Sept. 17, 1968 R. A. BEU 3,401,691

DENTAL SYRINGE

Filed Dec. 2, 1964 2 Sheets-Sheet 1

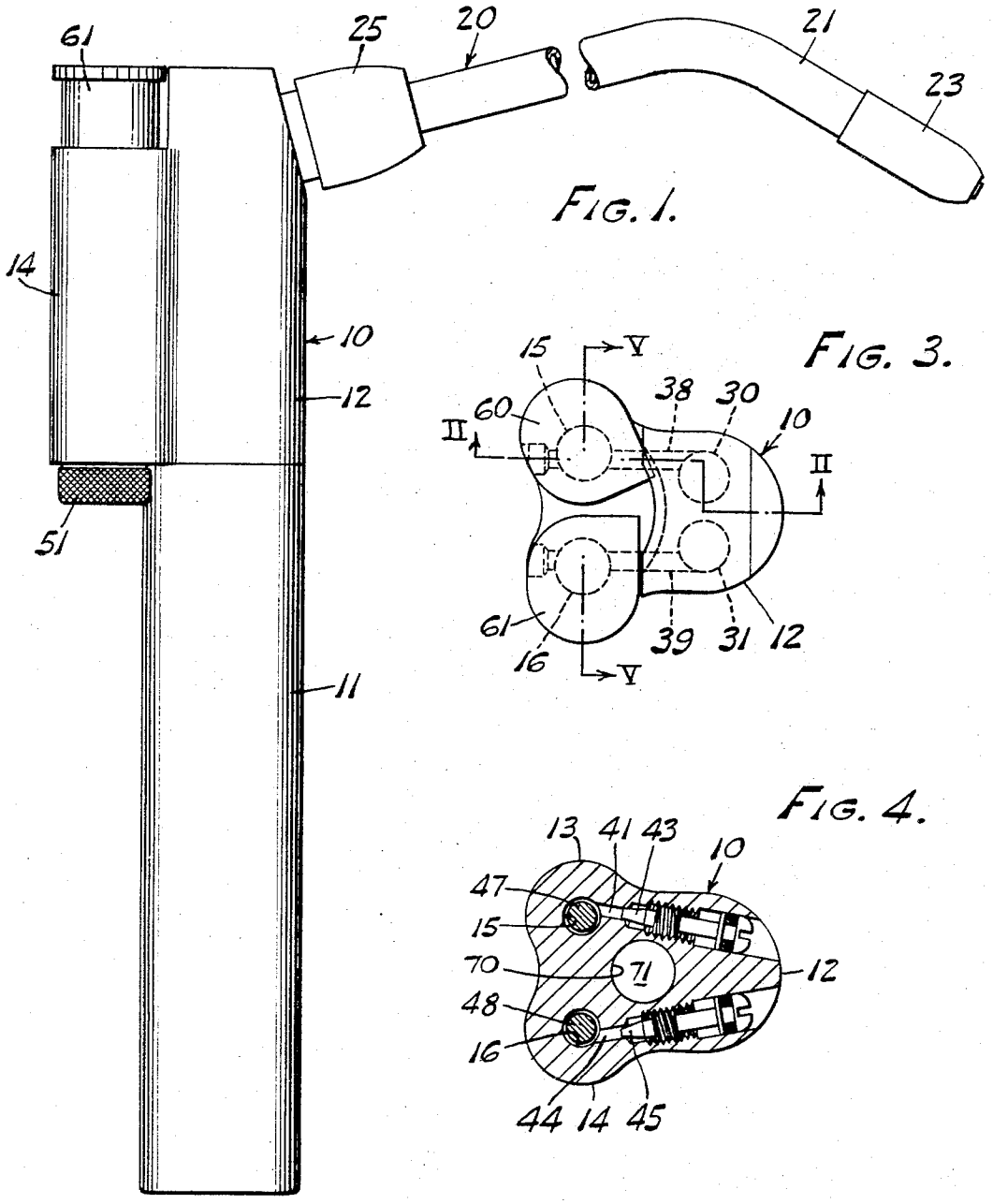

FIG. 1.

FIG. 3.

FIG. 4.

