

United States Patent

Robinson

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[54] ULTRASONIC TOOTH-CLEANING
APPARATUS

[72] Inventor: Seymour Robinson, Miami, Fla.

[73] Assignee: Hydrosonic Corporation, Miami, Fla.

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[51] Int. Cl. A61h 1/00

[58] Field of Search 128/62 A, 66, 24 A; 32/58

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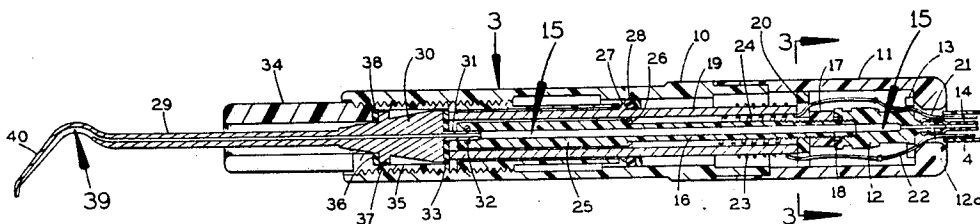
Primary Examiner—L. W. Trapp

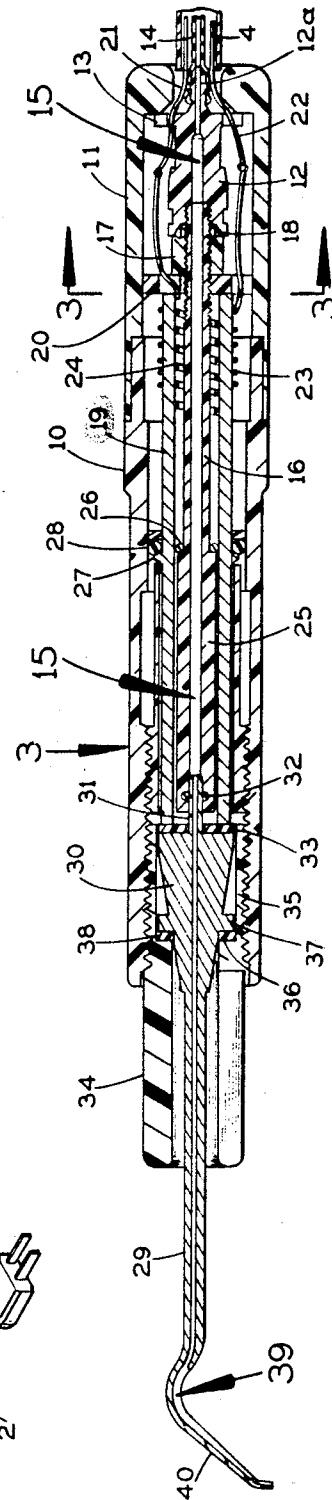
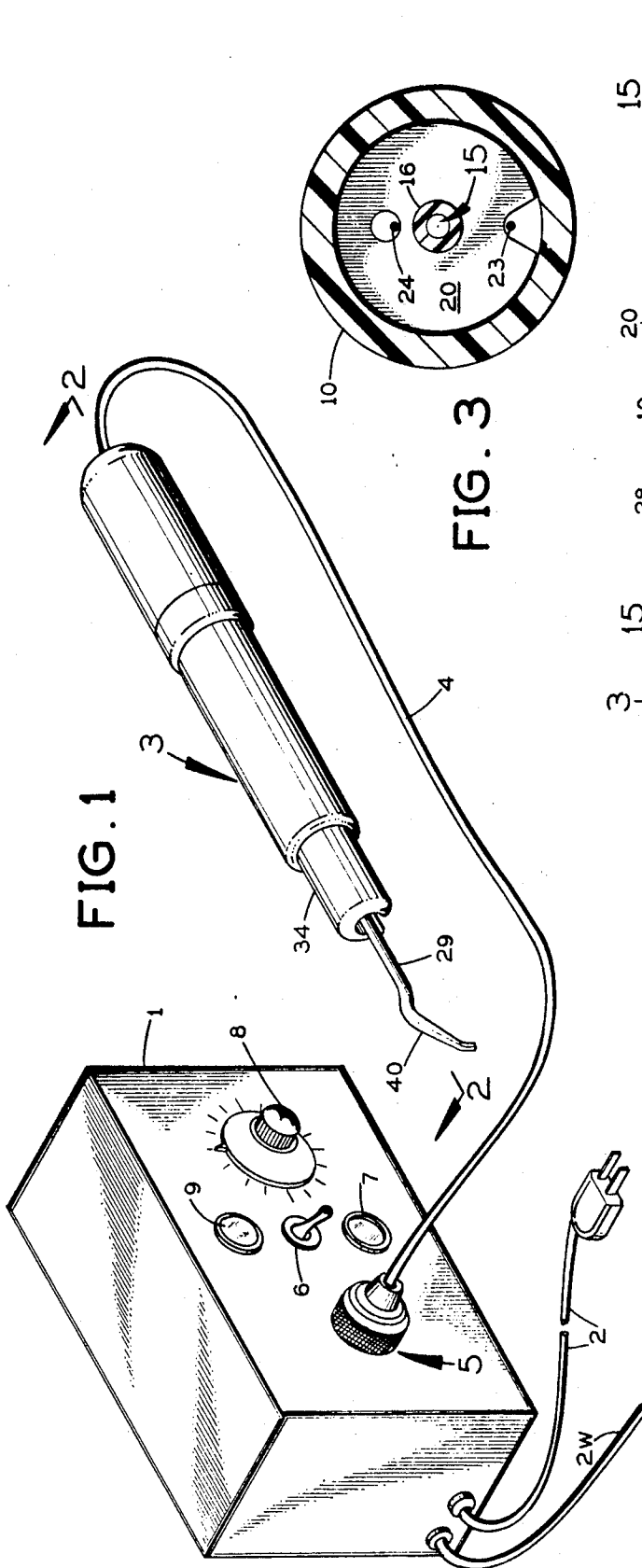
Attorney—Lloyd J. Andres

