to permit the introduction of a regulated amount of fresh fluid into the system.

9 Claims, 3 Drawing Figures

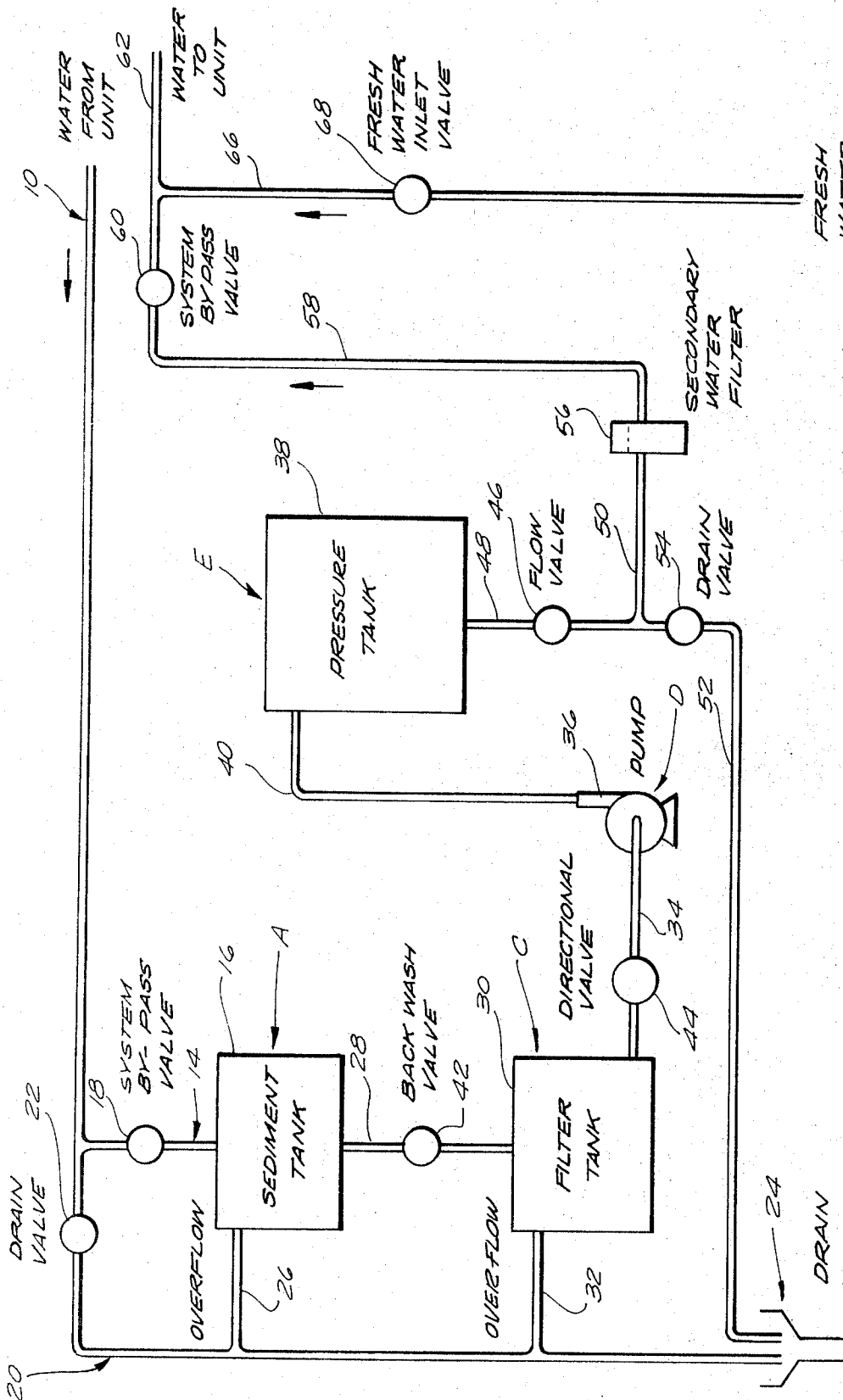


FIG. 1

FIG. 2

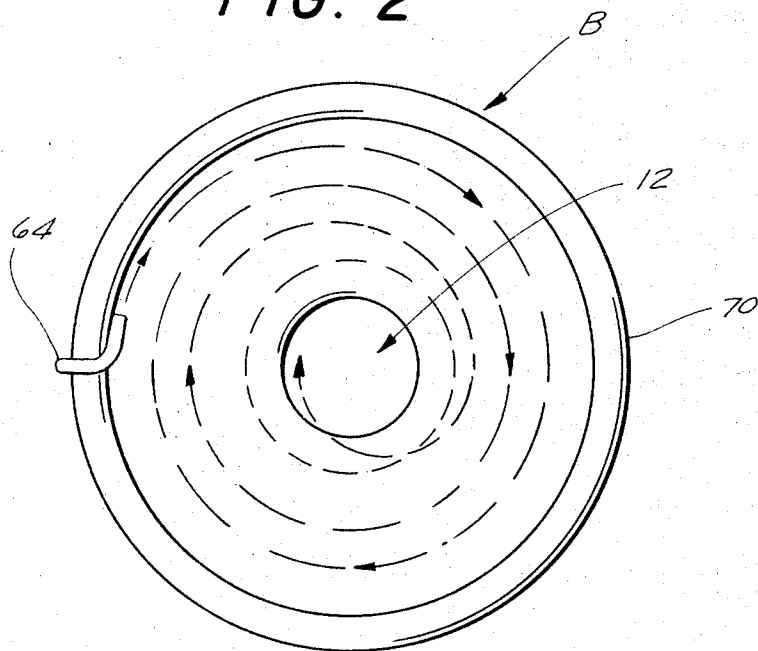
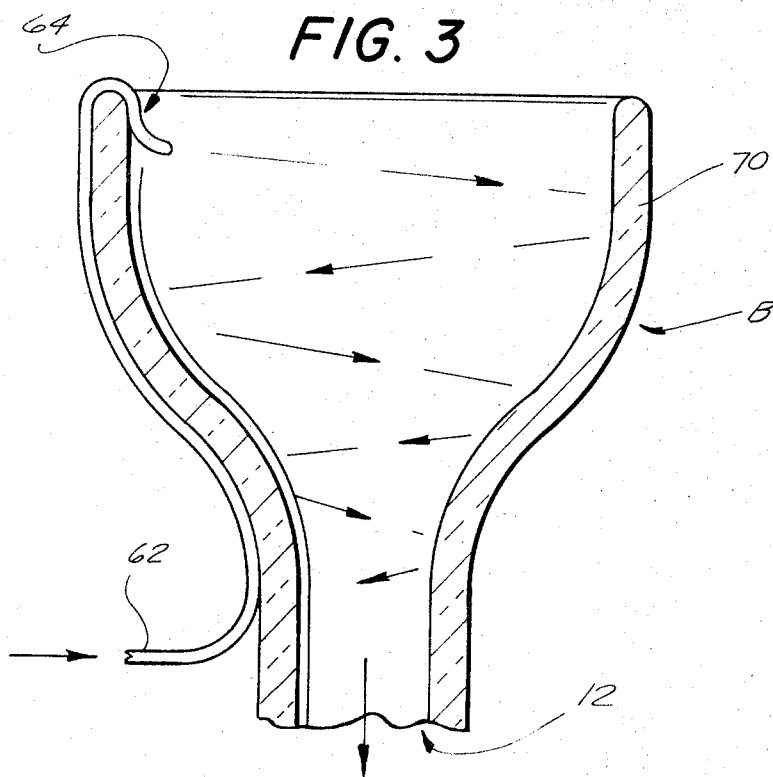


FIG. 3



APPARATUS FOR RECYCLING A FLUID FOR USE IN A DENTAL CUSPIDOR

The present invention relates to fluid recycling systems and more particularly to apparatus for recycling a fluid for use in flushing a dental cuspidor.

Water recycling systems have been known in the art and have taken various forms in accordance with the intended application of the particular system. Most of these fluid recycling systems have been utilized for the recycling of water in swimming pools or the recycling of a coolant in an industrial machine of some type or an internal combustion engine. However, these types of recycling systems are designed to achieve a particular result and, therefore, have proved inadequate or undesirable for a multitude of reasons when utilized for purposes other than for which they were designed.

