

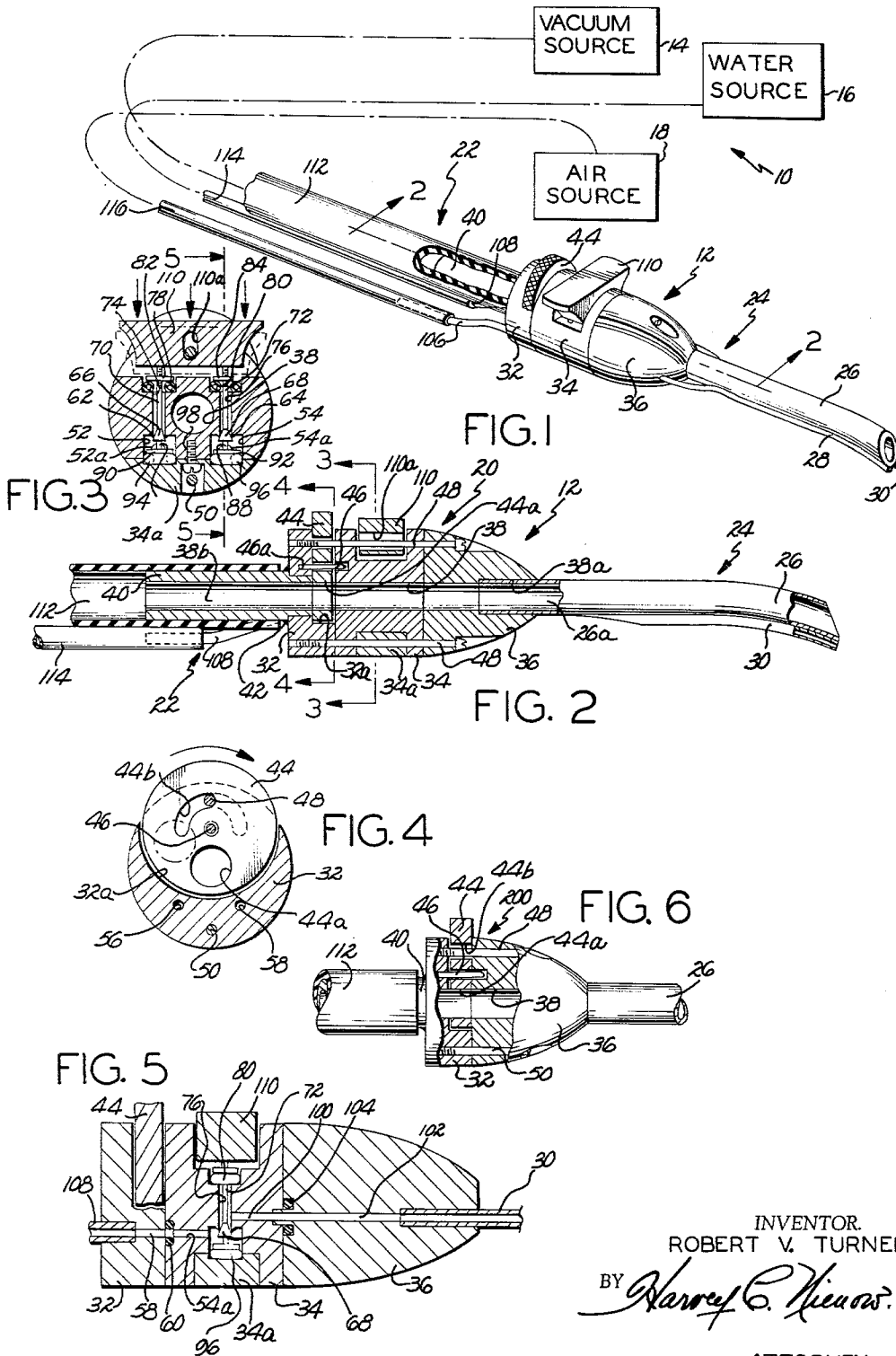
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ASPIRATING HANDPIECE WITH CONTROLS FOR VACUUM, AIR, AND WATER

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**ASPIRATING HANDPIECE WITH CONTROLS  
FOR VACUUM, AIR, AND WATER**

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The present invention relates generally to dental apparatus and more particularly to apparatus and equipment for properly treating a portion of the mouth of a dental patient.