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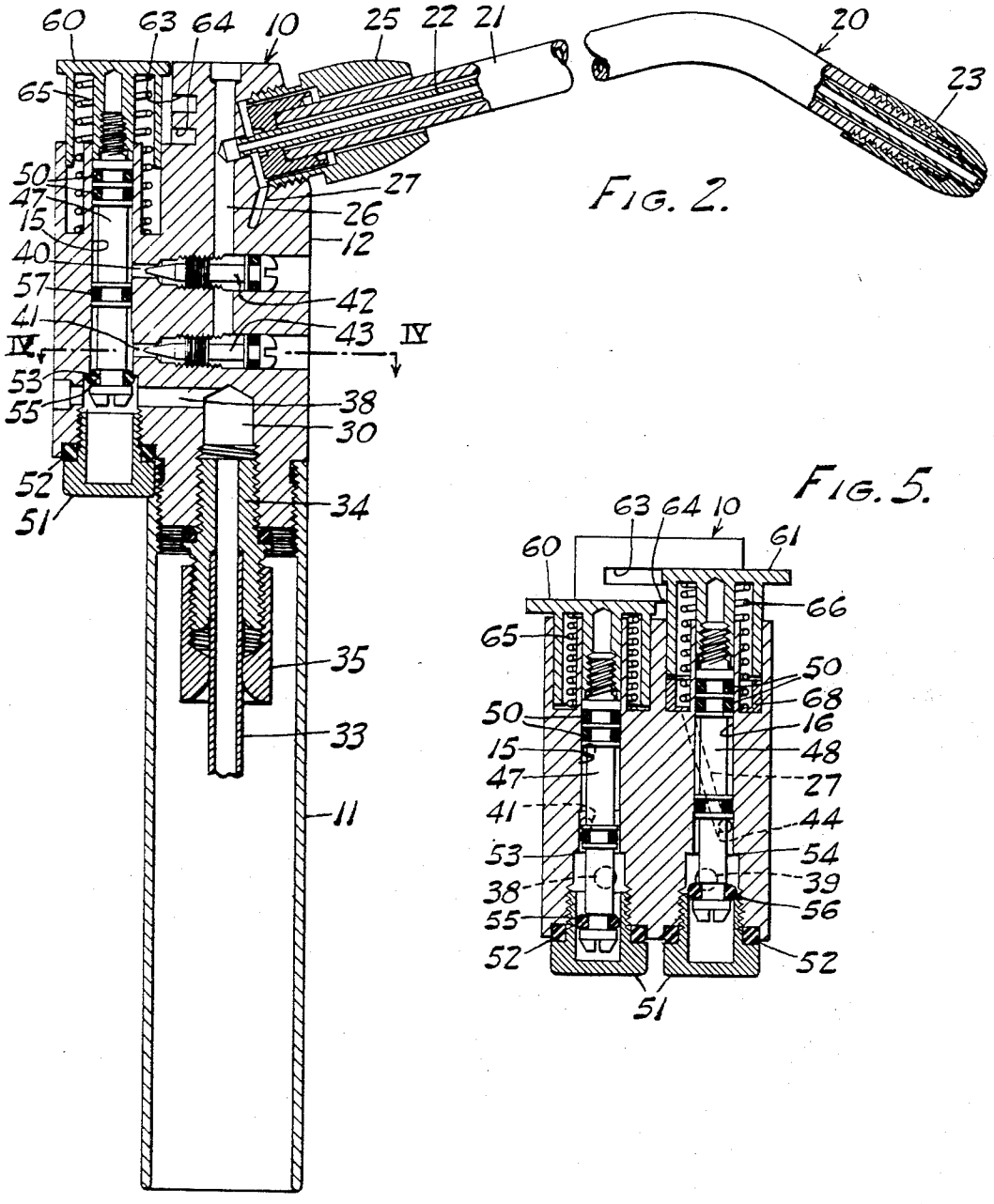

FIG. 2.

FIG. 5.

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3,401,691

DENTAL SYRINGE

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4 Claims. (Cl. 128—173.1)

ABSTRACT OF THE DISCLOSURE

A dental implement for ejecting water, air or an air-water spray through a nozzle has a pair of adjacent push buttons to provide water or air to the nozzle. The maximum range of movement of the air push button is equal to a fraction of the full range of movement of the water push button whereby joint depression of both push buttons to the maximum range of movement of the air push button moves the water push button only fractionally to produce a properly proportioned water-air spray, each push button being separately operable to provide either air or water discharge alone.

This invention relates to dental or surgical implements and more particularly to a hand device for ejecting streams of water or air or an air-water spray into a patient's mouth or for analogous dental or medical uses.

