

[54] ORAL HYGIENE DEVICE

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[56] References Cited

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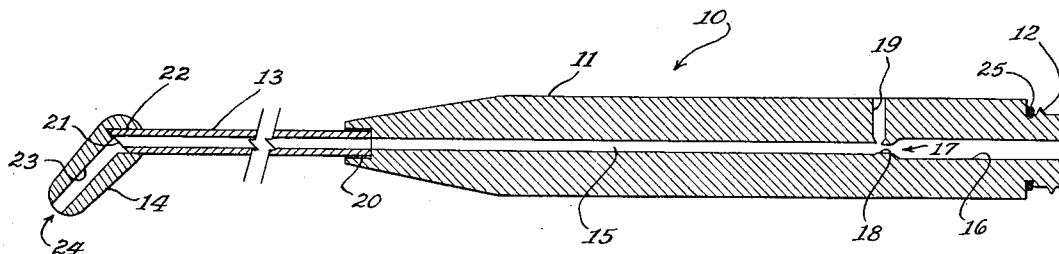
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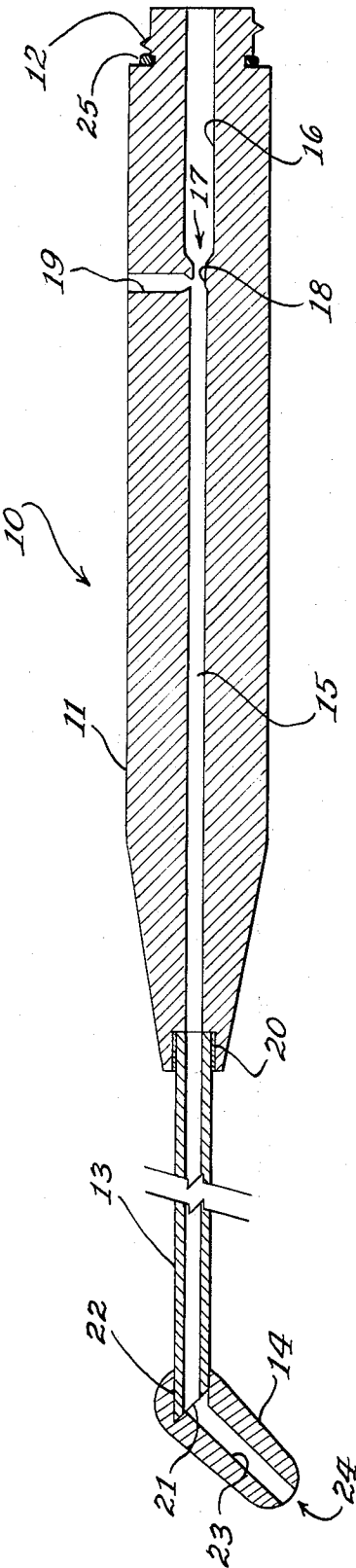
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[57] ABSTRACT

A bubble-containing water jet is provided in order that oral tissues may withstand a more rapid moving jet so that a non-pulsating jet of water can be more effectively utilized to provide cleansing of teeth and stimulation of oral tissue. The bubbles are produced by passing the water constituting the jet through a Venturi section of a tube which is vented in the low pressure section so that air is drawn into the water which is forced through the tube providing innumerable tiny bubbles in the water jet which issues from the outlet of the tube.

11 Claims, 1 Drawing Figure





ORAL HYGIENE DEVICE

The present invention relates to an oral irrigating and tooth cleansing device adapted to produce a jet of aerated water upon connection with a source of water under pressure, e.g., a faucet.

Dental syringes and the like are available to deliver a low velocity stream of water into the mouth which is useful for flushing dental materials and the like out of the mouth, but the water velocity is necessarily limited because, with an incompressible fluid like water, excessive velocity applies an excessive pressure on the gums and other tissues in the mouth, inducing undesired pain or damage to the gum tissue or the more fragile sublingual tissue and producing little beneficial stimulation of the tissues.

