

[54] PNEUMATIC CLEANING, DISINFECTING
AND OILING DEVICE FOR A TUBE-TYPE
DENTAL HANDPIECE

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134/166 C

[51] Int. Cl. B05c 7/02

[58] Field of Search 118/317, 73; 134/166 C,
134/167 C, 168 C, 169 C, 94, 99

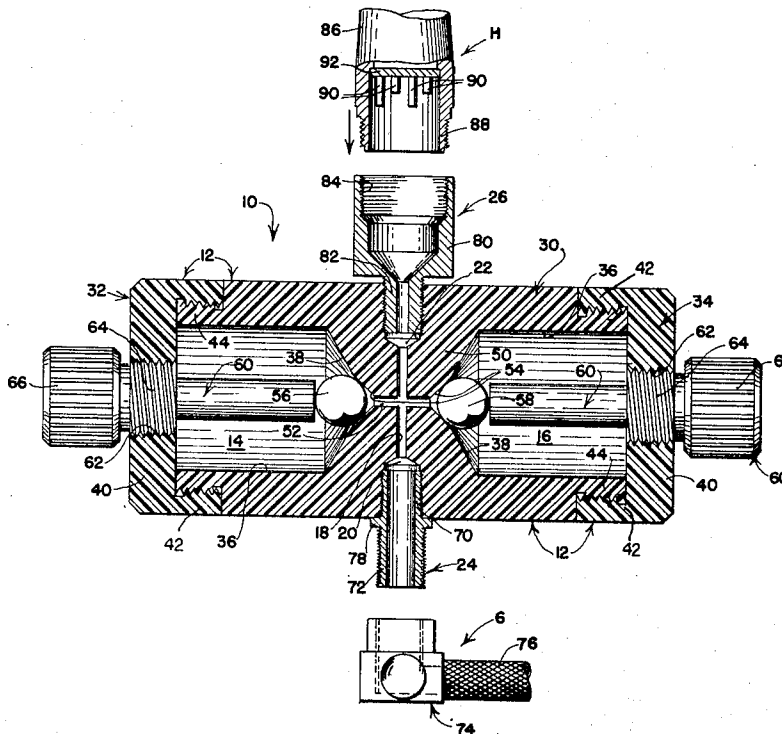
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[57] ABSTRACT

A device in the form of a small compact portable reservoir and valve arrangement designed for attachment to a source of pressurized air and by means of which measured charges of a cleansing, disinfecting and oiling liquid may be successively and forcibly projected in an atomized condition through the small bore passages of a dentist's handpiece.