Heretofore, practicing dentists have been required to have many different instruments and apparatuses for cleaning and drying a given tooth and for general preparation and maintenance of the patient's mouth. That is, prior to the present invention, dental equipment of this nature has included separate devices for applying a stream of water to a given tooth area, for applying a stream of air thereto, for feeding a water spray thereto, and for aspirating or removing the saliva from the patient's mouth. All of these functions are necessary to properly prepare and maintain the patient's mouth during performance of dental work.

Prior aspirating devices have included an inverted generally U-shaped tube or conduit which is positioned over the patient's lower jaw so as to extract the saliva from the patient's mouth. Not infrequently, means for applying a stream of air to a given area of a tooth to dry the same or to remove drilling chips or dust therefrom, have taken the form of a manually operable flexible syringe which the dentist is required to squeeze in order to produce a stream of air. The means heretofore used for applying a stream of water for washing the tooth has comprised an elongated flexible tube or hose from a source of water, there being a valve for controlling the flow of water through such hose. As often as not, there has been no convenient means for providing a water spray within the patient's mouth.

Operating the above miscellaneous equipment has tended to keep the practicing dentist very busy merely conditioning and maintaining the work area within the patient's mouth. Such practice, of course, is very cumbersome and awkward, and as a result such functions are more often performed by the doctor rather than his dental assistant. Thus, the employee-dental assistant frequently has little to do while the employer-dentist is extremely busy, to a considerable extent with relatively inconsequential details.

In view of the prior practices and dental equipment for use in cleaning and preparing a patient's mouth, it is an object of the present invention to provide apparatus which is extremely convenient and easy to operate so as to be readily usable by a dental assistant.

Another object of the present invention is to provide dental apparatus which can be operated with only one hand by a dental assistant to provide four different functions.

Another object of the present invention is to provide apparatus as characterized above which is capable of affording air, water or water spray to any portion of the patient's mouth and evacuation of any saliva therein.

A further object of this invention is to provide apparatuses as characterized above wherein the water and air means are juxtaposed so that simultaneous operation thereof affords a water spray.

Another object of this invention is to provide a dental instrument for use in apparatuses as characterized above wherein a single actuator is provided for individually controlling the water, air and water spray functions.

A still further object of the instant invention is to provide in an instrument as characterized above valve means for modulating the aspirating function, to enable the tech-

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nician or dental assistant to adjust the aspirating force in accordance with the rate of development of saliva in the patient's mouth.

Another object of the present invention is to provide an instrument as characterized above which is extremely small and compact, and exceptionally light in weight.

Another object of the present invention is to provide dental apparatus as characterized above which is simple and inexpensive to manufacture, and which is rugged and dependable in operation.

The novel features which I consider characteristic of my invention are set forth with particularity in the appended claims. The device itself, however, both as to its organization and mode of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIGURE 1 is a perspective view of an instrument according to the present invention, said instrument being schematically shown as part of more complete dental apparatus;

FIGURE 2 is a fragmentary sectional view of the dental instrument taken substantially along line 2-2 of FIGURE 1;

FIGURE 3 is a sectional view taken substantially along line 3-3 of FIGURE 2;

FIGURE 4 is a sectional view taken substantially along line 4-4 of FIGURE 2;

FIGURE 5 is a sectional view taken substantially along line 5-5 of FIGURE 3 of the drawings; and

FIGURE 6 is a fragmentary elevational view of a modification of the instrument shown in FIGURES 1-5 inclusive.

Like reference numerals indicate corresponding parts throughout the several views of the drawings.

Referring to FIGURE 1, there is shown therein dental apparatus which is designated generally with the numeral 10. Such apparatus comprises a dental instrument 12, to be hereinafter more fully described, and a vacuum source together with sources for water and air under pressure. The boxes or squares identified with the numerals 14, 16 and 18 represent vacuum, water and air sources respectively, as indicated by the labels within such boxes.

The dental instrument 12 generally comprises a control unit 20 having inlet means 22 and outlet means 24 connected to opposite ends thereof. The outlet means comprises a relatively large tubular member 26 and a pair of smaller tubular members 28 and 30, all of said tubes being connected together as with silver solder to provide a unitary structure to be inserted into the patient's mouth as will hereinafter be explained.

