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[54] **ORAL HYGIENE APPLIANCE**
15 Claims, 6 Drawing Figs.

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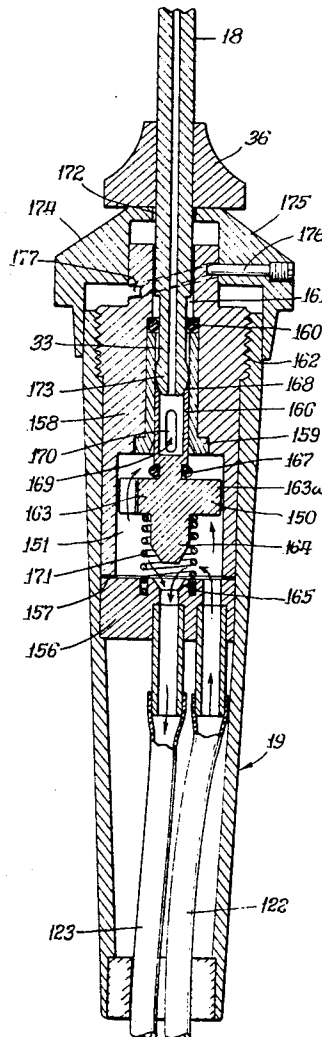
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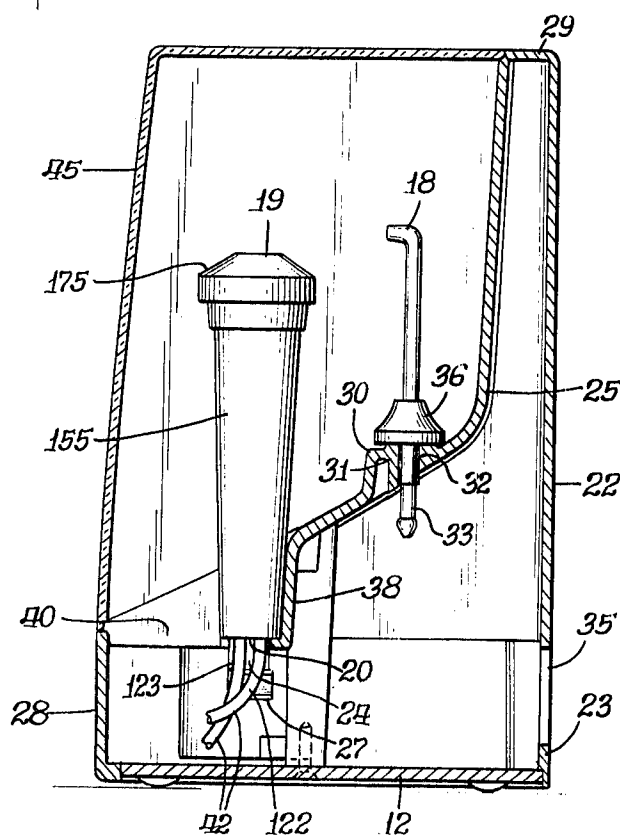
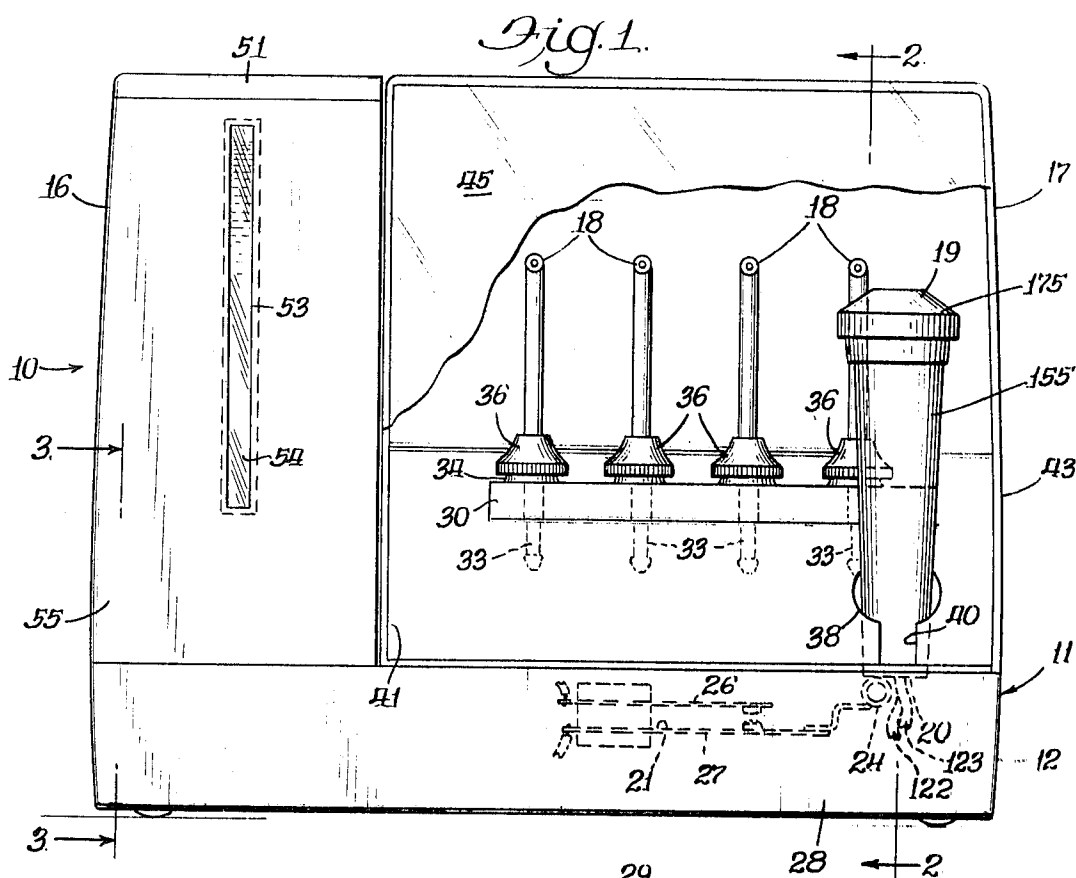
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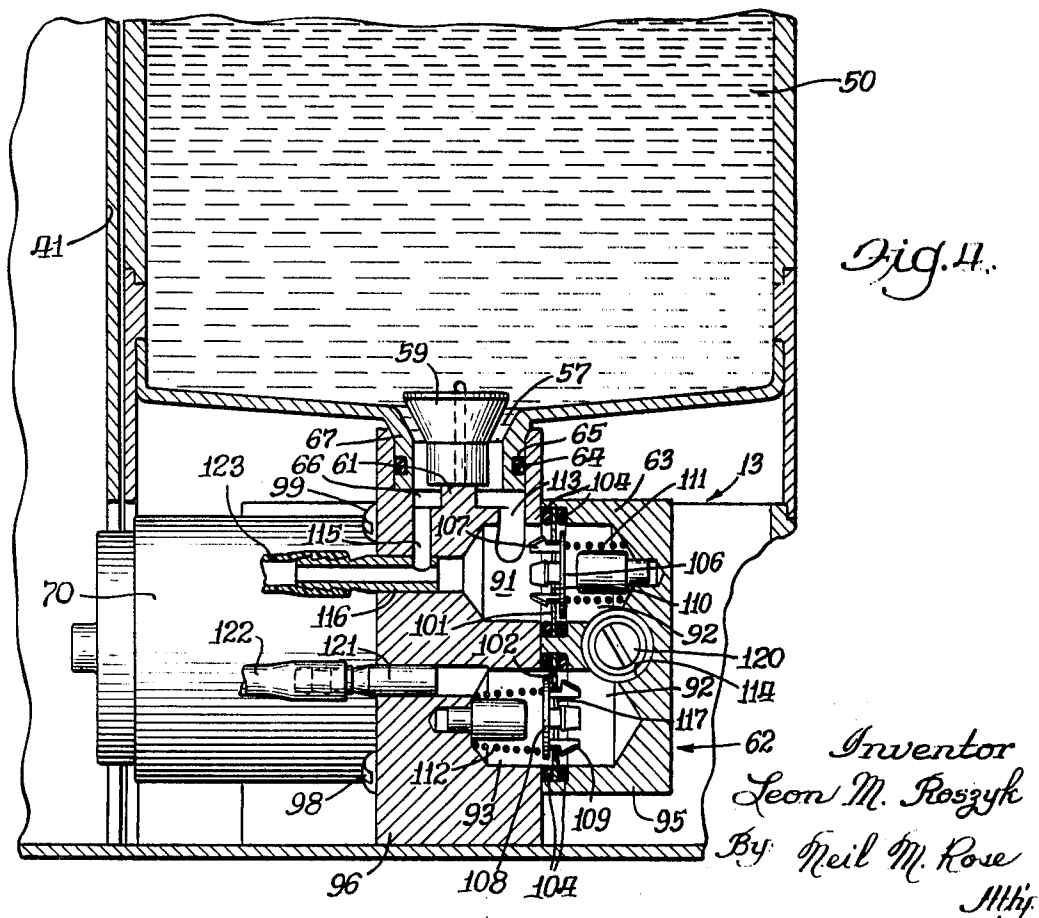
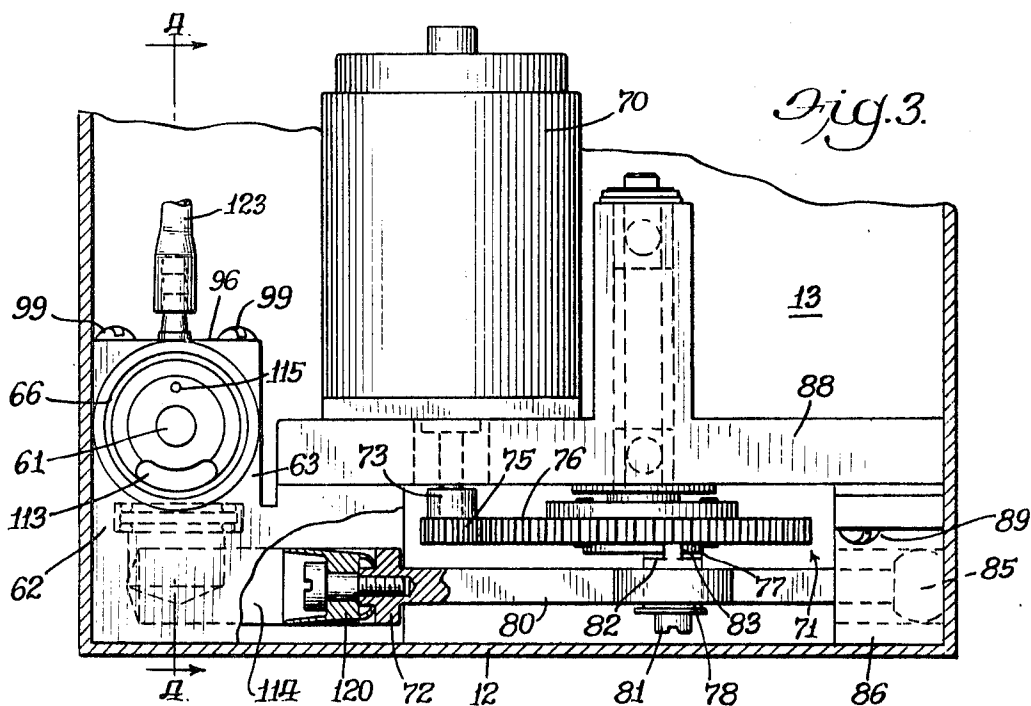