9 Claims, 6 Drawing Figures



SHEET 1 OF 2

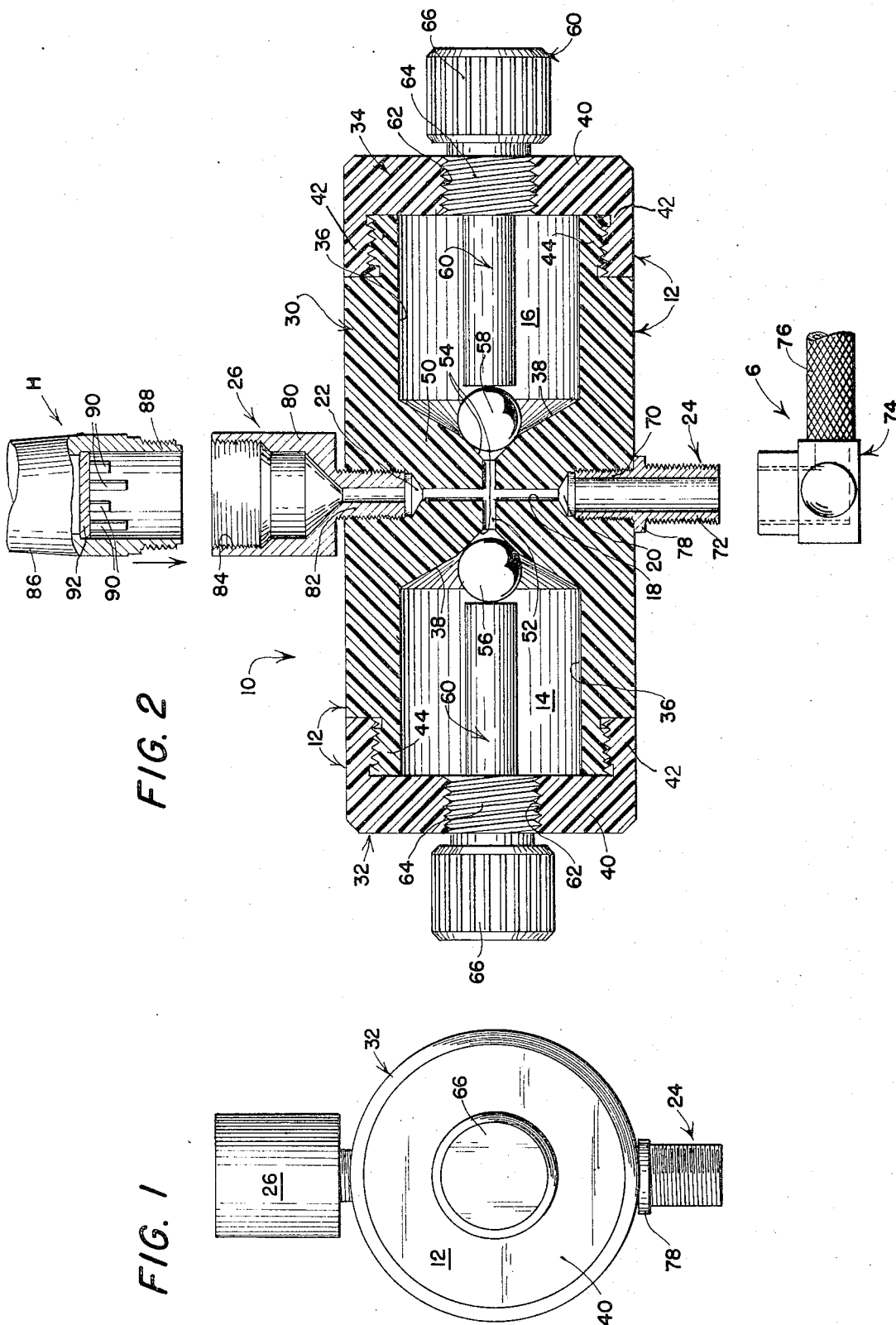


FIG. 6

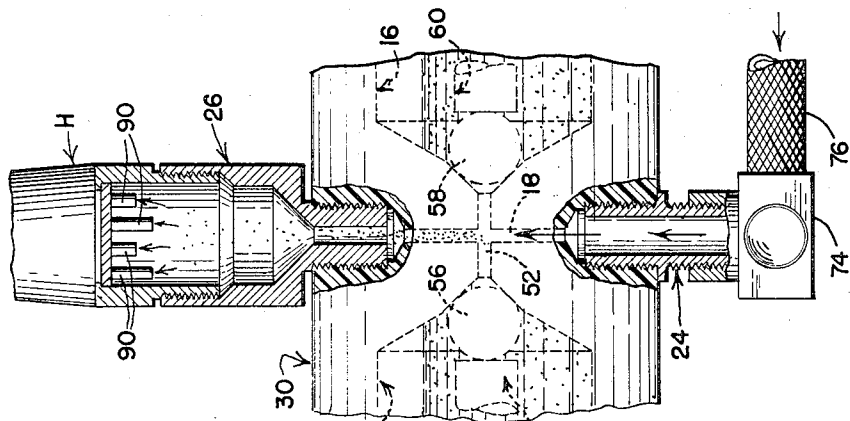


FIG. 5

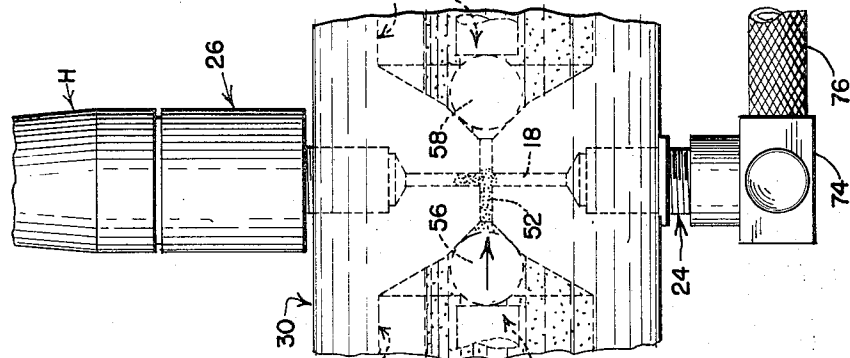


FIG. 4

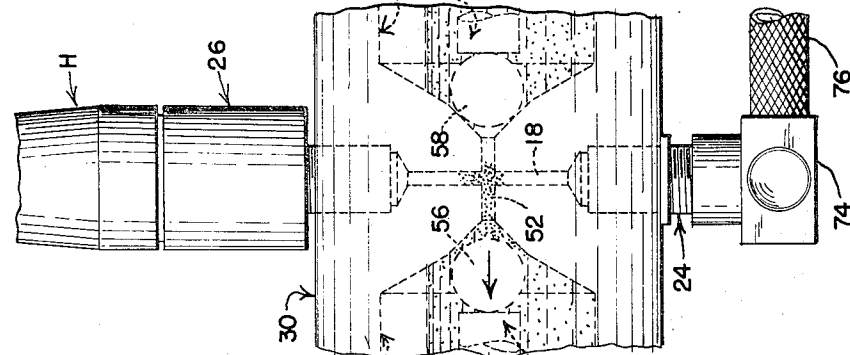
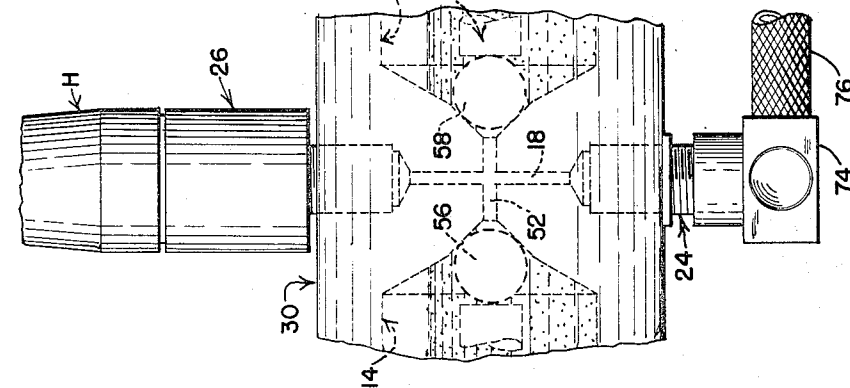


FIG. 3



PNEUMATIC CLEANING, DISINFECTING AND OILING DEVICE FOR A TUBE-TYPE DENTAL HANDPIECE

The improved cleaning, disinfecting and oiling device comprising the present invention is designed for use primarily in connection with the treatment of a dental handpiece in order to render the same acceptable for reuse. The invention is, however, capable of other uses and a device embodying the principles of the invention may, if desired and with or without modification as required, be employed for similarly treating other equipment which is in need of internal cleaning, disinfecting, oiling, and the like. Irrespective, however, of the particular use to which the present invention may be put, the essential features thereof are at all times preserved.