The control unit 20 comprises three housing members, a rearward housing member 32, an intermediate housing member 34 and a forward housing member 36. As shown most clearly in FIGURE 2, each of the housing members is formed with a through central opening which is contiguously arranged, when the control unit 20 is assembled, with the corresponding opening in adjacent housing members to thereby provide an opening 38 which extends the entire longitudinal length of the control unit. The forward end portion 38a of such opening is enlarged to receive end 26a of the large tubular member 26. In like fashion, the rearward end portion 38b of opening 38 is enlarged to receive one end of a tubular adaptor 40, the latter of which is fastened to housing member 32 as by silver solder 42.

For controlling fluid flow through opening 38 of control unit 20, there is provided in housing member 32 a rotatable valve member 44 which overlays the said opening 38. Valve member 44 is rotatably mounted on a pin

46 one end 46a of which is rigidly secured to housing member 32 by being pressed fitted in an opening formed therein.

Valve member 44 is provided with a valve port 44a which is moved from alignment with opening 38 to complete misalignment therewith merely by rotation of valve member 44. Such arrangement, as will hereinafter be further explained, enables valve member 44 to modulate fluid flow through opening 38 from maximum flow permitting condition to flow preventing condition.

Valve member 44 is further formed with an arcuate slot 44b for loosely receiving a mounting stud or bolt 48. Bolt 48, of course, is stationary relative to valve member 44 and hence cooperates therewith to limit the rotational movement of such valve. Another mounting bolt 50 is provided on the other side of instrument 12, said bolts 48 and 50 being operable to maintain the control unit 20 in assembled relation as will hereinafter be apparent.

To accommodate valve member 44, rearward housing member 32 is formed with an arcuate opening 32a. When valve member 44 is in operating position, only a minor portion thereof is exposed above the housing members 32 and 34 as shown in FIGURE 1. The peripheral surface of valve member 44 may be knurled to facilitate rotation.

Intermediate housing member 34, as shown most clearly in FIGURES 3 and 5 is formed with a pair of valve chambers 52 and 54. An inlet is provided to each of such chambers as shown at 52a and 54a respectively. As shown most clearly in FIGURES 4 and 5 of the drawings, such inlet openings are contiguously arranged with openings 56 and 58, respectively in housing member 32. An O-ring, as shown at 60 with respect to inlet opening 54a, is positioned around each of the inlets 52a and 54a where the housing members 32 and 34 are in abutting relation. Such O-rings, of course, hermetically seal the space between the adjacent surfaces of such housing members.

Housing member 34 is formed with a valve seat at each of the valve chambers 52 and 54 as shown respectively at 62 and 64. For cooperation with such valve seats, there is provided a pair of conically shaped valve member 66 and 68, each of which is attached to or formed integrally with a valve stem as shown at 70 and 72 respectively. Each valve stem is movably positioned in one of the through openings 74 and 76 formed in housing member 34.

The upper end portions of the openings 74 and 76 are enlarged to receive resilient annular sealing members 78 and 80 respectively, and fastening nuts 82 and 84 which are threadedly mounted on the upper end portions of the respective valve stems 70 and 72. The resilient sealing members 78 and 80 are positioned between the fastening nuts 82 and 84 and the annular shoulders formed in housing member 34 to provide an hermetic seal therebetween. Also, the resilience or flexibility of such members is operable to bias the valve members 66 and 68 into flow preventing engagement with their respective valve seats 62 and 64.

Attached to the lowermost ends of the valve members 66 and 68, or formed integrally therewith if desired, are stems 86 and 88 each of which carries a disc 90 and 92 respectively. Positioned between such discs and the lower portion of housing member 34 are annular sealing members 94 and 96.

In order to assemble the valve units in housing member 34, it may be desirable to provide the latter with a removable portion as shown at 34a. Such portion can be attached to the main portion of housing member 34 by a fastening screw 98. The annular sealing members 94 and 96 are then operable to hermetically seal the adjacent surfaces of intermediate housing member 34 and the removable portion 34a thereof, and also aid in urging the valve members toward flow preventing engagement with their respective valve seats.