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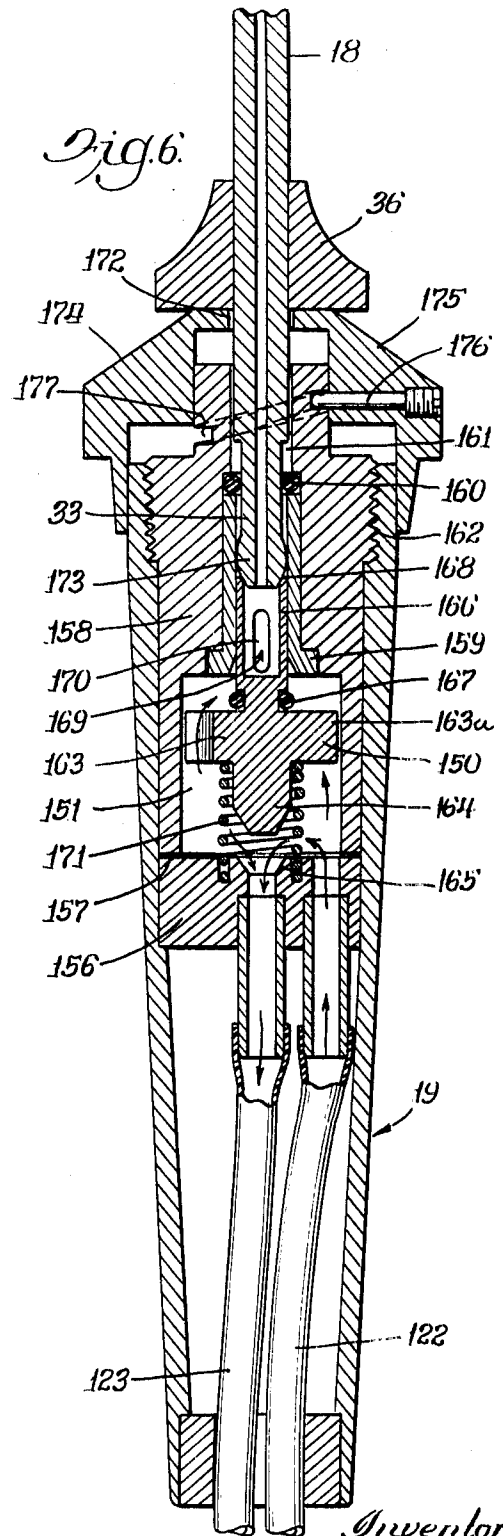
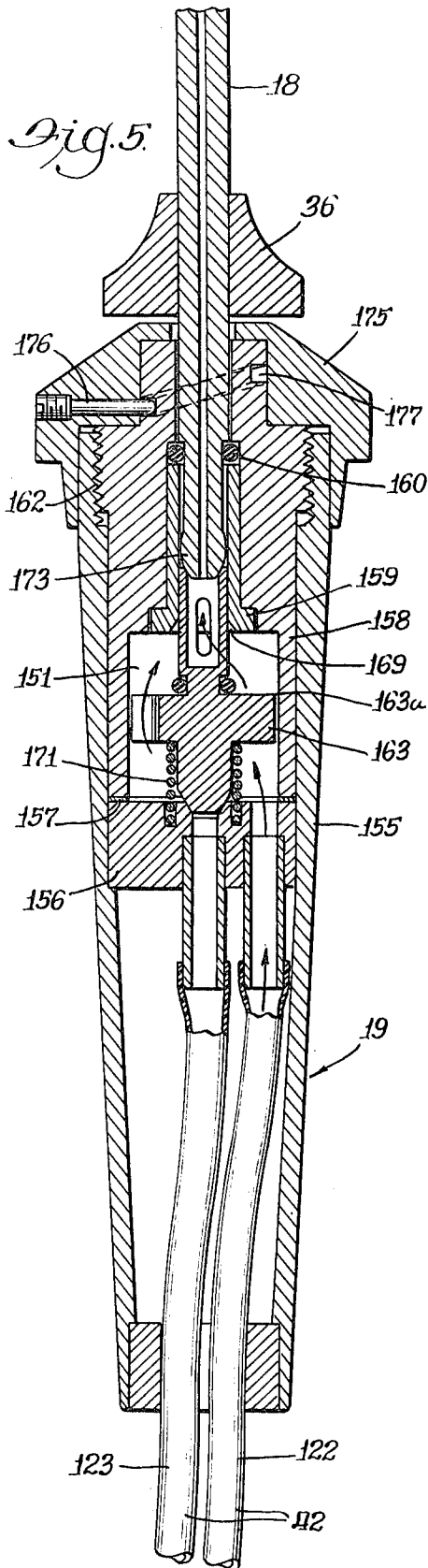
ABSTRACT: An oral hygiene appliance comprising a housing having a hollow base member which supports a liquid reservoir container and a storage and display compartment for the jet nozzles and jet nozzle handle. A liquid pump assembly of the reciprocating piston type is mounted in the base member such that a spout in the bottom of the reservoir container feeds a liquid to the pump chamber. This liquid is converted to a sequential series of liquid pulses by the pump and then delivered through a coiled tube to a jet nozzle control member which discharges the liquid pulses from a jet nozzle. The jet nozzle control handle has a normally closed valve element to prevent the discharge of the liquid pulses until opened by pressing down on the jet nozzle's fluted knob and has an adjustable feedback valve element that controls the portion of each liquid pulse that is fed back through a second coiled tube to the pump.