Heretofore, the various procedures which have been employed by a dentist or dental technician in reconditioning a dental handpiece for use in a patient's mouth after a prior use have not proven altogether satisfactory. Due to the relatively small diameter of the various fluid-conducting tubes which are mounted in and extend through the handpiece, difficulty is encountered in forcing a cleansing, disinfecting or oiling liquid through such tubes. Faucet water pressure, however great, is ineffective to flush out these tubes due to the capillary blockage which takes place within the tubes. Placing the handpiece in a steam or other sterilization chamber may destroy germs, but it is ineffective to flush foreign material out of the tubes. Some dentists attempt to treat a handpiece by applying the discharge end of a conventional syringe to the proximate end of the tubular handpiece, but not only is manual bulb pressure inadequate to force the liquid through the tubes, but the procedure is untidy due to lack of an adequate seal between the syringe and the handpiece. The treatment of a dental handpiece in this manner is usually carried out over a sink or basin and an inordinate amount of liquid is usually consumed. Furthermore, different syringe containers for the several different liquids which are employed must be made available and careful wiping of the handpiece after treatment thereof must be resorted to.

The present invention is designed to overcome the above-noted limitations that are attendant upon the care and treatment of a dental handpiece in a dentist's office or laboratory and, toward this end, the invention contemplates the provision of a novel handpiece treating device which is in the form of a casing having at least two reservoirs, one for each type of liquid with which the handpiece is to be treated. The reservoirs communicate with a common atomizing passage having a first nipple fitting by means of which a handpiece may be attached to such passage and a second nipple fitting which, when connected to a source of pressurized air, causes air to be forcibly projected through the atomizing passage so as to atomize any liquid which may be present in the latter and force the same through the handpiece. A manually operable valve is associated with each reservoir and such valve, when momentarily opened and then closed again, admits a small quantity of liquid from the reservoir into the passage for subsequent atomization thereof and consequent projection through the tube structure of the handpiece. The casing of the device is preferably formed of transparent material so that not only are the liquids in the reservoirs visible, but also the valves are readily discernable so that

the selective flow of liquid from each reservoir into the passage for atomizing purposes may be viewed at the time of valve manipulation. By such an arrangement, the atomized liquids perform a scavenging action on the small bore tubes of the handpiece and, after the small amount of liquid which has been caused to enter the atomizing passage has been discharged through the handpiece, the small bore tubes are blown dry.

The provision of a handpiece cleaning, disinfecting and oiling device such as has briefly been outlined above constitutes the principal object of the present invention.

A further and important object of the invention is to provide a device of the general character set forth above and in which each valve manipulation will serve to introduce a predetermined and substantially fixed volume of liquid into the atomizing passage, regardless of the extent to which the valve is opened, or of the duration of time that the valve is allowed to remain open, or the angle at which the device is being held during valve manipulation.

Other objects and advantages of the invention, not at this time enumerated, will be apparent from a consideration of the following detailed description. The invention consists in the several novel features which are hereinafter described and are particularly defined by the claims at the conclusion hereof.

In the accompanying two sheets of drawings forming a part of this specification, one illustrative embodiment of the invention is shown.

In these drawings:

FIG. 1 is an end elevational view of a pneumatic cleaning, disinfecting and oiling device embodying the principles of the present invention;

FIG. 2 is a sectional view taken substantially centrally and longitudinally through the device, such view showing the device in poised relationship with respect to a dental handpiece which is to be applied thereto preparatory to cleaning, disinfecting and oiling of the latter; and

FIG. 3, 4, 5 and 6 are fragmentary side elevational views of the medial region of the device, illustrating schematically and progressively the manner in which the device is used during the handpiece cleaning phase of operation.