Reference is had herein to the use of the device of the present invention, particularly in the practice of dentistry since it is customary for dentists to cleanse an area where work has been or is being performed by the use of a water stream or an air-water spray and a stream of air is commonly used to dry a work area. Dentists frequently employ two separate devices for these related purposes, a water syringe and an air jet device. Some modern dental hand pieces such as are used for drilling are provided with air or water connections for cooling the tool and for preventing overheating of the tooth being worked upon. While these devices commonly discharge air or water into the patient's mouth they do not perform the functions of water and air discharge devices such as are contemplated in the present invention.

A dental syringe for directing streams of water or air or both into a patient's mouth is shown and described in Patent No. 3,054,402 dated Sept. 18, 1962, to Edmond J. Franwick and the present applicant and the present invention are concerned with syringes of this general type. In the syringe of the foregoing patent three different uses are provided for, namely, a water stream discharge, an air stream discharge, or a water-air spray. Proper selection of any of these three modes of operation is by selective depression of three manual buttons, singly or in various combinations.

The emission of a water stream or an air-water spray is characterized by the fact that a lesser volume of water is required for the spray than for the straight water stream. The present invention provides a dental syringe wherein all of the desired modes and degrees of emission are available but in which only two manual push buttons are required. Depression of either push button by itself gives either a water stream or an air stream and the water stream can be regulated from zero to maximum by the degree to which the water push button is depressed.

For emitting an air-water spray both push buttons are simultaneously depressed and the limit of movement of the air push button is such that the movement of the water push button automatically stops at a partial water discharge position which is compatible with the production of a suitable air-water spray. This not necessarily so but will normally result since the user will normally simultaneously depress the closely adjacent push buttons with the same finger or thumb in producing a water-air spray. Convenient means for latching the push buttons in various positions of operation are also provided.

The present invention provides a very simple multiple purpose dental syringe which operates in a safe, convenient and foolproof manner and which may be instantaneously employed by the dentist to perform the three basic functions, water cleansing, air drying, and the emission of a water-air spray for additional cleansing or clearing operations.

The utility and versatility of the dental tool of the present invention will be explained more fully in connection with a detailed description of an exemplary form of such tool which is illustrated in the accompanying drawings and described in detail in the following specification. However, it is to be understood that such embodiment is set forth primarily to illustrate and exemplify the principles of the invention and that the scope of the latter is not limited to the precise form thus disclosed, nor otherwise than as defined in the appended claims.

While the device of the present invention is designed and intended primarily for use by dentists and dental technicians for oral cleansing and drying operations and the foregoing discussion is directed particularly to its use for such purposes, it is to be understood that the device may find analogous uses in other surgical or therapeutic fields.

Certain variations and possibilities in the mode of use of the device of the present invention which may be attained and practiced by various flow adjustments and various manipulations of the device will be better understood after an understanding of the mechanism of the exemplary form set forth herein. For this reason a further discussion of such various adjustments and modes of use is set forth at the end of this specification following the detailed description of the form of the device illustrated in the drawings by way of example.

In the drawings:

FIG. 1 is a general side elevational view of one form of the dental syringe of the present invention;

FIG. 2 is a vertical cross sectional view of the syringe shown in FIG. 1 taken somewhat irregularly but generally as indicated by the line II—II of FIG. 3;

FIG. 3 is a top plan view of the syringe shown in FIG. 1;

FIG. 4 is a horizontal cross sectional view taken approximately on the line IV—IV of FIG. 2; and

FIG. 5 is a vertical cross sectional view taken approximately on the line V—V of FIG. 3.

Like characters of reference denote like parts throughout the several figures of the drawings and the numeral **10** designates a body member having a tubular downward extension **11** threaded thereto and forming a handle portion and a housing for enclosing water and air conduits and electrical connections which extend outwardly from the body member. For convenience the portion of the dental syringe depicted in the drawings which is at the right hand side of FIGS. 1 and 2 shall be referred to as the front of the device and the portion shown to the left of those figures will be referred to as the rear of the device.

As appears most clearly in FIG. 4, body member **10** has an upright generally cylindrical forward portion **12** and a pair of adjacent generally cylindrical rear portions **13** and **14**, the three portions forming a three-lobed or trefoil shaped body in horizontal cross section. The cylindrical portions **13** and **14** of body member **10** are vertically bored to form valve chambers **15** and **16**, respectively, for controlling the flow of water and air, respectively, as will presently appear.

It will be noted that the bores **15** and **16** extend entirely through the body member and the arrangement is such that fabrication of the body member **10**, by ma-

chining, die-casting, molding or other methods, is greatly simplified. Furthermore, the arrangement is such that either of the valve assemblies may be simply assembled into or disassembled from the body member without disturbing the remainder of the device, thus facilitating maintenance when required.