As shown most clearly in FIGURE 5 of the drawings, intermediate housing member 34 is further formed with

a pair of outlet openings in communication with the valve stem openings 74 and 76 in housing unit 34. One such outlet opening 100 is shown in FIGURE 5 in communication with the valve stem opening 76. For cooperation with such outlet openings, there is formed in forward housing member 36 a pair of openings, one of which is shown at 102 in FIGURE 5. Each such opening is contiguously arranged with respect to the corresponding outlet opening in housing member 34 when the control unit 20 is assembled as shown. Suitable sealing means in the form of O-rings 104 can be provided about the outlet openings to hermetically seal the adjacent surfaces of housing members 34 and 36.

As shown most clearly in FIGURE 1 of the drawings, each of the tubular members 28 and 30 of the outlet means 24 is inserted into a separate one of the outlet openings in the forward housing member 36.

In like fashion, there is inserted into each of the inlet openings 56 and 58 in the rearward housing member 32 an inlet tube as shown at 106 and 108 respectively.

For actuation of valve members 70 and 72 from their flow preventing positions to their flow permitting positions, there is provided actuating means comprising an actuator 110 formed with an elongated through opening 110a for receiving the mounting bolt 48. The biasing force on valve members 66 and 68 also urges actuator 110 to its solid line position as shown in FIGURE 3. Such actuator can be pivoted in either opposite direction so as to actuate the corresponding one of the valve members 66 and 68.

In the event it is desired to open both of the valve members, it is merely necessary to depress actuator 110 immediately above opening 110a to thereby move the entire actuator 110 downwardly. Such action, of course, moves both of the valve members 66 and 68 to their flow permitting positions against their respective biasing forces.

Any appropriate flexible conduits can be employed for connecting the vacuum source 14 to the tubular adaptor 40, the water source 16 to the tubular member 108, and the air source 18 to the tubular member 106. Such flexible conduits, as shown at 112, 114 and 116, may be positioned within a single casing or sleeve, and may be provided with an exterior surface which is of woven silk threads or the like to enhance the appearance of the entire apparatus.

The subject apparatus 10 is operated merely by placing the outlet means 24 within the patient's mouth. The saliva within the patient's mouth can be easily extracted or aspirated merely by rotating valve member 44 to the desired flow permitting position. The vacuum source, of course, will cause the saliva to be forced or drawn within the tube 26 and through the opening 38 in control unit 20 to the source 14. The force of such aspirating function can be modulated merely by varying the degree of cooperation or alignment of port 44a with the through opening 38. The maximum and minimum aspirating force positions of valve member 44 are defined by the arcuate slot 44b as it engages bolt 48 at its opposite ends.

By pivoting actuator 110 to one side, as above described, the corresponding one of the valve members 66 and 68 is moved to flow permitting position against its biasing force. In the event valve member 66 is so moved, air is forced from source 18 through conduit 116, tubular member 106, and inlet ports or openings 56 and 52a to valve chamber 52. From there the air passes around valve member 66 so as to ultimately pass through tubular member 28 in outlet portion 24. The stream of air can be directed to any particular area within the mouth merely by so directing the instrument 12.

In the event valve member 68 is moved to flow permitting position, water is forced from source 16 through conduit means 114, tubular member 108 and inlet openings 58 and 54a to valve chamber 54. From here the water is forced past valve member 68 through outlet openings 100 and 102 to tubular member 30. Such stream of

water, of course, can be directed to any area of the patient's mouth.

By pushing actuator 110 straight down so as to open both of the valve members 66 and 68, both air and water are caused to flow from the forward portion 24. Due to the proximity of the end portions of tubular members 28 and 30, the streams of air and water are caused to come together so as to provide a spray or mist. This, of course, can also be directed within the mouth as desired.

It is thus seen that the dental instrument 12 is operable to provide any one of the aspirating, water, air or spray functions. Also, substantially any combination of such functions can be provided including the aspirating function with the spray or stream of water so that the accumulated moisture and saliva can be removed immediately.

Referring to FIGURE 6 of the drawings, there is shown therein an embodiment which comprises only the rearward and forward housing members 32 and 36 of the control unit 20. That is, the intermediate housing member 34 and all of its associated components and functions are eliminated.

Accordingly, the embodiment 200 of FIGURE 6 affords only the aspirating function as above described. It should be noted, however, that the control unit 20 of FIGURE 1 is so constructed as to be susceptible of rearrangement as shown in FIGURE 6. That is, the design of the control unit 20 is such that units having only some of the above mentioned four functions can be provided as desired.