Referring now to the drawings in detail and in particular to FIGS. 1 and 2, a pneumatic cleaning, disinfecting and oiling device embodying the present invention is designated in its entirety by the reference numeral 10, and consists essentially of a cylindrical casing 12 which defines an internal reservoir 14 for a liquid detergent or other cleaning material and an internal and adjacent reservoir 16 for a suitable liquid disinfectant and oiling mixture or solution. The two reservoirs 14 and 16 communicate with a common diametrically extending air passage 18 which is formed in the central portion of the casing 12 and extends between an internally threaded air inlet 20 and an internally threaded air outlet 22. The air inlet 20 is adapted to be connected to a suitable externally threaded nipple fitting 24 while the air outlet has operatively installed therein an externally threaded outlet fitting 26 which is designed for connection to the proximate end of a dental handpiece H to be cleaned, disinfected and oiled. The nipple fitting 24 is adapted to be operatively connected to a source (not shown) of pressurized air.

The cylindrical casing 12 consists of three parts, namely, a casing body 30 and a pair of identical closure caps 32 and 34. Preferably, but not necessarily, the casing body 30 is formed of a suitable transparent molded plastic material such, for example, as Lucite, as also are the two closure caps 32 and 34. Each end of the cylindrical body 30 of the casing 12 is provided with a relatively deep cylindrical socket 36 which presents a frusto-conical inner or bottom wall surface 38 of steep slant angle and small slant height. Each closure cap 32 and 34 is of shallow cup-shape design and includes a circular end wall 40 and an annular rim flange 42, the latter being internally threaded for reception over the externally threaded and reduced rim region 44 of the adjacent end of the casing body 30.

The two closure caps 32 and 34 are interchangeable on the opposite ends of the casing body 30 and, as best illustrated in FIG. 2 of the drawings, the left-hand closure cap 32, when applied to the casing body, affords an end closure for the detergent reservoir 14, while the right-hand closure cap 34 similarly affords an end closure for the combined disinfectant and oiling reservoir 16.

The two reservoirs 14 and 16 are separated from each other by a relatively thick, circular, internal partition-like wall 50 through which the aforementioned diametric air passage 18 extends. A longitudinally extending bore or liquid passage 52 extends centrally through the partition wall 50, intersects the diametric air passage 18 at right angles, and establishes communication between each reservoir 14 and 16 and the passage 18. The opposite ends of the longitudinally extending passage 52 open into funnel-shaped depressions 54 which are formed in the central portions of the bottom walls 38, the slant angle of these depressions 54 being somewhat steeper than the slant angle of the bottom walls so as to provide respective valve seats for two valve elements in the form of valve balls 56 and 58. The latter are associated with and loosely disposed within the reservoirs 14 and 16, respectively, and their nature and function will be made clear presently.

Each of the two valve balls 56 and 58 is adapted normally to be maintained in seating engagement with its respective valve seat by means of a valve actuator 60. The latter is in the form of a thrust rod or plunger which projects through an opening 62 in the associated end wall 40, and is formed with an enlarged externally threaded medial section 64 which is threadedly received in such opening. The inner end of each plunger is adapted to bear against the adjacent valve ball and force the same against the associated depression-formed valve seat 54 when the actuator 60 is tightened in the opening 62. Each actuator (plunger) is provided at its outer end with an enlarged knurled manipulating knob 66 which is disposed exteriorly of the casing 12 for manual gripping purposes and by means of which the actuator 60 may be turned in either direction for tightening or loosening purposes as the case may be. By completely unthreading each actuator 60 from its associated end wall 40, the actuator may be removed from the casing 12 and the opening 62 will serve as a filling opening for the adjacent reservoir.

The nipple fitting 24 may be of any conventional type, there being a wide variety of brass or other commercially available fittings by means of which the air inlet 20 may be operatively connected to a source of pressurized air or other gaseous fluid under pressure.