The front cylindrical portion **12** extends upward somewhat higher than the rear portions **13** and **14** as clearly appears from FIG. 1 and the upper end of portion **12** is fitted with a combined water-ejecting, air-ejecting and air-water spray emitting nozzle assembly designated generally by the numeral **20** in FIGS. 1 and 2. Referring to FIG. 2, the nozzle **20** comprises an outer air conduit member **21** and an inner water conduit member **22**, the walls of the two conduits being radially spaced to provide an intervening annular air passage.

At the outer end of the nozzle the water conduit **22** extends beyond the outer end of the outer air conduit **21** and a threaded ferrule **23** defines the end of outer conduit member **21** and may be adjusted axially to modify the air-water spray characteristics of the syringe. The conduit members **21** and **22** are fitted to the upper end of body portion **12** and are held in place by a gland type of retaining nut **25**.

Body portion **12** is provided with a vertical water passage bore **26** clearly shown in FIG. 2 and a generally upward air passage bore **27** which will be referred to later herein. The water passage bore **26** communicates with the interior of inner conduit **22** and the air passage bore **27** communicates with the annular space between the outer and inner conduits **21** and **22**. The construction of nozzle **20** and the mode of water and air communication thereto is not novel to the present invention and may, if desired, be the same as in the aforesaid patent to Franwick et al.

Referring to FIGS. 2 and 3, the lower end of the portion **12** of body member **10** is provided with a water inlet bore **30** and an air inlet bore **31**. The lower ends of the bores **30** and **31** are fitted, respectively, with flexible water supply and air supply conduits, the former being shown in detail at **33** in FIG. 2. The water and air supply flexible conduits are attached to the bore portions **30** and **31** of body member **10** by conventional nipple and gland nut connection devices designated generally by the reference numerals **34** and **35**, respectively, in FIG. 2.

The water inlet bore **30** and the air inlet bore **31** lead to the valve chambers **15** and **16**, respectively, by way of horizontal bores designated **38** and **39**, respectively, the horizontal water bore **38** being shown in cross section in FIG. 2. The water valve chamber **15** communicates with the vertical water passage bore **26** which leads to the discharge nozzle **20** by way of a pair of horizontal passages **40** and **41** which are clearly shown in FIG. 2. Each of the passages **40** and **41** is provided with adjustable needle valves **42** and **43**, respectively, which control the effective flow orifices of these passages to establish maximum flow capacities for the passages **40** and **41**.

The air valve chamber **16** communicates with air passage **27** which leads to nozzle **20** by way of a horizontal passage **44** which is controlled by a needle valve **45** as shown in FIG. 4, likewise to establish maximum air flow capacity of passage **44**. Air passage **27** which is shown only partially in FIG. 2 extends obliquely from horizontal air passage **44** to the inner end of nozzle **20**. Fluid flow through the water and air valve chambers is manually selectively controlled by valves designated **47** and **48**, respectively. The valves **47** and **48** are identical in the illustrated instance merely for interchangeability and mass production, since their actual valving operation is somewhat different, as will appear.

Each of the valves **47** and **48**, which comprise stem members disposed coaxially in the valve chambers **15** and **16**, respectively, is provided with a pair of O-rings **50** at its upper end which seals the respective valve chambers at their upper ends. The lower ends of the valve chambers are sealed by screw members **51** which likewise include packing rings or sealing members in the form of O-rings **52**. The lower ends of the valve chambers have enlarged portions which form annular valve seats **53** and **54** and the valves **47** and **48** are provided with valve elements which in the present instance are in the form of O-rings designated **55** and **56**, respectively.

In addition to the valve seat and valve element designated **53** and **55**, respectively, the valve **47** is provided with an O-ring **57** which seats snugly in the upper portion of valve chamber **15** as shown in FIG. 2 but is adapted to move downwardly into an enlarged portion of valve chamber **15** upon downward movement of valve **47**. The corresponding O-ring of the valve **48** serves no function. The upper ends of the valves **47** and **48** have threaded thereon manipulating buttons designated **60** and **61**, respectively.

The upwardly extending portion of body member **10** is provided at its rear face with a pair of horizontal slots **63** and **64**. It will be noted that the head portions of the operating buttons **60** and **61** are non-circular whereby the buttons may be depressed and rotated to engage their head portions in the slots to lock the respective valves in depressed positions. The head portion of button **60** of valve **47** is shown thus engaged in FIG. 3.