All dental offices utilize a cuspidor into which the patient releases water which he has used to rinse his mouth in order to eliminate foreign substances present therein. The substances present in the patient's mouth are of many types, such as particles of silver from fillings as they are ground down and removed, pieces of tooth enamel which are removed during drilling, and other similar foreign substances which normally accumulate in the mouth during the dental procedures. When this rinsing fluid and the foreign substances therein are released into the cuspidor, the foreign substances tend to adhere to the walls of the cuspidor. Bacteria growth and offensive odors occur within the cuspidor bowl if the bowl is not cleaned within a reasonable time.

It is therefore necessary to continuously clean the interior walls of the cuspidor in order to avoid these unsanitary conditions. Normally, this is accomplished by means of a faucet which is placed on the interior of the uppermost portion of the cuspidor rim. Water is introduced under pressure through this faucet such that it makes several spirals within the cuspidor itself and cleans the entire area of the inner walls of the cuspidor. Gravity acts on the flushing water, moving it towards the bottom of the bowl as it spirals, and at the bottom it leaves the cuspidor by means of a drain.

The water introduced into the cuspidor by means of the faucet is normally fresh water which is not reused. Since the water is continuously running in the cuspidor throughout the entire day, a great deal of water is used to eliminate a relatively small amount of foreign material from the walls of the cuspidor. The cost of this water represents a substantial expenditure on the part of the dentist. Moreover, larger dental offices having larger staffs have become fashionable with the increases in specialization which are taking place within the dental profession. These larger dental offices may have as many as five or 10 dentists working simultaneously. Since each dentist working on a patient must have a cuspidor in which water is continuously cleaning the walls, there may be as many as five or 10 different cuspidors with water flowing therein operating at the same time for the entire workday. The amount of fresh water which normally would be used in a single cuspidor is therefore increased five or ten-fold, making the expenditure for fresh water a substantial cost factor in running the dental office.

Since it is not necessary for the water used to clean the walls of the cuspidor to be fit for human consumption, there is no necessity for continually introducing

fresh water for this purpose. However, since it is highly desirable to have water which is used for this purpose at least cleaned to the point where it is odorless and colorless, it is not possible to merely reuse the water without eliminating the foreign substances therein.

The present invention relates to a water recycling system which is particularly well suited for the application described above and therefore is specifically disclosed in conjunction therewith for use as a recycling apparatus to recycle the fluid which is used to flush the walls of the dental cuspidor. However, it should be understood that there are many other uses for a system such as the one described herein, which will become obvious to one skilled in the art as the system is more fully described. The system herein can be utilized to recycle and reuse water for any application in which the recycled fluid does not have to be fit for human consumption, and in which there is a relatively small amount of foreign substance deposited within a relatively large amount of fluid. It therefore may have application in a dry cleaning establishment or an automatic carwash, for example.

It is therefore a prime object of the present invention to provide apparatus for recycling a fluid which is not to be used for human consumption and which has a relatively small amount of foreign substances deposited in a relatively large amount of fluid.

It is another object of the present invention to provide apparatus for recycling a fluid for use in flushing the walls of the dental cuspidor.

It is a further object of the present invention to provide recycling apparatus which is relatively inexpensive to manufacture and maintain which comprises inexpensive and reliable elements which can be easily and quickly replaced or repaired.

It is another object of the present invention to provide apparatus for recycling a fluid having a filter means therein which can easily be backwashed in order to clean the filter.

It is another object of the present invention to provide apparatus for recycling a fluid which can easily and quickly be bypassed such that fresh water may be introduced into the system when desired.

It is a further object of the present invention to provide apparatus for recycling a fluid which has means for automatically eliminating any excess fluid which may occur in the system.