[57] ABSTRACT

A dental hand-piece including a ceramic ultrasonic transducer energized by a cable connecting an electronic generator for oscillating each one of a plurality of interchangeable treatment tools retained in the hand-piece. Each of the tools having a bore therethrough. A coupling device for engaging a selected tool with the transducer for oscillation and conducting water therethrough. A water conducting conduit through said transducer and said coupling for conducting pressurized water to flow from the end portion of the tool secured in said hand-piece for ultrasonically cleaning teeth and massaging gums and flushing same with water.

4 Claims, 9 Drawing Figures





INVENTOR.
SEYMOUR ROBINSON
BY
Lloyd J. Anderson

FIG. 4

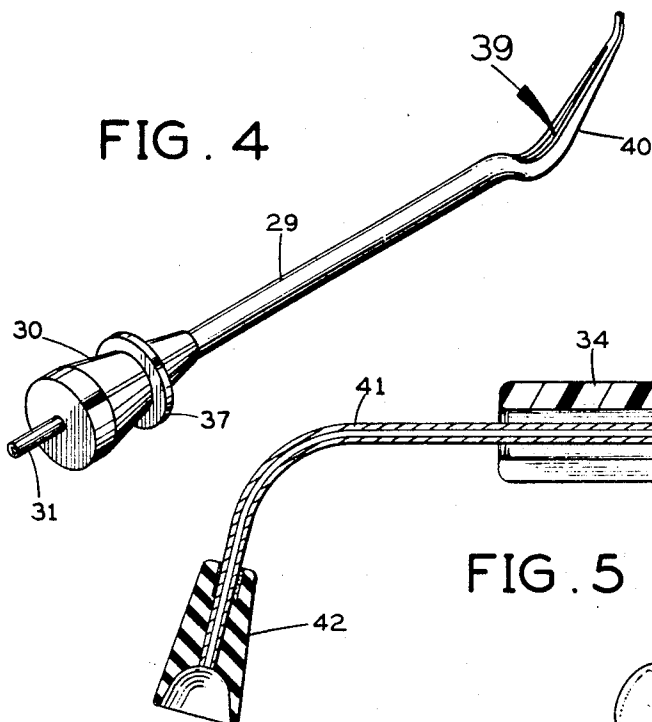


FIG. 5

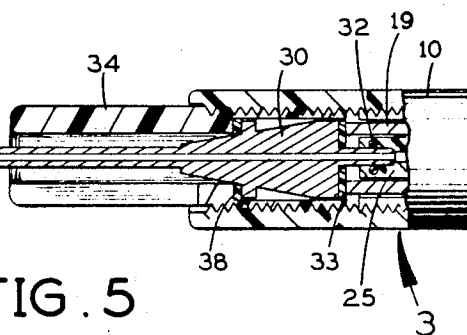


FIG. 6

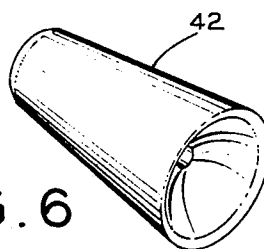


FIG. 7

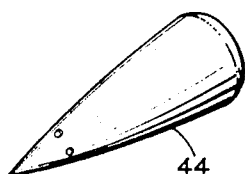


FIG. 8

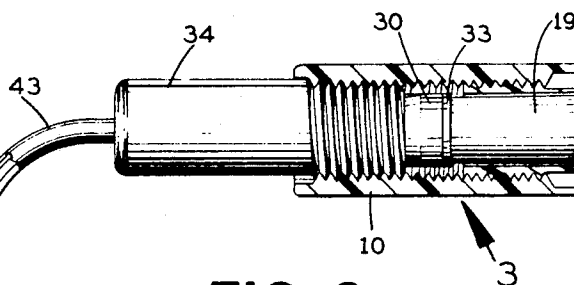
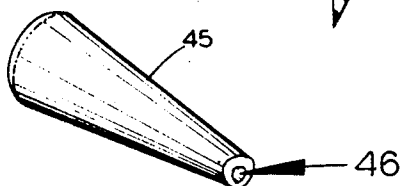


FIG. 9



INVENTOR.
SEYMOUR ROBINSON

BY *Lloyd J. Tucker*

ULTRASONIC TOOTH-CLEANING APPARATUS

This invention relates in general to dental apparatus and more particularly to an ultrasonically operated hand-piece which provides for interchangeable tools having tips for cleaning the teeth and massaging the gums at ultrasonic frequencies and simultaneously flushing with water.

Prior dental cleaning and massaging devices were time-consuming hand operations and required a high degree of skill and care when used by the dentist or hygienist.

Prior ultrasonic devices do not provide for interchangeable tools having different tips for cleaning and massaging largely because of the difficulty arising from detachably coupling a tool for the transducer without excessive energy loss and the further disadvantage of having a separate means for supplying flushing water to the treated areas.

The present invention overcomes the above objections and disadvantages by the provision of a hand-piece in which a detachable coupling means is provided in the hand for engaging interchangeable tools having different treatment tips without serious energy loss, including the provision of a water passage through the tool for providing treatment in the presence of a water supply.

These and other objects and advantages are described and shown in the following specification and drawings, in which:

FIG. 1 is a perspective view of an ultrasonic tooth-cleaning device connected to a source of electric ultrasonic energy.