The valves **47** and **48** are normally biased to the upper limit positions illustrated in FIGS. 1 and 2 by coil springs **65** and **66**, respectively, in which position the valves **55** and **56** are closed. The slots **63** and **64** in body member **10** provide for two open positions of valve **47** but only one open position of valve **48** is desired, that in which the flange of button **61** is in registry with slot **63**, since in such position the valve **48** is fully open. Accordingly a cup-shaped member **68** is disposed in body member and its upper rim portion limits downward movement of button **61** to the position shown in FIG. 5, in which figure the water operating button is shown fully depressed to its lowermost position. The positions illustrated in FIG. 5 are not normally encountered in customary methods of operation and are shown in FIG. 5 merely by way of illustration.

It will be noted that when valve **47** is manually depressed only partially, that is until the flange of button **60** is approximately in registry with slot **63**, water from supply passage flows through valve chamber **15** and passage **41** to vertical bore **26** and thence to the discharge nozzle. This position of button **60** provides a fractional flow of water through the syringe and is usually the amount required for producing a satisfactory air-water spray. If the button **60** is fully depressed to a point where its flange is in alignment with lower slot **64**, O-ring **57** moves into the enlarged lower portion of valve chamber **15**, whereby water flows past O-ring **57** and through passage **40**, whereby water is supplied to vertical bore **26** and nozzle **20** through both passages **40** and **41** and this represents maximum water delivery, which is usually desired when water only is being discharged, although the operator may discharge water only at any desired rate by pressing button **60** down to various positions between zero and maximum.

As previously mentioned, full air flow past valve **48** is established when button **61** is depressed until its lower edge abuts the rim of cup-shaped stop member **68** which corresponds to the partly-open position of valve **47**. From this it will be seen that a user desiring an air-water spray merely depresses both of the buttons **60** and **61** simultaneously with the thumb or one finger on both buttons. This depression of both buttons will automatically be arrested when button **61** reaches its lower limit of movement at which time the button **60** and valve **47** will be in their half-way down positions which is proper for producing a normal air-water spray.

What is claimed is:

1. In a dental syringe, a body member having a discharge nozzle and water and air passages leading thereto, normally closed valve means in said passages, a pair of adjacent manually movable members connected to said

valve means for opening the same, said water passage valve means movable member having a first position for fractional water passage and a further position for full water passage, means limiting movement of said air valve means movable member to a range equal to the range of movement of said water passage valve means to said first water valve position, whereby joint manual operation of both movable members to the limit of air valve opening movement opens the water valve means fractionally to produce a properly proportioned air-water spray.

2. In a dental syringe, a body member having a discharge nozzle and water and air passages leading thereto, normally closed valve means in said passages, a pair of adjacent manually movable members connected to said valve means for opening the same, said water passage valve means movable member having a first position for fractional water passage and a further position for full water passage, means limiting movement of said air valve means movable member to a range equal to the range of movement of said water passage valve means to said first water valve position, whereby joint manual operation of both movable members to the limit of air valve opening movement opens the water valve means fractionally to produce a properly proportioned air-water spray, said body member having slots adjacent to said manually movable members and the latter having eccentric flange portions whereby rotation thereof engages said flange portions selectively in one or another of said slots to retain the valve means in predetermined open position.

3. In a dental syringe, a water passage and an air passage and normally closed valve means in said passages, pir of adjacent manually depressible push buttons connected to said valve means and adapted to be separately or jointly depressed by an operator to selectively open the same, said water passage valve push button being depressible to various positions for variable water flow through

said syringe stop means limiting depressing movement of said air flow push button for full air flow through said air passage to a fraction of the full range of depressing movement of said water valve means push button, whereby joint depression of both push buttons to the limit of air valve means opening movement opens the water valve means only fractionally to produce a properly proportioned air-water spray and a discharge nozzle leading jointly from said water and air passages.

4. In a dental syringe, a body member having a discharge nozzle, a water passage and an air passage leading to said discharge nozzle, and normally closed valves in said passages, a pair of adjacent manually depressible push buttons adapted to be separately or jointly depressed by an operator and connected to said valve means to selectively open the same, said water passage valve push button being depressible to various positions for variable water flow through said syringe, stop means limiting depressing movement of said air flow push button for full air flow through said air passage to a fraction of the full range of depressing movement of said water valve push button, whereby joint depression of both push buttons to the limit of air valve opening movement opens the water valve only fractionally to produce a properly proportioned air-water spray.

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