In accordance with the present invention apparatus for recycling water for use in flushing the walls of a dental cuspidor is provided. A dental cuspidor normally has a conical bowl and a cuspidor faucet on the inner rim of the bowl. Water under pressure is introduced from the faucet into the bowl and circulates around the inner wall of the bowl until the water is acted upon by gravity and moves to the extreme bottom of the bowl where a cuspidor drain is located. The drain is in fluid communication with a means for separating sedimentary material from the water. After the sedimentary material has been separated from the water, the water is directed to a means for filtering the water. Both the sediment separating means and the filter means have means for eliminating excess water should an overflow in the system occur. From the filtering means the water is pumped into a storage means where it is stored under pressure. The storage means is in fluid communication with the cuspidor faucet such that the recycled water may be continuously fed into the cuspi-

dor. Means for introducing fresh water into the system is located between the storage means and the cuspidor faucet so that the regulation of the relative amounts of recycled water and fresh water introduced into the cuspidor can easily be achieved.

This system is designed so that sediment separating means, filtering means and the storage means can be easily bypassed to permit a supply of entirely fresh water to be fed to the cuspidor faucet and the drainage from the cuspidor to be led directly to a water drain. Bypassing the recycling portion of the system may be necessary in the event that repairs are required, the filtering means must be backwashed, or to permit drainage of the recycled water and introduction of fresh water into the system.

After a certain period of time, it will be necessary to clean the filtering means in order to eliminate the foreign materials which have accumulated therein. This may be accomplished by backwashing the filter. It is desirable to perform the backwashing operation with as little inconvenience and in as small a time as possible. In order to accomplish this, the system is so designed that after the sediment means, filter means and storage means are bypassed, the direction of the pump may be reversed and the water in the storage means pumped backwards through the filter means and out the drain. This function may be achieved without disconnection of piping if a reversible pump is employed. The appropriate valves are provided such that the pump will force water into the outlet side of the filter means and out through the overflow pipe into the drain, thus backwashing the filter without disrupting the rest of the system. The backwashing operation, therefore, can be performed in a minimal time by simply turning certain valves.

To the accomplishment of the above and to such other objects as they may hereinafter appear, the present invention relates to a preferred embodiment of apparatus for recycling a fluid for use in a dental cuspidor as defined in the appended claims and as described in the specification, taken together with the accompanying drawings in which like numerals refer to like parts and wherein:

FIG. 1 is a schematic diagram of the preferred embodiment of the apparatus.

FIG. 2 is a top elevational view of the dental cuspidor which is used in conjunction with the recycling apparatus.

FIG. 3 is a cross-sectional side view of the dental cuspidor of FIG. 2.

The present invention comprises a means for separating sedimentary material, generally designated as A, which is in fluid communication with the drain of a dental cuspidor, generally designated B. Filter means, generally designated C, is connected to the sediment separating means A in order to perform separation of substances not separated from the fluid by the sediment separating means A. Pump means, generally designated as D, is interposed between the filter means C and a storage means, generally designated E, in order to move the filtered fluid to storage means E wherein it is stored under pressure until it is conducted back to the cuspidor B.

As seen in FIG. 1, the apparatus for recycling water for use in flushing the walls of a dental cuspidor comprises an inlet pipe 10 which is in communication with the drain 12 of the dental cuspidor B. The inlet pipe 10

is connected by means of pipe 14 to a means for separating sedimentary material A which is shown here as sediment tank 16. A system bypass valve 18 is located in pipe 14 in between inlet pipe 10 and sediment tank 16. Inlet pipe 10 is also connected to a drain pipe 20 by means of drain valve 22. Drain pipe 20 leads directly to a drain 24 which may be connected to a sewer or the like in order to dispose of unwanted water. System bypass valve 18 is normally opened and drain valve 22 is normally closed so that the water from cuspidor drain 12 which passes through inlet pipe 10 is directed to sediment tank 16.

Sediment tank 16 is a commercially available piece of equipment in which the water which is being recycled is permitted to stand for a short period of time in order to permit the heavier particles of the foreign substance contained therein to settle to the bottom of the tank. The particles which will settle out of the water which comes from the cuspidor will be, for example, small pieces of silver which are drilled by the dentist when old fillings are removed, pieces of enamel which are dislodged by drilling and the like. All of these particles, because of their size and weight, will settle to the bottom of sediment tank 16. Located near the top of sediment tank 16 is overflow pipe 26. Overflow pipe 26 is effective only when an excess of water is present in sediment tank 16. Instead of backing up into inlet pipe 10, the water will flow out overflow pipe 26 and into drain 24.