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ORAL HYGIENE APPLIANCE

BACKGROUND OF THE INVENTION

This invention relates to an oral hygiene appliance of the water jet type for cleaning teeth and massaging gum tissues and, particularly, to the water jet type that delivers intermittent pulses of liquid.

Oral hygiene appliances that deliver an intermittently pulsed stream of water are known to be highly effective in dislodging foreign matter from the teeth and gum tissues and in massaging gum tissue. All the current commercial oral hygiene units of this type operate in substantially the same manner. A liquid, usually water, is fed into an inlet chamber of a liquid pump from a liquid reservoir. The liquid pump is generally of the reciprocating type which draws a quantity of liquid from the inlet chamber into the pump chamber on each intake stroke, and on each exhaust stroke delivers a quantity of liquid directly into a delivery tube which is connected to a removable jet nozzle. A separate nozzle is provided for each family member who would use the appliance. These commercial units usually further include a pulse intensity control that feeds back a portion of the pumped liquid to the inlet chamber to reduce the pressure or force of the liquid discharged at the jet nozzle. The bypass control knob is conventionally positioned on the liquid pump's housing. In addition, none of the prior art devices of this type have means for cutting off the discharge of the liquid from the jet nozzle while the liquid pump is operating.

The above-described location of the control knob for varying the intensity of pulses is quite inconvenient for the user. If the user desires to vary the pulses' intensity during the cleaning and massaging operation, it is quite difficult to fine the intensity control knob while holding the jet nozzle inside his mouth. This invention overcomes this disadvantage by providing variable pulse intensity control in the handle for the jet nozzle.

The oral hygiene unit of this invention also provides in the jet nozzle handle an on-off control over the discharge of the liquid pulses from the jet nozzle. This on-off control permits the user to have convenient and instant control over the operation of the jet spray, which enables the user to place the jet nozzle inside the mouth area before the liquid pulses are discharged from the jet nozzle.

It is an object of this invention to provide an improved oral hygiene apparatus of the intermittent pulse type.

It is another object of this invention to provide an improved oral hygiene apparatus of the intermittent pulse type having a control in the jet nozzle handle for varying the intensity of the liquid pulses.

It is a further object of this invention to provide an oral hygiene apparatus of the intermittent liquid pulse type having an on-off control in the jet nozzle handle.

Briefly, in carrying out the objects of this invention, one embodiment consists of a housing having a base member which supports a removable liquid reservoir container and a storage and display compartment for storing several jet nozzles and a jet nozzle control handle. A liquid pump assembly is mounted in the base member such that a spout in the bottom of the liquid reservoir container registers with an opening in the pump housing for supplying a liquid to the intake chamber of the pump. The liquid pump is of the reciprocating piston type and delivers through a resilient coiled tube a sequential series of pulses of liquid to the jet nozzle control handle. The liquid pulses are delivered from the tube into a discharge chamber within the control handle. The discharge chamber has an outlet port in communication with a recess or channel formed in the control handle that removably receives the stem of a jet nozzle and a bypass port that is in communication with one end of a second coiled resilient tube whose other end is connected to a fitting formed in the intake chamber of the liquid pump.

A valve mechanism is positioned within the discharge chamber of the jet nozzle control handle and has a shutoff

valve stem that is held by a spring member into sealing engagement with the outlet port of the discharge chamber. The shutoff valve stem is opened by pushing inwardly on the jet nozzle which causes the stem of the jet nozzle to engage the shutoff valve stem and push it away from the outlet port to permit the liquid pulses to discharge from the jet nozzle.

The valve mechanism also has a bypass valve stem that is positioned in alignment with the bypass port. When the jet nozzle is pushed inwardly to open the shutoff valve stem, it moves the bypass valve stem to a position adjacent to the bypass port. The distance between the bypass valve stem and bypass port determines what portion of each pulse of liquid will be fed back to the pump's intake chamber and thereby determines the intensity of the liquid pulses discharged from the jet nozzle. To provide a variable control over the intensity of the liquid pulses, the control handle has an adjustable stop member that limits the distance the jet nozzle can be pushed and thereby provides control for varying the distance between the feedback valve stem and the feedback port.

Further objects and advantages of the present invention will become apparent as the following specification proceeds, and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference may be had to the accompanying drawings in which:

FIG. 1 is a front elevational view of a new and improved oral hygiene appliance;

FIG. 2 is a vertical sectional view taken substantially along line 2-2 of FIG. 1;

FIG. 3 is an enlarged fragmentary vertical sectional view taken along line 3-3 of FIG. 1;

FIG. 4 is a fragmentary sectional view taken along lines 4-4 of FIG. 3;

FIG. 5 is a sectional view of the jet nozzle handle with the jet nozzle held in the "on" position and the bypass valve shut off; and

FIG. 6 is a sectional view of the jet nozzle handle with the jet nozzle held in the "on" position and the bypass valve open.

DESCRIPTION OF THE PREFERRED EMBODIMENT

There is shown in FIG. 1 of the drawings, a housing 11 for an oral hygiene appliance 10. To serve as a base or pedestal for the appliance 10, housing 11 has a hollow, box-shaped base member 12 which also houses the liquid pump assembly 13 (see FIGS. 3 and 4). Supported above base member 12 is a liquid reservoir container 16 and a storage and display compartment 17. The storage and display compartment 17 is provided to store a number of jet nozzles 18 and a jet nozzle control handle 19. The main support for storage and display compartment 17 is its vertical rear wall 22, which is an integral extension of the rear wall 23 of base member 12.