In an effort to effectively employ water jets of higher velocity in oral hygiene, resort has been had to the use of a pulsating jet consisting of spaced apart pressure pulses which are produced by a pump including a plunger which reciprocates at high speed in order to provide about 800 to about 1,600 distinct pulses per minute in order that the tissues depressed by the pressure of the pulse might rebound between the pulses. Of course, the pump required is costly, requires electricity for operation, and batteries if it is portable, the pump parts wear and must be replaced, and operation is noisy.

This invention has as its purpose the provision of a simple faucet-attached structure which will provide a jet of water at high velocity which will enable effective tooth cleansing and oral tissue stimulation without the need for a pulsating water jet and, therefore, without recourse to the complex pump structure which was hitherto considered to be necessary for this purpose.

In this invention, water under pressure from any convenient source, such as the common household faucet or spigot, is passed through a tube including a constriction or Venturi section with the tube being vented in the low pressure section of the tube so that air is drawn into the water which then issues from the tube as a high velocity jet of small diameter which is filled with innumerable bubbles having a diameter at the outlet of the jet in the range of 0.005 inch to 0.050 inch in diameter, for a jet issuing from an outlet having a diameter of 0.060 inch. In ordinary operation, in excess of 10,000 bubbles per second are generated providing a high velocity water jet which, because of the presence of these bubbles, is a jet of compressible liquid. While the water itself cannot be compressed, the air bubbles within the jet are compressible and this permits higher velocities to be used without pain or damage to sensitive oral tissues providing effective cleansing of teeth and a considerable tissue stimulation which induces a tingling sensation in the oral tissues.

The invention will be more fully understood from the drawing which shows a cross-section of an oral hygiene device constructed in accordance with the invention.

Referring more particularly to the drawing, the oral hygiene device is generally identified by the numeral 10, and it includes a tubular holder 11, the rear end of which is threaded at 12 for attachment to a faucet-connected hose, and the forward end of which is secured to a tubular extension 13 which, in turn, is secured to a nozzle 14.

The tubular holder 11 is axially bored, there being a small diameter axial hole 15 in the forward end of the

holder 11 and there being a large diameter axial hole 16 in the rear of the holder 11. Intermediate the axial holes 15 and 16 is a Venturi section 17 having a constricted portion 18. An air inlet 19 communicates with the constricted or low pressure section 18 of the Venturi 17 so that, as water under pressure passes through the axial holes 16 and 15, a considerable volume of air is drawn into the holder 11 through the air inlet 19.

The forward extremity or tip of the holder 11 is formed with an enlarged bore 20 in order to provide a seat for the rear end of the tubular extension 13. The tubular extension 13 defines an axial opening which is approximately of the same diameter as the diameter of the axial hole 15 in the holder 11 and provides a continuation of the holder. The forward end of the tubular extension 13 is cut at an angle, desirably an angle of 45° to provide an angled tip 21, the angle being with respect to the axis of the tube, in order that it can be conveniently received in an enlarged bore 22 in the rear of the nozzle 14. The nozzle 14 includes an axial bore 23 of small diameter, substantially the same as the diameters of the holes in the tubular extension 13 and the axial hole 15 in the holder 11. The tip 21 of the tubular extension 13 is then seated in the enlarged bore 22 in order to provide an outlet 24 at the forward end of the nozzle 14. This permits the jet of aerated water to be conveniently manipulated and directed within the mouth.

The holder 11 may be conveniently formed of brass and the tubular extension 13 and the nozzle 14 may be conveniently brass which has been plated with nickel. These parts may be brazed together, but soldering can be used in place of brazing if desired. A gasket 25 is desirably provided at the rear of the holder 11 in order that the threaded securement can be fluid-tight.

