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[54] **DENTAL CLEANING AND MASSAGING DEVICE**
9 Claims, 3 Drawing Figs.

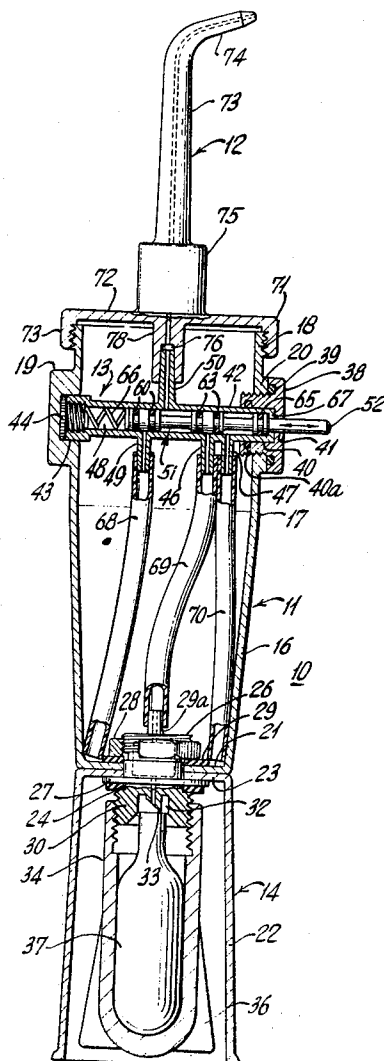
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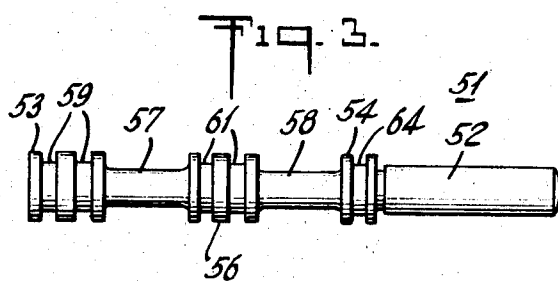
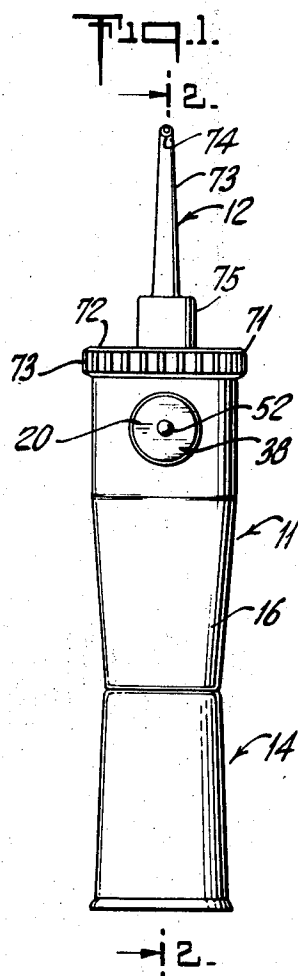
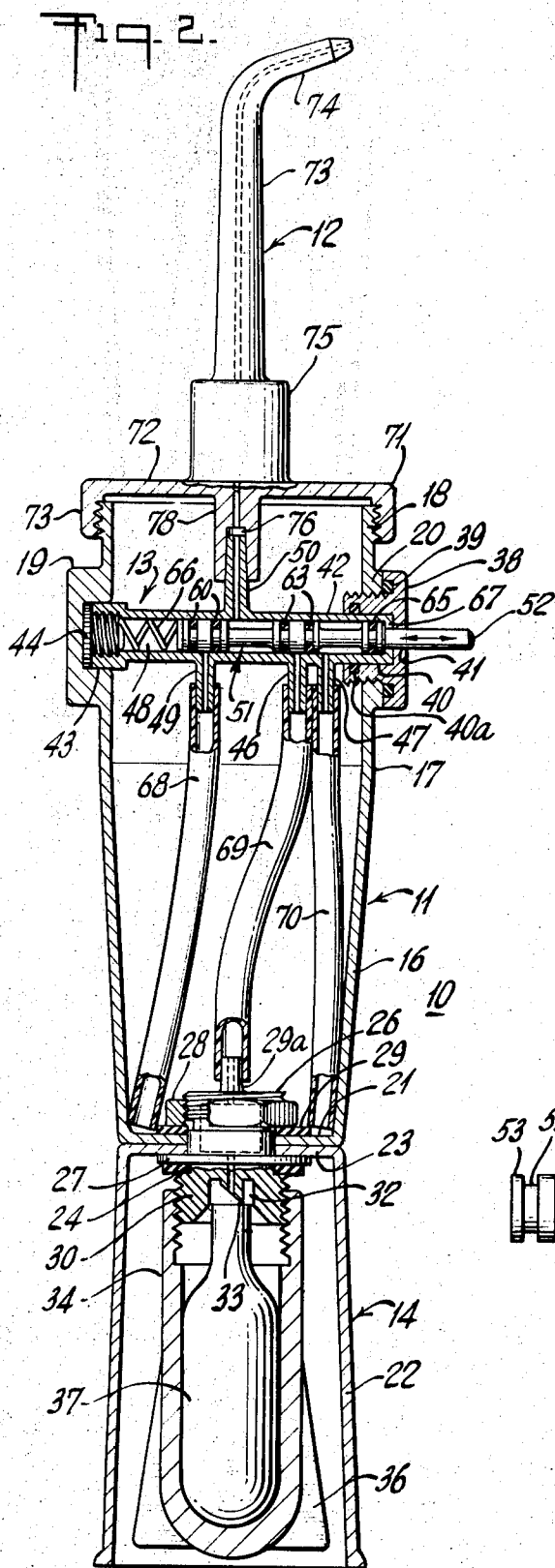
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ABSTRACT: A dental cleaning and massaging device includes a water tank and CO₂ cartridge-containing housing arranged end to end therewith to form a handle. The top of the tank is closed by a screw cap supporting a nozzle. A slide valve is mounted in the tank and includes two pairs of normally closed interconnecting inlets and outlets. A piercing tube is located in the housing and communicates through a pressure regulating valve and a first valve inlet-outlet pair with the tank bottom, a screw casing being provided to hold the cartridge and force it against the piercing tube. The second valve inlet is connected by a tube to the bottom of the tank and an axial tapered coupling nipple defines the second valve outlet which is engaged by a cap-carried socket communicating with the nozzle through a water pulsing device.