The jet nozzles 18 and jet nozzle handle 19 are stored in receptacles formed in a V-shaped or channel-shaped member 25. The V-shaped member 25 is secured between the front plate 28 of base member 12 and a narrow horizontal top plate 29, which is formed integrally of rear wall 22 at the upper edge thereof. To receive and store the jet nozzles 18, a ledge 30 is provided on member 25 and is formed with a plurality of pockets 31 therein. As best seen in FIG. 2, each pocket has an opening 32 large enough to snugly receive a stem 33 of jet nozzle 18. The pockets 31 are of sufficient depth to hold the jet nozzles 18 in a vertical position. Each pocket 31 has an upstanding annular ridge 34 formed above horizontal ledge 30 which engages the bottom edge of a fluted knob 36 secured to nozzle 18 above the stem 33; the ridges 34 facilitate the grasping of knobs 36 by the fingers when the nozzles are being removed from the pockets 31.

To store and receive jet nozzle handle 19, a receptacle 38 is formed in member 25 at a position in front of and below the

horizontal ledge 30. The receptacle 38 is of sufficient depth to support jet nozzle handle 19 in the vertical storage position. To provide access to a storage space beneath member 25 for a pair of coiled tubes 42 which supply and return liquid to and from the handle 19, a slot 4 extends through the member 25 between receptacle 38 and the forward edge of member 25. As will be explained below, coiled tubes 42 are permanently connected between jet nozzle handle 19 and liquid pump assembly 13.

The oral hygiene appliance 10 has a novel means for automatically turning off the liquid pump assembly when the user is finished with the cleaning and massaging operation. As the control handle 19 is placed in receptacle 38, its bottom surface 20 contacts an actuating arm 24 and moves arm 24 downwardly as is best shown in FIG. 1. This downward movement actuating arm 24 causes spring biased contact 27 of a switch 21 to move away from fixed contact 26 to open the circuit in which the switch 21 is connected. Since switch 21 is connected in one of the electrical wires (not shown) that electrically energizes the liquid pump assembly 13, the liquid pump assembly 13 is deenergized when jet nozzle control handle 19 is placed in receptacle 38.

The electrical power for the liquid pump assembly is preferably provided by the 115 volts A.C. available at any household electric outlet, the 115 volts supply being reduced to 6 volts by means of a potted water-sealed transformer to minimize shock hazards. A small opening 35 is formed in rear wall 23 to permit the electrical cord (not shown) connecting the transformer to a household outlet to exit from housing 11.

To cover the jet nozzles 18 and jet nozzle handle 19 while in their stored position on member 25, a plastic transparent L-shaped cover member 45 is provided. Cover member 45 extends between horizontal plate 29 and the top of front plate 28 and, together with side walls 41 and 43 of storage and display compartment 17, it completely encloses the area housing jet nozzles 18 and jet nozzle handle 19.

The liquid reservoir container 16 is preferably made removable for easy and convenient refilling of the liquid 50 which it supplies to liquid pump assembly 13. The liquid reservoir container 16 can be refilled by lifting its top plate 51. To permit the user to see the level of liquid 50 while he is using the oral hygiene appliance 10, the liquid reservoir container 16 has a liquid level indicator 53 which consists of an elongated, rectangular-shaped glass or transparent plastic piece 54 that is mounted in the front plate 55 of liquid reservoir container 16.

The liquid 50 in liquid reservoir container 16 is prevented from leaking out of opening 57 when the container 16 is separated from appliance hygiene appliance 10 by means of a gravity valve 59. When liquid reservoir container 16 is placed into the liquid supply position (see FIG. 4), the gravity valve 59 is forced upwardly by a boss 61 on the liquid pump housing 63 to permit the passage of the liquid 50 through opening 57 of a spout 67. To provide a seal between the outlet opening 57 and an inlet chamber 66 of pump housing 63, an O-ring 64 is positioned in an annular groove 65 cut into the outer surface of spout 67 so that the O-ring 64 is compressed in sealing engagement with the interior of inlet chamber 66.

Liquid pump assembly 13 consists of liquid pump 62, a low voltage permanent magnet motor 70, and gear mechanism 71. To reciprocally drive a piston 72 of liquid pump 62, the rotary drive from output shaft 73 is converted to a reciprocating motion by gear mechanism 61. Gear mechanism 71 consists of a small pinion gear 75 secured to the end of output shaft 73, larger pinion gear 76 and scotch yoke mechanism 77. Scotch yoke mechanism 77 includes a channel member or guide 78 rigidly attached to the rod 80 by a set screw 81. A cross head 82 is slidably mounted in the channel 78 and is pivoted on the gear 76 on an eccentric stub shaft 83. When the gear 76 is rotated, the cross head 82 moves back and forth while reciprocating motion is transmitted directly to the rod 80. The end of the rod 80 remote from pump 62 is mounted in a sliding bearing 85 formed in the block member 86.

Because of the large driving forces applied to the liquid pump 62, motor 70 and gear mechanism 71 are mounted on a metal T-shaped frame 88. The T-shaped frame is secured at one end by two screws 89 to block member 86. At the other end, the T-shaped member 88 is mounted to pump housing 63 by two screws (not shown).