It is thus seen that the present invention provides dental apparatus which is capable of affording, in a single unit, many different functions. As such, it is a simple matter for a dental technician or assistant to provide valuable assistance to the practicing dentist.

Although I have shown and described certain specific embodiments of my invention, I am fully aware that many modifications thereof are possible. My invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

I claim:

1. Water-air-vacuum dental apparatus to be held in one hand and operated completely with the thumb of said hand comprising in combination, a housing formed to be gripped in the fingers of the hand of an operator, means including separate conduits in said housing individually and separately affording water, air and vacuum therethrough, a pair of normally closed valves in spaced relation in said water and air conduits to individually and separately control the flow of water and air through said housing, a control member for said valves including a pivot pin in said housing for pivotally mounting said control member on said housing intermediate said valves to be pivoted as desired with the thumb of said operator to selectively engage said valves and permit and prevent the flow of water and air through said housing, and flow control means for said vacuum comprising a rotatable member substantially adjacent said control member and oriented with respect thereto to rotate about an axis substantially parallel to the pivot axis of said control member, whereby an operator can hold said apparatus in one hand and with the thumb of said hand control the water, air and vacuum separately or simultaneously as desired.

2. Water-air-vacuum dental apparatus to be held in one hand and operated completely with the thumb of said hand according to claim 1, wherein said pivotal control member is formed with an elongated opening for said pivot pin to permit rectilinear movement thereof relative to its said pivot axis whereby said control member can be actuated to simultaneously afford flow of water and air through said housing.

3. Water-air-vacuum dental apparatus to be held in one hand and operated completely with the thumb of said

hand comprising in combination, a housing formed to be gripped in the fingers of the hand of an operator, means including separate conduits in said housing individually and separately affording water, air and vacuum therethrough, a pair of normally closed valves in spaced relation within said water and gas conduits to individually and separately control the flow of water and air through said housing, a control member for said valves including a pivot pin in said housing for pivotally mounting said control member on and partially recessed within said housing intermediate said valves to be pivoted as desired with the thumb of said operator to selectively engage said valves and permit and prevent the flow of water and air through said housing, said control member being only partially exposed beyond said housing to permit the operator to grip the housing with one hand while the thumb thereof engages said control member, and flow control means for said vacuum comprising a rotatable member substantially adjacent said control member and recessed within said housing to expose only a small portion thereof beyond said housing, said rotatable member further being oriented with respect to said control member to rotate about an axis substantially parallel to the pivot axis of said control member, whereby an operator can hold said apparatus in one hand and with the thumb of said hand control the water, air and vacuum separately or simultaneously as desired.

4. Water-air-vacuum dental apparatus to be held in one hand and operated completely with the thumb of said hand comprising in combination, a cylindrically shaped housing of such size as to be gripped in the fingers of the hand of an operator, means including separate conduits in said housing individually and separately affording water, air and vacuum therethrough, a pair of normally closed valves in spaced relation in said water and air conduits to individually and separately control the flow of water and air through said housing, a control member for said valves including a pivot pin in said housing for pivotally mounting said control member on said housing intermediate said valves to be pivoted as desired with the thumb of said operator to selectively engage said valves and permit and prevent the flow of water and air through said housing, and flow control means for said vacuum comprising a rotatable disc substantially adjacent said control member formed with a knurled peripheral surface substantially adjacent said control member, said rotatable disc being so oriented with respect to said control member to rotate about an axis substantially parallel to a pivot axis of said control member, whereby an operator can hold said apparatus in one hand and with the thumb of the said hand control the water, air and vacuum separately or simultaneously as desired.

5. A dental instrument comprising in combination, a housing formed with three separate through openings, a rotatable valve member rotatably mounted on said housing to overlay one of said openings, said valve member being formed with a valve port for alignment with said one opening and movable therefrom upon rotation of said rotatable valve member, a valve seat in each of the other two openings, a rectilinearly movable valve member for each of said valve seats biased into flow preventing engagement therewith and movable therefrom to flow permitting position, and actuating means for said rectilinearly movable valve member comprising a pivotal actuator mounted on said housing for pivotal movement in opposite directions about an axis substantially parallel to the axis of rotation of said rotatable valve member for alternative movement of said rectilinear valve members to flow permitting position, said rotatable valve member and said actuating means being positioned substantially adjacent each other on said housing whereby all of said valve members can be operated individually or simultaneously with the thumb of one hand of the operator.

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