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DENTAL CLEANING AND MASSAGING DEVICE

BACKGROUND OF THE INVENTION

The present invention relates generally to improvements in dental cleaning and massaging devices and it relates particularly to an improved method and device for the cleaning of teeth by use of a liquid jet.

A common method for cleaning the teeth is by means of a fine, high-velocity water jet directed onto the dental area to be cleaned. The water jet is also employed for massaging the gums since the jet produces a pressure in the region of the gums subjected to the jet and the successive application and relief or variation of such pressure effects the massaging of the gums. Many forms of water jet dental cleaning devices have been employed and proposed but these possess many drawbacks and disadvantages, particularly when used domestically as distinguished from professionally. A conventional apparatus includes a water tank, an electrically driven pump and a hand held nozzle connected to the pump outlet by a pressure hose. This apparatus is expensive, bulky, highly inconvenient and unreliable and requires the use of an electrical outlet with its attendant drawbacks. It has been proposed to connect the jet nozzle by way of a pressure hose and coupling member to the domestic faucet nozzle but such arrangement is likewise highly inconvenient, difficult to control and manipulate, of very limited application and otherwise leaves much to be desired.

SUMMARY OF THE INVENTION

It is, therefore, a principal object of the present invention to provide an improved dental cleaning method and device.

Another object of the present invention is to provide an improved dental cleaning device of the water jet type.

Still another object of the present invention is to provide an improved water jet dental cleaning device which obviates the need for any external connections such as to an electrical outlet or to a pressurized water supply.

A further object of the present invention is to provide a compact, self-contained water jet dental cleaning device.

Still a further object of the present invention is to provide a dental cleaning device of the above nature characterized by its convenience, reliability, simplicity and ease of use.

The above and other objects of the present invention will become apparent from a reading of the following description taken in conjunction with the accompanying drawing which illustrates a preferred embodiment thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical longitudinal sectional view of a dental cleaning and massaging device embodying the present invention illustrated with the gas cartridge being urged into engagement with the cartridge piercing needle;

FIG. 2 is a side elevational view thereof; and

FIG. 3 is an enlarged plan view of a valve spindle forming a part thereof.

In a sense, the present invention contemplates the provision of a dental cleaning device comprising a liquid reservoir, a nozzle member carried by said reservoir, and connected to the lower part thereof, a compressed gas cartridge, a manually operable valve normally biased to a closed position and including a first outlet with said reservoir and a first inlet, and means for connecting said valve inlet to said gas cartridge.