As best shown in FIG. 4, the liquid pump 62 consists of an intake chamber 91, a pump chamber 92, and an exhaust chamber 93. The pump housing 63 for liquid pump 62 is constructed from two plastic block members 95 and 96 that are secured together by a set of screws 98 and 99. Before the block members 95 and 96 are mounted together as shown in FIG. 4, annular valve seats or members 101 and 102 are each placed in a shouldered recess formed in block member 63 such that they are each sandwiched between a pair of O-rings 104 and 105 which provide seals for members 101 and 102 and seal the space between block members 95 and 96. Inlet valve 106 is held loosely in the center of valve seat 101 by means of its four finger elements 107. Similarly, outlet valve 108 is held loosely in valve seat 102 by finger members 109. Inlet valve 106 is spring biased to the closed position by spring member 11, and outlet valve 108 is spring biased to the closed position by spring member 112.

The liquid 50 is fed from spout 67 of the liquid reservoir 16 into inlet chamber 66 and passes through a kidney-shaped opening 113 (see FIG. 3) into intake chamber 91. A small circular opening 115 is drilled through block member 96 and fitting 116 is received in block member 96 to provide a return path from the nozzle handle 19 to the intake chamber 91, as will be explained hereinafter.

During the operation of liquid pump assembly 13, piston 120 of liquid pump 62 is reciprocated at about 600 strokes per minute. On each of its intake strokes (towards the right as viewed in FIG. 3), a quantity of liquid 50 is drawn from intake chamber 91 through intake port 110 and pump chamber 92 into a piston chamber 114. On each exhaust stroke of piston 120, the quantity of liquid 50 in piston chamber 114 is driven through outlet port 117 into exhaust chamber 93. On each intake stroke of piston 120, the pressure inside pump chamber 92 is reduced which causes inlet valve 106 to move against the pressure of spring 111 and open. On each exhaust stroke of piston 120, the pressure in pump chamber 92 is increased which causes outlet valve 108 to move against the force exerted by spring 112.

Each quantity of liquid 50 that is discharged into exhaust chamber 93 is delivered to jet nozzle handle 19 by means of discharge tube 122 that is secured to the end of a fitting 121 which is secured to block 96 and which communicates with the chamber 93. As will be explained hereinafter, a second tube 123 is used to feed back a portion or all of the liquid delivered to jet nozzle control handle 16. Both tubes 122 and 123 are made of a flexible plastic which is relatively non-stretchable and is formed in a springlike coil.

The new and novel means for shutting off the pulses of liquid or for controlling the intensity of these pulses is housed in control handle 19, as illustrated in FIGS. 5 and 6. A valve mechanism 150 is arranged in the discharge chamber 151 of jet nozzle control handle 19 to control the relative amounts of liquid fed back to the pump 62 and discharged from the jet nozzle 18, depending on its relative position within discharge chamber 151. Discharge chamber 151 is formed by three separate pieces that are mounted within an outer cylindrical casing 155 of control handle 19. Two of these three pieces consist of a block member 156 and a cylindrical block member 158 which clamp a sealing gasket 157 between their adjacent surfaces. At its upper end, cylindrical block member 158 is threadedly engaged at 162 with the interior of outer casing 155.

The third piece forming the discharge chamber 151 is a valve guide 159 that is secured in an upwardly extending axial passageway 161 in cylindrical block member 158. Valve mechanism 150 consists of a valve member 163 having a center spider piece 163a, and extending below (as viewed in

FIGS. 5 and 6) the spider piece 163a is a feedback valve stem 164 which cooperates with a conical seat 165 to control the amount of liquid fed back to feedback tubing 123. The upper end of the valve member 163 controls the on-off release of the jet pulses and includes a shutoff valve stem 166 which is slidably received in valve guide 159. An O-ring 167 carried by valve member 163 and positioned between spider piece 163a and stem 166 seats between spider piece 163a and valve guide 159 to seal the upper outlet from chamber 151. The shutoff valve stem 166 is constructed as a hollow cylinder with several slots 170 to permit the liquid to discharge from chamber 151 into the stem 33 of jet nozzle 18. Valve member 163 is constantly biased by spring 171 upwardly (as viewed in FIGS. 5 and 6) to urge the O-ring into a sealing engagement with valve guide 159.

When the oral hygiene appliance 10 is to be used, one of the jet nozzles 18 is taken from socket 31 and its stem 33 is inserted into the center opening 172 in the upper end of jet nozzle handle 19. The jet nozzle 18 is then pushed through opening 172 and moves through the center bore 161 of cylindrical block member 158 until the ball section 173 of stem 33 passes below the O-ring 160 which is compressed as the ball section 173 passes therethrough. In this position, the ball section 173 engages the top 168 of shutoff valve stem 166.

To turn on the jet pulses, the user depresses the fluted knob 36 of the jet nozzle 18 towards the jet nozzle handle 19. This depressing motion by the user will cause the ball section 173 of stem 33 to push the valve member 163 downwardly (as viewed in FIGS. 5 and 6) and unseat the O-ring 167 which permits the passage of liquid into the cylindrical section 166 and through stem 33 and out jet nozzle 18. When the user desires to turn off the jet pulses, he simply releases the slight pressure being exerted on fluted knob 36, and the spring pressure of spring 171 returns the valve mechanism 150 to the off position. In order to facilitate the operation of valve mechanism 150 to a particular position which would produce a desired rate or force of pulsed liquid discharged from the nozzle 18, handle 19 is provided with an adjustable collar 175.