In order to illustrate the invention in its presently preferred form, the hole 16 at the rear of the holder 11 is formed to a diameter of one-eighth inch and the hole 15 at the forward end of the holder 11 has a diameter of one-sixteenth inch. The constricted or low pressure portion 18 of the Venturi 17 has a diameter of one thirty-second inch and extends for a distance of nine sixty-fourths inch. The air inlet 19 has a diameter of one-sixteenth inch. The enlarged bore 20 at the forward end of the tubular extension 13 has a diameter of 1.29 inch, and the tubular extension 13 has an external diameter of one-eighth inch and an internal diameter of one-sixteenth inch. Similarly, the internal diameter of the bore 23 at the forward end of nozzle 14 is one-sixteenth inch.

Utilizing the structure described above, and typical operating conditions, it was found that, when the air inlet 19 is sealed, unaerated water will flow through the device at a rate of 9 ml. per second at a maximum pressure of 48 p.s.i. Uncovering the air inlet 19, and directing the aerated water stream into a graduated cylinder filled with water inverted in a basin, it was found that 3 ml. of air per second were introduced into the cylinder. Bubbles from the aerated jet were then collected on a glass plate submerged in water, and the mean size of the bubbles at the outlet was established to be approximately 0.030 inch in diameter. With this data, it was calculated that approximately 13,300 bubbles per second were present in the water jet. Even varying the orifice diameters and the operating pressures, it is believed that there will be produced at least about 3,000 bubbles per second, and a minimum of approximately

6,000 per second represents preferred operation. As previously indicated, ordinary operation of a preferred structure as disclosed herein produces in excess of 10,000 bubbles per second when operated to provide an aerated jet of appropriate velocity.

In order that the jet of aerated water will be appropriate for oral hygiene, the orifice in the nozzle 24 should be in the range of from about one thirty-second inch to about one-eighth inch, preferred practice being the one-sixteenth inch orifice described. The jet velocity will vary with the individual, and this can be adjusted by adjusting the rate of flow of water issuing from the faucet in the usual manner. While the relative sizes of the component parts of the device can vary considerably, it will be appreciated that the tubular holder 11 should be sized for convenience of hand holding and that the nozzle should be small enough to fit easily between the cheeks and the gum.

The invention is defined in the claims which follow.

I claim:

1. An oral irrigating and tooth cleansing device comprising a tubular holder adapted to be held in the hand, said holder defining a lengthwise oriented bore communicating with an orifice, said bore containing a Venturi including a low pressure section at a location spaced from said orifice by a distance many fold in excess of the diameter of said bore, an air inlet communicating with said low pressure section of said Venturi, means for attaching the rear of said holder to a supply of water under pressure, and the front end of said holder being connected with a nozzle for directing a single jet of aerated water into the mouth.

2. A device as recited in claim 1 in which a tubular extension interconnects said holder and said nozzle.

3. A device as recited in claim 1 in which said nozzle is mounted at about a 45° angle with respect to the axis of said holder.

4. A device as recited in claim 1 in which said nozzle has an orifice having a diameter at the outlet in the range of from about one thirty-second inch to about one-eighth inch.

5. A device as recited in claim 4 in which said Venturi and said air inlet are dimensioned to introduce at least about 3,000 bubbles per second into the water flowing through said Venturi.

6. A device as recited in claim 5 in which the orifices in said nozzle and in the forward end of said holder have a diameter of about one-sixteenth inch.

7. A method of cleansing the teeth and irrigating the gum tissues comprising passing a stream of water through a Venturi including a low pressure section, there being an air inlet connected with said low pressure section of said Venturi to introduce into said stream of water innumerable air bubbles having a diameter in the range of 0.005 inch to 0.050 inch, directing a stream of aerated water so-produced through a tube having a length many fold in excess of its diameter and thence through an orifice to form a jet, and directing said jet into the mouth.

8. A method as recited in claim 7 in which said aerated water is passed through an orifice having a diameter in the outlet in the range of about one thirty-second inch to about one-eighth inch in order to provide the jet of aerated water which is directed into the mouth.

9. A method as recited in claim 7 in which said aerated water in said jet contains at least about 3,000 bubbles per second.

10. A method as recited in claim 9 in which said aerated water in said jet contains at least about 10,000 bubbles per second.

11. A device as recited in claim 1 in which said supply of water under pressure comprises a household faucet.

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