According to the preferred form of the improved dental cleaning device the reservoir is a cylindrical tank provided at one end with a screw cap which axially supports the outwardly directed nozzle. An open ended housing is axially end to end to the opposite end of the tank and defines a handle. A threaded pressure regulator housing bushing extends through the abutting walls of the tank and housing and includes a piercing tube at one end in the housing and an outlet coupling tube in the tank. A separable threaded cartridge casing releasably engages the bushing and holds a CO₂ cartridge which is pressed against the piercing tube to effect the punc-

turing thereof. A spring biased normally closed slide valve extends across the upper part of the tank and includes an outwardly projecting push button actuator. The slide valve includes a first inlet port tube connected to the cartridge piercing tube and an associated first outlet port tube connected to the bottom of the tank, a second inlet port tube connected to the bottom of the tank and an associated second outlet port connected to an upwardly directed axial coupling tube which releasably engages a mating cap carried coupling tube communicating with the nozzle. A liquid pulsing device is located between the second outlet port and the nozzle.

The improved dental device is compact, easy to control and manipulate, requires no external water or power source and is highly reliable and versatile.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing which illustrates a preferred embodiment of the present invention, reference numeral 10 generally designates the improved device which comprises a water reservoir section 11, a nozzle and closure member 12, a valve assembly 13, and a pressurized gas cartridge section 14. Reservoir section 11 and cartridge section 14 are assembled to form a handle which conveniently and easily may be held in the hand and its operation controlled in use.

Reservoir section 11 comprises an elongated cylindrical open topped tank or body 16 including an upwardly slightly diverging peripheral wall 17 provided with an externally threaded upper peripheral border 18. Formed on the outer upper face of wall 17 are opposite coaxial bosses 19 and 20, boss 20 having a tapped axial bore and boss 19 having an axial well in its inner face. Tank 16 has a flat bottom wall 21 provided with a circular central opening.

Section 14 comprises an open-bottomed cylindrical housing 22 disposed below and arranged coaxially end to end with tank 16 and includes a centrally apertured top wall 23 coinciding with wall 21. A cylindrical casing 24 houses a conventional pressure reducing regulator valve and includes a threaded upper section 26 registering with the openings in walls 21 and 23 and provided at its base with a peripheral flange 27 abutting the underface of wall 23. A nut 28 engages threaded section 26 and is tightened onto a washer 29 overlying wall 21 firmly and hermetically to interconnect sections 11 and 14. Integrally formed with the casing upper section 26 is an upwardly directed outlet coupling tube 29a. The regulated outlet pressure of the regulator valve is preferably of the order of 25 to 50 pounds per square inch, the normal inlet pressure ranging up to about 900 pounds per square inch.

Casing 24 includes a threaded lower section 30 depending below flange 27 and having an axial well 32 formed in the underface thereof. Integrally formed with casing 24 is a piercing tube 33 which is coaxially disposed in well 32 and is provided with a sharpened tip, tubes 29a and 33 communicating through the regulator valve in casing 24. A cup-shaped magazine or casing 34, internally threaded at its upper border, releasably engages section 30 and is provided at its lower part with radially projecting wings 36 to facilitate the tightening and removal of casing 34 from threaded section 30. A conventional pierceable compressed carbon dioxide cartridge 37 is separably housed in casing 34 and includes a neck portion the upper end of which is insertable into well 32 so that tightening of casing 34 by clockwise rotation thereof forces the cartridge against piercing tube 33 to effect the aperturing of cartridge 37 and communication between the pierced cartridge and coupling tube 29.

A threaded plug 38 registers with tapped boss 20 and includes an outer enlarged head provided in its inner face with an annular groove, which holds a resilient ring 39 bearing on the outer face of boss 20 to form a seal therewith. An axial well 40 is formed in the inner face of plug 38 and communicates with the outer face thereof through coaxial bore 41 of reduced diameter. An annular groove is formed in the face of the well 40 and holds a resilient sealing ring 40a.

Valve assembly 13 comprises a tubular valve body member 42 one end of which nests in well 40 and sealed by the resilient ring therein and the other end 43 of which is enlarged and tapped and closed by a threaded plug 44, end 43 and plug 44 nesting in a suitably dimensioned well in boss 19. Integrally formed with and depending from valve body member 42 are first longitudinally spaced inlet and outlet tubes 46 and 47 respectively which communicate with the valve body member axial bore 48 through corresponding inlet and outlet ports. A second valve inlet tube 49 spaced from the first inlet tube 46 depends from body member 42 and communicates with bore 48 through a corresponding second inlet port. A second valve outlet coupling tube 50 is directed upwardly from valve body member 42 coaxial with tank 16 and communicates with bore 48 through a corresponding second outlet port. Coupling tube 50 is upwardly tapered and terminates at a point below the top of tank 16.