After the larger particles have been removed from the water by sediment tank 16, the water is conducted by means of pipe 28 into a filter means C shown here as filter tank 30. Filter tank 30 can be any commercially available filtering apparatus. However, it has been found that a tank partially filled with activated charcoal functions particularly well in this regard. Another overflow pipe 32 is connected between filter tank 30 and drain pipe 20 in order to eliminate a water backup into the sediment tank 16 which may result when the quantity of water in the filter tank becomes too great.

The filtered water exits from filter tank 30 by means of pipe 34 which leads into a pump means D shown here as a pump 36. Pump 36 can be any commercially available water pump. However, it is preferable to use a pump which can easily reverse direction to facilitate backwashing of filter tank 30. From pump 36 the filtered water is pumped under pressure into storage means E shown here as pressure tank 38 via pipe 40. In pressure tank 38 the water is stored under pressure until it is fed to the cuspidor unit. It is preferable to keep the water under approximately 60 lbs./inch² pressure in pressure tank 38 to provide the necessary pressure for running the water through several cuspidor units simultaneously.

From pressure tank 38 the stored water is directed through a variable flow valve 46 by means of pipe 48. Flow valve 46 permits the regulation of the amount of water which is taken from pressure tank 38. The extent to which flow valve 46 is opened will depend upon the requirements of the system and particularly the number of cuspidor units which are being utilized simultaneously. Pipe 48 divides into pipe 50 which leads back to the cuspidor unit, and pipe 52 which leads to drain 24. Drain valve 54 controls the amount of water which flows from pipe 48 into pipe 52 and thus into drain 24. Drain valve 54 is normally closed. However, in the

event that the water from pressure tank 38 is to be drained, for instance when fresh water is being introduced into the system, drain valve 54 is opened, thus permitting the water which is present in pressure tank 38 to be conducted into drain 24.

A secondary water filter 56 may be provided in pipe 50 if desired. The secondary water filter 56 is generally a small screen or paper filter which is used to trap any remaining impurities in the water. From secondary water filter 56 the water is conducted by means of pipe 58 through a second system bypassing valve 60 to outlet pipe 62 which is in fluid communication with the cuspidor faucet 64.

A fresh water inlet pipe 66 is provided in fluid communication with a fresh water source (not shown). Fresh water inlet valve 68 controls the introduction of fresh water into the system. By means of the proper regulation of system bypass valve 60 and fresh water inlet valve 68, the desired percentages of fresh and recycled water may be introduced into pipe 62 and thus cuspidor faucet 64. In the event that the recycling portion of the system is to be bypassed entirely, such as during the time when repair or backwashing is taking place, system bypass valve 60 is closed entirely and fresh water inlet valve 68 is opened. During this time only fresh water will be introduced into the cuspidor. At other times fresh water inlet valve 68 will be partially or entirely closed and system bypass valve 60 opened such that the water from the cuspidor is continuously recycled.

Under normal operating conditions, bypass valve 18 and bypass valve 60 will be opened. Drain valve 22 and fresh water inlet valve 68 will be entirely or partially closed depending upon whether small quantities of fresh water are being continually introduced into the system or not. In this mode of operation, the water from the cuspidor is conducted to sediment tank 16, through filter tank 30 and is stored under pressure in pressure tank 38 until recycled water is reintroduced into the cuspidor.

However, there will be times when it will be necessary to bypass the recycling portion of the system entirely such as for draining, repair or cleaning. In order to accomplish this, bypass valve 18 and 60 are closed and drain valve 22 and fresh water inlet valve 68 opened. The water from the cuspidor will flow directly into drain 24 in this instance and only fresh water will be introduced into the cuspidor. This will leave the recycling portion of the system dormant to permit the necessary draining, repair, or cleaning operations to take place without interrupting the function of the cuspidor.