The particular fitting 24 illustrated herein is of tubular construction and includes an inner externally threaded section 70 which is threadedly received in the internally threaded air inlet 20, an outer externally threaded section 72 which is designed for connection to a valve-equipped fitting 74 at the outlet end of a flexible air line 76 leading from a source of pressurized air, and an intermediate or medial annular stop flange 78. Where a source of pressurized air is not available, the nipple fitting 24 may be connected to the gas discharge outlet of a portable tire inflating device of the general type which is shown and described in my copending United States patent application Ser. No. 201,051, filed on Nov. 22, 1971, and entitled "CARTRIDGE-ACTUATED DEVICE FOR INFLATING TIRES AND THE LIKE." Such device embodies a puncturable carbon dioxide cartridge which, when punctured, releases its gas into a surrounding container, the latter being equipped with a valved gas outlet which is capable of direct connection to the nipple fitting 24.

The nipple fitting 26 also is in the form of a commercially available tubular brass or other fitting having an outer socket-equipped body portion 80 and an inner reduced stem portion 82, the latter being externally threaded for reception in the internally threaded air outlet 22. The body portion 80 of the nipple fitting 26 is formed with an internally threaded socket 84 which is designed for reception of the externally threaded proximate end region of the dental handpiece H. This handpiece is conventional and represents only one of a wide variety of handpieces to which the present cleaning, disinfecting and oiling device may be applied. Only the proximate end of the handpiece H is shown in FIG. 2 of the drawings. It will be understood that this handpiece embodies a tubular casing 86, the proximate end region of which is externally threaded as indicated at 88 for threaded reception in the internally threaded socket 84 in the body portion 80 of the fitting 26. As is conventional, longitudinally extending small bore tubes which are collectively designated by the reference numeral 90 are mounted within the casing 86 and are held in spaced relationship by a series of spacer disks, one of which appears at 92 (see FIG. 2). The various tubes 90 serve a number of different functions, one of them, for example, may supply motive fluid to a small turbine which is disposed at the distal end of the handpiece and receives various rotary dental tools such as an abrasive disk, a brush or the like, and another tube may be employed to supply a flushing liquid to the oral cavity of the person to whom the handpiece H is being applied.

The operation of the herein described dental handpiece cleaning, disinfecting and oiling device will be facilitated by reference to FIGS. 3 to 6 of the drawings wherein the initial cleaning phase of device manipulation is progressively illustrated. This initial cleaning phase, as well as the disinfecting and oiling phase which follows, is greatly facilitated by the fact that the casing 12, including the casing body 30 and the closure caps 32 and 34 are formed of a transparent material so that the valve balls 56 and 58, and particularly the diametric air passage 18 and the longitudinal extending liquid passage 52, are visible through the casing for viewing of the liquid detergent in the reservoir 14 and the liquid disinfectant and oiling mixture in the reservoir 16 during manipulation of the knobs 66.

It may be assumed that the outlet fitting 26, when initially threaded into the air outlet 22, will remain as a permanent part of the device 10 for threaded reception therein of successive dental handpieces which are to be cleaned. The nipple fitting 24, with the flexible air line 76 attached thereto by way of the valve-equipped fitting 74, may also remain in position within the air inlet 20 if the device is to be maintained in a ready position for immediate use by the dentist during his office hours. For storage of the device, the valve-equipped fitting 74 may be removed from the fixed nipple fitting 24.

During actual treatment of the handpiece H, an initial cleaning phase is performed, after which a disinfecting and oiling phase is initiated as heretofore indicated. Accordingly, after the particular handpiece H which is to be treated has been threaded into the outlet fitting 26, the left-hand actuator 60 as viewed in FIG. 2 of the drawings, that is, the actuator which controls the operation of the valve ball 56, is loosened by proper manual manipulation of its knob 66 to a sufficient extent to allow the ball 56 to become unseated from the associated funnel-shaped depression 54 in the bottom wall 38 of the reservoir 14, whereupon a small quantity of the liquid detergent in said reservoir 14 will flow into the adjacent end of the longitudinally extending liquid passage 52 as shown in FIG. 4.