A valve shaft 51 is longitudinally slideably disposed in valve body bore 48 and has an axial cylindrical pushbutton 52 integrally formed therewith and projecting through plug bore 41. Valve shaft 51 includes enlarged inner and outer end sections 53 and 54 respectively, and an enlarged intermediate section 56, end section 54 being disposed shortly inwardly of pushbutton 52. Shaft sections 53 and enlarged section 56 are joined by an integrally formed coaxial rod 57 of reduced cross section and spool sections 54 and 56 are joined by an integrally formed coaxial rod 58 of reduced cross section, rods 57 and 58 delineating passageways with the face of bore 48. A pair of spaced annular grooves 59 spaced inwardly of end section 53 are provided and hold resilient sealing rings 60, a pair of spaced annular grooves 61 formed in intermediate section 56 are provided and hold resilient sealing rings 63, and an annular groove 64 between end section 54 and button 52 is provided with a resilient sealing ring 65. Rings 60, 63 and 65 slideably engage the face of bore 48 in the valve body to form a seal therewith.

A helical compression spring 66 is entrapped between plug 44 and the inner end of spool 51 to bias the spool to its outer closed position, with spool section 54 abutting an inwardly directed flange 67 at the corresponding end of valve body 42. In the spring-biased closed position of the valve, as seen in FIG. 2, valve section 53 registers with the second inlet port thereby closing communication between coupling pipes 49 and 50, and valve shaft section 56 registers with the first inlet port thereby closing the communication between coupling pipes 46 and 47. Movement inward of button 52 slides shaft 51 inwardly to open communication between coupling pipes 46 and 47 around shaft section 58, and between coupling pipes 49 and 50 around shaft section 57.

A flexible tube 68 engages coupling tube 49 and extends to the bottom of tank 16, while a flexible tube 69 engages and interconnects coupling tubes 29a and 46, and a flexible tube 70 engages tube 47 and extends to the bottom of tank 16.

The upper end of the tank 16 is closed by a separable screw cap 71 including a top well 72 and a depending internally threaded skirt wall 73 which engages the tank threaded border 18. A nozzle 73, of known construction projects coaxially upwardly from the cap top wall 72 and terminates in an angularly direct discharge or jet portion 74. A liquid pulsing device 75 is positioned at the base of the nozzle 73 affording communication between the inlet and outlet thereof, the device 75 regularly intermittently varying or stopping the liquid flow through nozzle 73 and may be of any suitable mechanical self energized type of maybe of a fluidic type for example, a fluidic multivibrator or oscillator. Depending coaxially from and integrally formed with wall 72 is a coupling tube 78 communicating with the nozzle and having a tapered socket 76 formed therein mating coupling pipe 50. When cap 71 is in closed position, coupling tube 50 snugly engages socket 76.

Considering now the operation of the dental cleaning device described above and the practice of the improved method, casing 34 is unscrewed and removed and a pressurized CO₂ cartridge 37 positioned therein. The casing is then engaged

with and tightened on threaded section 30 to force piercing tube 33 into and through the cartridge closure and into communication with the pressurized gas therein. Cap 71 is removed, tank 16 filled with water and the tank closed, with cap 71 coupling nozzle 73 to outlet pipe 50. The device is then ready for use.

The device is held by grasping the handle defining sections 11 and 14 and the nozzle 73 is directed toward the tooth and gum area to be treated. Button 52 is depressed to open communication between the corresponding valve outlets and inlets whereby to introduce gas at the regulator valve reduced pressure, into tank 16 from cartridge 37 through tubes 69 and 70 and valve 13. The pressurized gas in the tank 16 forces the water therein through tube 68, valve 13 and pulsing device 75 to nozzle 73 which directs a pulsating high pressure water jet onto the area to be cleansed and massaged, the jet being swept across and directed onto the desired area. It should be noted that an appreciable fraction of the pressurized carbon dioxide dissolves in the water in tank 16 to form a carbonic acid or a supersaturated solution at atmosphere pressure of the carbon dioxide in water, which carbon dioxide carrying water is directed by the nozzle onto the treated area. The carbonic acid provides desirable advantages over the use of straight water jets for among other reasons that upon impact on the dental surface the carbon dioxide is rapidly released and produces high foaming which greatly improves the cleaning action. After completion of the cleaning and massaging operation, which generally does not require more than a tankful of water, button 52 is released to close valve 13 and seal off communication between tank 76 and nozzle 73 and cartridge 37. Tank 16, in the valve-closed position, retains its valve regulated pressure and the water therein is charged with carbon dioxide, and the device is ready for further use. Upon depletion of water on tank 16, cap 71 is removed, the water in the tank replenished and cap 71 reapplied. A single conventional CO₂ cartridge 37 is generally sufficient for at least several full tanks of water and is easily replaced when spent. It should be noted that various ingredients may be added to the treating water if desired, such as germicides and the like, and the device is easily cleaned to remove any residues.