In FIGS. 5 and 6, there is illustrated two different positions of valve mechanism 150 with the fluted knob 36 depressed against collar 175. FIG. 5 represents the condition of feedback valve stem 164 in sealing engagement with seat 165 to prevent any feedback of the liquid pulses through tube 123. FIG. 6 represents the condition of feedback valve stem 164 in the fully open feedback position with the largest possible separation between feedback valve stem 164 and seat 165. For the purpose of positioning collar 175 in various axial locations with respect to handle 19, the upper end of block member 158 is formed with a helical cam groove 177 within which a pin 176 on the collar 175 rides as a cam follower. In FIG. 6, pin 176 is at the upper limit of its travel which will be termed the 0° angular position. As collar 175 of stop device 174 is turned between the angular positions shown in FIGS. 5 and 6, the distance between feedback valve stem 164 and seat 165 will vary between the sealing position of FIG. 5 and the fully open position of FIG. 6.

One of the goals in designing the oral hygiene appliance 10 was to construct the jet nozzle handle 19 with a control that could provide a reasonably linear variation between pulse intensity and the amount of rotation of the control means. A jet nozzle handle was constructed as described above and was found to have the following test results:

Valve rotation of collar 175	Discharge pulse rate (ml./min.)
0°	105
45°	120
90°	135
135°	324
180°	475

The above chart illustrates the large range of control over the intensity of the pulses. By contrast, a current commercial

unit with its pulse intensity control knob mounted on its housing was tested, and it was determined at the low setting, 368 ml. per minute were discharged and at the high setting, 495 ml. per minute were discharged.

One of the factors to be considered in designing an on-off control for the jet liquid pulses in the jet nozzle handle is that the liquid pump is continuously operating. If a valve mechanism prevents the discharge of the liquid pulses, a large back pressure is built up between the valve mechanism and the liquid pump which will eventually cause a fault to develop and also causes the liquid pump to waste power. In designing the valve mechanism 150 for jet nozzle handle 19, this problem was overcome by arranging the feedback valve stem 164 to be separated from seat 165 whenever O-ring 167 seals off the discharge of the liquid pulses from jet nozzle 18. As can be readily appreciated by referring to FIGS. 5 and 6, when O-ring 167 is in its shutoff position with valve member 163 in its uppermost position, all the liquid delivered by liquid pump 62 to jet nozzle handle 19 enters discharge chamber 151 from tube 122 and is fed back to liquid pump 62 through feedback tube 123. It should also be understood that in any intermediate position of the valve mechanism 150 in which flow is limited through outlet port 169, the feedback valve stem 164 will be separated from the seat 165 and permit return flow through feedback tube 123.

Although the reasons for including the return feedback line 123 in the above described system are not immediately evident, a consideration of the alternatives is helpful in developing an appreciation of the advantages of the instant invention. If the flow of liquid through nozzle 18 is cut down by closing off the slots 170, there will be an increase in the load on the pump 13. This condition will cause the pump motor 70 to draw more power and produce more wear and tear on the pump parts as well as the means for conducting the liquid to the jet nozzle 18. When the flow through the outlet port 169 is completely cut off, there is a substantial increase in the pressure throughout the system and an additional load on the motor and pump. The use of the feedback tube 123 permits one to employ a control positioned in the jet nozzle 18 while avoiding the pressure and overload problems inherent in a non-circulating system. It is also possible with the feedback arrangement to obtain the reasonably linear control of flow volume over a fairly wide range. Accordingly, the oral hygiene appliance disclosed herein is characterized by lower operating costs, better and more accurate control of the water flow through the nozzle, greater convenience, and longer life of the parts because of the absence of the overloads.

While the invention has been described in connection with particular pump unit construction, various other devices and methods of practicing the invention will occur to those skilled in the art. Therefore, it is not desired that the invention be limited to the specific details illustrated and described and it is intended by the appended claims to cover all modifications which fall within the spirit and scope of the invention.

What I claim as new and desired to be secured by Letters Pat. of the U.S. is:

1. An oral hygiene apparatus of the intermittent pulse type having a liquid pump assembly for delivering a sequential series of pulses of liquid through a first tubular means to a jet nozzle control handle, said control handle comprising an outer casing of sufficient size to be hand grasped, an opening in said casing for removably receiving the stem of a jet nozzle, a valve means for selectively preventing the discharge of said pulses of liquid from said jet nozzle and a pulse intensity control means for selectively varying the proportions of liquid discharged from said nozzle and liquid returned through a second tubular means to the intake of said liquid pump assembly to thereby provide a variable control over the volume of each pulse of liquid delivered by said pump assembly.

2. An oral hygiene apparatus as defined in claim 1, said jet nozzle control handle further comprising a discharge chamber formed inside said outer casing having an inlet port for receiving said liquid from said first tubular means and an outlet port

for passing said liquid from said discharge chamber into said jet nozzle stem, and said valve means including a shutoff valve stem with a sealing element and a spring member that biases said shutoff valve stem towards said outlet port to cause said sealing element to seal off said outlet port, said jet nozzle stem being arranged to engage the end of said valve stem, hereby when the user presses inwardly on said jet nozzle against the force of said spring member said shutoff valve stem is moved causing said sealing element to move away from said outlet port and permitting said liquid to be discharged through said jet nozzle.

3. An oral hygiene apparatus as defined in claim 2, wherein said pulse intensity control means includes an adjustable stop means for selectively determining the distance said jet nozzle stem can be moved, a feedback valve stem mechanically coupled to said valve means and positioned in alignment with a feedback port formed in said discharge chamber, said feedback port being in communication with said second tubular means, whereby the setting of said stop means determines the distance between said feedback valve stem and said feedback port after the user presses inwardly on said jet nozzle and thereby determines the portion of each pulse liquid that is returned to said pump assembly through said second tubular means.