FIG. 2 is a cross-sectional side elevation taken through section line 2-2, FIG. 1.

FIG. 3 is a cross-sectional end view taken through section line 3-3, FIG. 2.

FIG. 4 is a perspective view of a cleaning tool for use in an ultrasonic device, shown in FIG. 1.

FIG. 5 is a cross-sectional side view of an ultrasonic gum massage device in the presence of a flow of water attached to the tool shown in FIG. 1.

FIG. 6 is a perspective view of an elastomer tip for the massage device shown in FIG. 5.

FIG. 7 is a tip for massaging and water flushing areas between teeth.

FIG. 8 is a cross-sectional view of the tip shown in FIG. 7 attached to the device shown in FIG. 1.

FIG. 9 is an elastomer tip to be used with the device shown in FIG. 8 for flushing an ultrasonic stream of water between teeth and/or bridgework.

Referring to FIG. 1, an electronic ultrasonic generator 1 is provided within a suitable casing which is adapted to be connected to a source of domestic alternating current power by a cord assembly 2, and a pressurized water supply conduit 2w. The ultrasonic cleaning device 3 is connected to the ultrasonic generator by a flexible cable 4 containing a water-conducting tube and a pair of electric conductors, by means of a coupling assembly 5. The generator is provided with an on-off switch 6 and an oscillation indicating lamp 7 therefor and a calibrated output intensity control 8.

The cross-sectional view of the cleaning device, shown in FIG. 2, provides a cylindrical casing 10, made from metal or molded plastic material and having a rear portion 11 secured thereto by well-known means.

The rear portion 11 has coaxially positioned therein a stem 12 including an integral flange 13 positioned against the inner transverse surface of the portion 11. The stem has a coaxial tubular projection extending rearward on which a flexible tube 14 is secured for conducting pressurized water through an axial bore 15 through the stem. The forward end of the stem has a female thread for receiving therein the threaded rear end portion of an axial water conducting tube 16, for a continuation of bore 15. A cylindrical spacer 17 is also threaded on the rear portion of tube 16 and against an O-ring 18 for hermetically sealing the stem 12 and the tube 16. A tubular transducer 19, such as the lead zirconate-lead titanate type, is coaxially positioned in the casing 10 with the rear end thereof against a resilient disc 20, preferably made of nylon material, which in turn is positioned against the front end of the spacer 17.