While there has been described and illustrated a preferred embodiment of the present invention, it is apparent that numerous alterations, omissions and additions may be made without departing from the spirit thereof.

I claim:

1. A dental cleaning device comprising a pressurized gas cartridge, a liquid reservoir, a nozzle member carried by said reservoir, and communicating with the lower part thereof, a manually operable valve normally biased to a closed position and including a first outlet communicating with said reservoir and a first inlet, means for connecting said valve inlet to said gas cartridge and a pressure reducing regulator valve connected between said gas cartridge and said reservoir.

2. The dental cleaning device of claim 1 including a magazine member separably secured to said reservoir and releasably housing said cartridge, said cartridge connecting means including a piercing tube projecting into said housing and communicating with said valve first inlet.

3. The dental cleaning device of claim 1 wherein said valve includes normally closed associated second inlet and second outlet, said second outlet being connected to said nozzle, and means connecting said second inlet to the lower part of said reservoir.

4. The dental cleaning device of claim 3 including a magazine member separably secured to said reservoir and for releasably housing said gas cartridge connecting means including a piercing tube projecting into said housing and communicating through said pressure regulator valve with said valve first inlet.

5. A dental cleaning device comprising a pressurized gas cartridge, a liquid reservoir, a nozzle member carried by said reservoir, and communicating with the lower part thereof a manually operable valve normally biased to a closed position

and including a first outlet communicating with said reservoir and a first inlet, means for connecting said valve inlet to a gas cartridge, and a liquid actuated pulsating device disposed between the outlet of said nozzle member and said reservoir.

6. A dental cleaning device comprising a pressurized gas cartridge, a liquid reservoir, a nozzle member carried by said reservoir, and communicating with the lower part thereof, a manually operable valve normally biased to a closed position and including a first outlet communicating with said reservoir and a first inlet, means for connecting said valve inlet to a gas cartridge, and a housing secured to and positioned end to end with said reservoir and defining a handle therewith, said nozzle being mounted on to the outer end of said reservoir, said valve including a tubular body member positioned in and extending across said reservoir and having longitudinally spaced first inlet and outlet ports defining said first inlet and outlet respectively, a valve shaft longitudinally movable in said body member between alternative first and second positions respectively closing and opening communication between said first inlet and outlet ports and normally biased to said first position and provided with a pushbutton projecting from said shaft outwardly of said valve body member and reservoir, and said cartridge connecting means including a piercing tube projecting into said housing and communicating with said valve first inlet.

7. The dental cleaning device of claim 6 wherein said valve body member has longitudinally spaced second inlet and outlet-defining ports formed therein, communication between said second ports being alternatively closed and open by said valve shaft when in said first and second positions respectively.

ly, said second outlet port being connected to said nozzle and said inlet port communicating with the lower part of said reservoir.

8. The dental cleaning device of claim 6 wherein said valve body member has longitudinally spaced second inlet and outlet defining ports formed therein, communication between said second ports being alternatively closed and open by said valve shaft when in said first and second positions respectively, a first tube directed upwardly from said valve body member coaxial with said reservoir and communicating with said second outlet port, said reservoir having an opening in the top thereof, a cap member releasably engaging said opening, said nozzle being mounted on and projecting through said cap member and terminating at its bottom in a second coupling tube releasably engaging said first coupling tube.

9. The dental cleaning device of claim 6 wherein said housing is open at its bottom and includes an upper wall abutting said reservoir bottom wall, a casing member projecting through said housing and reservoir abutting walls and secured thereto and having a pressure regulator valve housed therein, said piercing tube being coaxially formed with said casing member and depending therefrom, an externally threaded peripheral wall depending from and integrally formed with said casing member, a magazine member supporting said cartridge in engagement with said piercing tube and engaging said threaded peripheral wall, a first tube positioned in said reservoir and extending between said casing member bore and said valve first inlet and a second tube extending from said valve first outlet to the lower part of said reservoir.

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