4. An oral hygiene appliance of the intermittent pulse type having a liquid pump assembly for delivering a sequential series of pulses of liquid through a tubular means to a jet nozzle control handle, said control handle comprising an outer casing of sufficient size to be hand grasped, an opening in said outer casing to receive the stem of a jet nozzle, the end of said jet nozzle stem being in communication with the outlet port of said control handle, a shutoff valve means for selectively preventing the discharge of said liquid pulses from said jet nozzle, said shutoff valve means having a sealing element which is held in sealing engagement with said outlet port by a spring biasing member, said valve means cooperating with said jet nozzle stem such that an axial force by the user on said jet nozzle in a direction opposite to the force exerted by said biasing member causes said sealing element to unseat and permits said liquid pulses to be discharged from said jet nozzles.

5. The oral hygiene appliance of claim 4 wherein said shutoff valve means is mechanically coupled to a feedback valve in said handle, said feedback valve being fully open when said shutoff valve is sealed and being progressively closed as said shutoff valve means is displaced axially against the force of said biasing member.

6. The oral hygiene appliance of claim 4 having an adjustable stop on said handle adjacent said jet nozzle, said stop engaging said nozzle to control the amount of displacement of said shutoff valve means.

7. An oral hygiene appliance of the intermittent pulse type having a liquid pump assembly for delivering pulsed liquid through a first tubular means to a jet nozzle control handle, said jet nozzle control handle comprising an outer casing of sufficient size to be hand grasped, a recess in said control handle for removably receiving the stem of a jet nozzle, a discharge chamber formed inside said control handle having an inlet port in communication with one end of said first tubular means, an outlet port in communication with said jet nozzle stem and a feedback port in communication with one end of a second tubular means, the other end of said second tubular means being in communication with the intake port of said liquid pump assembly, and a pulse intensity control for variably regulating the volume of liquid delivered by said liquid pump assembly to said jet nozzle, said pulse intensity control including a feedback valve stem positioned in said discharge chamber in direct alignment with said feedback port and a means to vary the position of said valve stem with respect to said feedback port, whereby the position of said valve stem controls the portion of the liquid delivered to said discharge chamber which is fed back to said intake port of said liquid pump assembly.

8. An oral hygiene appliance as set forth in claim 7 having a liquid reservoir connected to deliver liquid to said intake port of said liquid pump assembly, said pump drawing liquid from

said reservoir and circulating it through said first tubular means to said handle except when said outlet port is closed whereupon said pump recirculates liquid delivered to said intake port from said handle by said second tubular means.

9. An oral hygiene appliance of the intermittent pulse type having a liquid pump assembly for delivering a sequential series of pulses of liquid through a liquid conduit means to a jet nozzle handle, said jet nozzle handle comprising an outer casing having a recess extending into its interior for receiving a jet nozzle, valve means for preventing the discharge of said liquid pulses from said jet nozzle, means for selectively actuating said valve means and means for relieving the back pressure built up on said liquid pump assembly when said liquid pulses are prevented from being discharged.

10. The oral hygiene appliance of claim 9 wherein said valve means is contained in said jet nozzle handle, an outlet opening in said handle connected to said jet nozzle to provide a liquid flow path from said conduit through said handle to said nozzle, said valve means controlling the flow through said outlet opening.

11. The oral hygiene appliance of claim 10 including a liquid reservoir positioned to deliver liquid to the intake of said pump assembly, said means for relieving back pressure comprising conduit means for recirculating liquid from said handle to said pump intake.

12. The oral hygiene appliance of claim 9 wherein said means for relieving back pressure comprises a valve in said handle for controlling return flow from said handle to the intake of said pump, said valve means for preventing the discharge being positioned in said handle and being mechanically coupled to said means for relieving back pressure.

13. An oral hygiene appliance comprising a housing having a base member, a removable liquid reservoir container and a display and storage compartment supported on said base member, said display and storage compartment having receptacle means for temporarily storing a jet nozzle handle and a number of jet nozzles, a liquid pump assembly mounted inside said base member and having the intake opening to the liquid pump arranged to be positioned in registration with an opening in the bottom of said reservoir container to supply a liquid to said liquid pump, a resilient coiled tube connecting the outlet port of said liquid pump to said control handle, and a slot formed in the bottom surface of said display and storage compartment for receiving said coiled tube when said jet nozzle is placed in said receptacle means.

14. An oral hygiene appliance comprising a housing having a base member, a removable liquid reservoir container and a display and storage compartment supported on said base member, said display and storage compartment having receptacle means for temporarily storing a jet nozzle handle and a number of jet nozzles, a liquid pump assembly mounted inside said base member and having the intake opening to the liquid pump arranged to be positioned in registration with an opening in the bottom of said reservoir container to supply a liquid to said liquid pump, and resilient coiled tube connecting the outlet port of said liquid pump to said control handle, a slot formed in the bottom surface of said display and storage compartment for receiving said coiled tube when said jet nozzle is placed in said receptacle means, a normally closed electrical switch connected in the electrical power cord to an electrical motor driving said pump, said switch having an actuating member that is positioned in the bottom of said receptacle means for said jet nozzle handle whereby when said jet nozzle handle is returned to said receptacle means for storing said actuating member is tripped causing said switch to open and thereby deenergize said liquid pump.

15. An oral hygiene appliance as defined in claim 13, wherein said jet nozzle handle comprises an outer casing of sufficient size to be hand grasped, a recess in said outer casing for removably receiving one of said jet nozzles, a passageway in said handle connecting the stem of said jet nozzle to said coiled tube, a valve means for preventing the discharge of any liquid delivered to said handle by said pump, a means for selectively actuating said valve means to commence the discharge of said liquid from said jet nozzle.