A conductor 22 in cable 4 is connected to a contracting helical spring 23 which is in tight contact with the outer electrode of the transducer. The remaining conductor 21 is connected to an expanding helical spring 24 in the bore of the transducer 19 for making connection to the inner electrode of the transducer.

The enlarged forward portion 25 of the tube 16 is sealed within the bore of the transducer by an O-ring 26, and a triangular-shaped ring 27 secured to the outer periphery of the transducer is positioned against an O-ring 28 which seals the space between the outer periphery of the transducer and the inner periphery of the casing 10.

A typical tool 29 having a cleaning tip has a junction retaining member 30 on the inner end thereof which has a coaxial extension tube 31 entering a bore in the outer end of portion 25 of the tube 16 and is sealed therein by an O-ring 32. A second resilient washer 33, preferably made of nylon material, is positioned between the outer end of the transducer and the inner end of the junction member 30, as shown. The junction member is held in the position shown in FIG. 2 by a generally tubular guard 34 having an inner portion 35 thereof threaded into the front end of casing 10 which includes a shoulder 36 which bears against a flange 37 with a resilient washer 38 positioned therebetween. The outer end portion of the guard is flattened along one side for clearance when in use.

Thus, it is now apparent that the junction member 30 will be moved inward and clamp the transducer between the disc 20 and the washer 33 depending upon the degree of tightness of rotation of the guard 34. It is also apparent that when the transducer is energized, its longitudinal motion will be transmitted to the tip of the tool 29 to a predetermined degree depending upon the adjustment of the guard 34. It is to be noted from FIG. 1 that the lower outer portion of guard 34 is cut away below the tool 29 for convenient use in the mouth.

Referring to FIG. 4, the tool 29 having a junction member 30 and a flange 37 and a rear extension tube 31 has a bore therethrough terminating in an open channel 39 in the hook-shaped outer tip portion 40 of the tool.

FIG. 5 illustrates another type of tool in which a metal tube 41 is curved for convenient use and terminates in an elastomer cup shaped tip 42 which is also shown in FIG. 6 for use in massaging the gums under the flow of water through the tube 41.

FIGS. 7 and 8 illustrate another form of the tube 43 having a conical tip 44 shaped to clean the interstices between and around the teeth, which conducts water through a plurality of holes in the outer end portion of the cone.

FIG. 9 is another form of conical tip 45 with the axial bore 46 therethrough for flushing water under ultrasonic motivation from around the teeth and bridges therefor.

This invention comprehends modifications in construction that come within the teachings and spirit of the above specification.

Having described my invention, I claim:

1. An ultrasonic dental hand-piece comprising a means forming an elongated handle having a bore therethrough, a tubular ceramic transducer having a pair of electrodes positioned in the bore of said handle against a support means fixed in the rear end portion of said handle, a pair of terminals connecting the said electrodes of said transducer, a pair of flexible electric conductors positioned through the rear portion of said handle connected to said terminals, a dental tool with the outer end thereof terminating in a treatment tip and the rear end thereof terminating in a coaxial coupling means having a coaxial flange spaced from a coaxial planar end surface, a resilient washer positioned between said front end of said transducer and the said rear end of said coupling means, a tubular guard member threaded into the outer end of said bore in said handle and projecting outward therefrom, a second resilient washer positioned between the front surface of said flange and the rear surface of said guard member for urging and holding said coupling means

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against the front end of said transducer with predetermined pressure whereby said tool will be oscillated by said transducer at an ultrasonic frequency when said conductors are energized by electric ultrasonic energy of predetermined frequency.

2. The construction recited in claim 1 including a coaxial projection of predetermined dimensions around the central portion of said transducer,

a resilient ring positioned around said transducer adjacent said projection with the outer periphery thereof against the inner surface of said bore in said handle for supporting said transducer for axial oscillation in spaced relation with said bore.

3. The construction recited in claim 1 including a water-conducting tube secured at the rear end portion thereof through said support means and extending forward substantially through the bore through said transducer,

a flexible conduit for conducting pressurized water,

a water coupling means connecting the said rear end portion of said tube with said conduit,

a cylindrical central extension integral and concentric with the rear end of said coupling means,

a water passage through said extension and said coupling and said tool,

sealing means connecting the front end of said tube with said extension whereby pressurized water in said conduit will flow through said tube and the outer end portion of said tool for flushing the teeth and gums when said tool is in use.

4. The construction recited in claim 1 including said tubular guard member with a portion of one side thereof extending from the said handle flattened a predetermined dimension to reduce the diameter thereof for providing greater clearance for the use of a tool within the mouth.

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