In order to backwash the water filter, a backwash valve 42 is provided between the sediment tank 16 and the filter tank 30 in pipe 28. Also, a directional valve 44 is provided between pump 36 and filter tank 30 in pipe 34. The backwashing is accomplished by reversing the direction of pump 36 as well as directional valve 44 and closing backwash valve 42. The pump 36 will then pump water from pressure tank 38 into the outlet side of filter tank 30 and through overflow pipe 32 into drain 24. The backwashing of filter tank 30, therefore, may be accomplished without disconnecting any parts of the apparatus. This configuration makes backwashing considerably more convenient and less time consuming. Of course, the amount of time required for backwashing the filter will depend on the requirements

of the particular type of filter means utilized in filter tank 30. After the backwashing operation is completed, backwash valve 42 is opened, directional valve 44 and pump 36 are changed to the forward direction, and the recycling apparatus is again ready to recycle the water.

FIGS. 2 and 3 show top and side views of the cuspidor bowl, respectively. The cuspidor B comprises a bowl 70 having an inlet faucet 64 and a drain 12. On the inner rim near the top of bowl 70 is situated the cuspidor faucet 64 which is in fluid communication with water outlet pipe 62. The water is introduced into cuspidor bowl 70 by faucet 64 which directs the flow of water along the upper portion of the inner rim. The water is introduced under pressure such that it revolves around bowl 70, in a clockwise direction, as shown in FIG. 2, as it is pulled by gravity towards cuspidor drain 12. The revolution of the water insures that the entire area of the inner wall of bowl 70 will be flushed by the water. The water makes several revolutions within bowl 70 and finally ends up in drain 12 which is in fluid communication with water inlet pipe 10. The water, after it has traveled over the inner walls of bowl 70, is thus directed by means of drain 12 into the recycling portion of the system. In the recycling portion of the system it will be purified and stored until such time as it is reintroduced into the cuspidor bowl 70 by means of cuspidor faucet 64.

Although only a single cuspidor bowl is shown in conjunction with the recycling portion of the apparatus, it is obvious that as many cuspidor bowls may be fed by this system as are necessary. Of course, the pressure under which the stored water is kept in storage tank 38 will depend upon the number and placement of the cuspidors which are to be fed by the system.

A preferred embodiment of the present invention has been specifically disclosed herein for purposes of illustration. It is apparent that many variations and modifications may be made upon this specific structure disclosed herein. It is intended to cover all of these variations and modifications which fall within the scope of this invention as defined by the appended claims.

We claim:

1. Apparatus for recycling a fluid for use in a dental cuspidor comprising a cuspidor bowl, a drain in said bowl, means for separating sedimentary material from said fluid, and separating means being in fluid communication with said drain, means for filtering said fluid, means for storing the filtered fluid under pressure and a cuspidor faucet in fluid communication with said pressure means for introducing the recycled fluid into said bowl.

2. The apparatus according to claim 1 further comprising means for backwashing said filter means.

3. The apparatus according to claim 1 further comprising means for eliminating overflow fluid from said sediment means and said filter means.

4. The apparatus according to claim 1 further comprising means for bypassing said apparatus such that fresh fluid may be utilized instead of recycled fluid.

5. The apparatus according to claim 1 further comprising means for draining the fluid from said apparatus.

6. Apparatus for recycling fluid comprising a cuspidor having a bowl with a drain therein, an inlet pipe connected to said drain, a sediment tank in fluid communication with said inlet pipe, a filter tank in fluid

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communication with said sediment tank, a pressure tank for storing the filtered fluid, a pump for pumping said fluid from said filter tank to said pressure tank and an outlet pipe in fluid communication with said pressure tank and connected to said cuspidor for introducing the recycled fluid therein.

7. The apparatus according to claim 6 further comprising a secondary fluid filter in said outlet pipe.

8. The apparatus according to claim 6 further comprising a drain and a first and a second overflow pipe, said first overflow pipe being operably connected between said sediment tank and said drain and said sec-

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ond overflow tank being operably connected between said filter tank and said drain.

9. The apparatus according to claim 8 further comprising a backwash valve between said sediment tank and said filter tank and a directional valve between said pump and said filter tank such that when the direction of fluid flow from said pump is reversed, said backwash valve closed and said direction valve conditioned to permit reverse flow, said filter tank can be backwashed through said second overflow pipe.

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