Due to the small diameters of the passages 18 and 52, gravity flow of the liquid from the reservoir 14 into such passages cannot be relied upon since capillary blockage will prevent free liquid flow. This, however, is an advantageous phenomenon since it is, therefore, not necessary to estimate any given time for maintenance of the valve ball 56 in an unseated condition. As soon as the valve ball 56 moves away from its seat 54, liquid will flow around said valve ball and enter the associated seat-forming depression 54, i.e., the depression leading to the passage 52 where it will remain in a static condition since it is unable to enter said passage due to the aforementioned capillary blockage. Then, as soon as the left-hand valve actuator 60 is manipulated by reverse turning of the associated knob 66 to force the ball 56 back toward its seat, the liquid within the adjacent depression 54 will be forcibly projected into the passage 52. Thus, regardless of the length of time that the valve ball 56 remains unseated, or of the extent to which the left-hand actuator 60 is retracted, a predetermined and small fixed quantity of the detergent liquid in the reservoir 14 will be forced into the passage 52 by the valve ball 56 each time said left-hand actuator is effectively operated. This quantity of detergent liquid is subsequently atomized by the on-rush of scavenging air which is ultimately directed through the diametric air passage 18 when the valve of the fitting 74 is manipulated into its open position and thus only a drop or two of the detergent liquid is utilized during each scavenging and atomizing operation.

The entry of liquid from the reservoir 14 into the passage 52 may readily be determined visually by reason of the transparency of the casing 12. Movement of the valve ball 56 against the seat 54 will entrap the cleaning fluid within the bore 52. Thereafter, the valve of the fitting 74 will be operated to release pressurized air into the diametric passage 18, whereupon the passages 18 and 52 will function as an aspirator and the liquid in the passage 52 will be entrained in the stream of air and conducted from the outlet 22 through the various tubes 90 of the dental handpiece H in an atomized condition

thereby thoroughly cleaning the handpiece by a scavenging action.

After the aforementioned cleaning operation has been completed, the disinfecting and oiling phase of operation is commenced without necessitating removal of the dental handpiece H from the outlet fitting 26. The disinfecting and oiling phase of operation is performed in a manner similar to that described in connection with the cleaning phase of operation, the right-hand actuator 60 being operated to unseat the ball 58 and admit disinfecting and oiling liquid into the passage 52. During this operation, the ball 56 will, of course, remain seated as the result of previous inward manipulation of the left-hand actuator.

It will be understood that, as previously described, the use of the valve-equipped fitting 74 for liquid-atomizing and passage-scavenging operations is purely exemplary and that in an instance where a portable puncturable carbon dioxide cartridge is employed for such atomizing purposes, the valve means which is associated with such actuator will be manipulated accordingly. Therefore, throughout this specification and in the appended claims the terms "air inlet," and "air outlet," or "air passages," etc., will be construed in such a manner that they will include the use of carbon dioxide or other pressurized gaseous fluid for atomizing and scavenging purposes.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification since various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. For example, although the device 10 has been illustrated and described herein as embodying two tandem-arranged reservoirs 14 and 16 from which a cleaning liquid and a combined disinfecting and oiling liquid are respectively dispensed, it is within the purview of the invention to construct the device with a single reservoir and its associated valve-dispensing means. In such an instance, the portion (partition-like wall 50) of the casing body which is adjacent to the frusto-conical bottom wall 38 is to be considered as an end closure wall. Furthermore, whereas the invention has been described in connection with the use of a cleaning liquid and a combined liquid-type disinfecting and oiling solution, various other liquid solutions may be employed. Finally, although the invention has been designed primarily for the treatment of dental handpieces, the same may readily be employed for the cleaning, disinfecting, oiling or other treatment of other tools or devices having small passages which are to be scavenged by fluid action. Therefore, only insofar as the invention is particularly pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent:

1. In a device for atomizing and forcibly projecting a liquid medium through a small bore passage associated with a dental handpiece or similar instrument for the purpose of treating such passage, a thick-walled, tubular casing embodying a cylindrical side wall and circular end closure walls defining together an internal reservoir for the liquid medium, one of said end closure walls having an air passage extending diametrically therethrough and an axial liquid passage establishing communication between a medial region of said air passage and the inner end of the reservoir, said air pas-

sage having at one end an air inlet designed for connection to a source of air under pressure and at its other end an air outlet designed for connection to said small bore passage of the dental handpiece, and a manuallyoperable valve means effective between said reservoir and said liquid passage for admitting small quantities of the liquid medium from said reservoir into said liquid passage for subsequent atomization and discharge through said air outlet by aspiration of such liquid medium during passage of air through said air passage, said valve means comprising a valve element loosely disposed within the reservoir, a valve seat for said valve element at the juncture region between the reservoir and the liquid passage, and a manuallyoperable actuator projecting axially through said other end closure wall and engageable with said valve element for forcing the latter against said valve seat.

2. A device as set forth in claim 1 and wherein said valve seat is in the form of a frusto-conical depression in said one end closure wall, and said valve element is in the form of a spherical ball.

3. A device as set forth in claim 1 and wherein the valve element is in the form of ball and said actuator is in the form of a plunger which projects through said other end closure wall, has its inner end designed for engagement with the valve ball, carries a manipulating knob on its outer end exteriorly of the reservoir, and has its medial region threadedly received in said other end closure wall whereby rotation of the plunger in opposite directions will tighten the valve ball against said valve seat and loosen the same therefrom.

4. A device as set forth in claim 3 and wherein said other closure wall is in the form of a closure cap which is telescopically and threadedly received over the adjacent end of said cylindrical side wall.

5. A device as set forth in claim 4 and wherein said plunger is cylindrical and said medial region thereof is of enlarged diameter and projects through a centrally disposed threaded opening in said other end closure wall within which it is threadedly received and from which it is removable so as to expose the opening for reservoir filling purposes.

6. In a device for successively and forcibly projecting a cleaning liquid and a disinfecting and oiling liquid through the small bore passages associated with a dental handpiece or the like for the purpose of scavenging such bores, a generally tubular casing presenting a cy-

lindrical side wall, circular end walls and a medial transverse partition wall, said walls defining a pair of liquid reservoirs on opposite sides of said medial partition wall and adapted to contain, respectively, said cleaning liquid and said disinfecting and oiling liquid, said casing being formed with a diametric air passage which projects completely through said side wall and partition wall and defines at one end an air inlet which is adapted for connection to a source of air under pressure, and at the other end an air outlet which is designed for attachment to the proximate end of the dental handpiece, said casing being further formed with a longitudinally extending liquid passage which extends centrally through said partition wall, intersects said air passage, and establishes communication between said reservoirs and air passage, and selectivelyoperable, manually-controlled valve means effective between each reservoir and said liquid passage for admitting small quantities of liquid from the former to the latter for subsequent atomization and discharge from said air outlet by aspiration of the liquid during passage of air through said air passage.

7. A device as set forth in claim 6 and wherein the opposite sides of said transverse partition wall are formed with frusto-conical depressions therein which communicate with the ends of said liquid passage, and each valve means embodies a valve ball loosely disposed in one of said reservoirs and designed for seating engagement with the associated frusto-conical depression, and a manually-operable plunger threaded centrally through an opening in one of said closure walls and having its inner end designed for engagement with said valve ball to force the latter against said frusto-conical depression when said plunger is tightened in said opening.

8. A device as set forth in claim 7 and wherein said frusto-conical depressions are of relatively steep slant angle and the areas of said opposite sides of the partition wall surrounding the depressions are frusto-conical on a lesser slant angle.

9. A device as set forth in claim 8 and wherein said casing is formed of transparent material to the end that the liquid contents of said reservoirs and the quantity of liquid in said passageways at any given moment may be visualized through the casing.

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