

[54] **DENTAL HYGIENE TOOL**

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[58] Field of Search **32/DIG. 4, 58**

[56] **References Cited**

UNITED STATES PATENTS

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[57] **ABSTRACT**

A dental hygiene tool to be connected to a sonic actuator wherein the connection to the actuator comprises an interfitting metallic ring assembly, the rings interfitting in an interfering manner to establish an extremely tight metal contact to efficiently transmit sonic vibrations.

8 Claims, 5 Drawing Figures

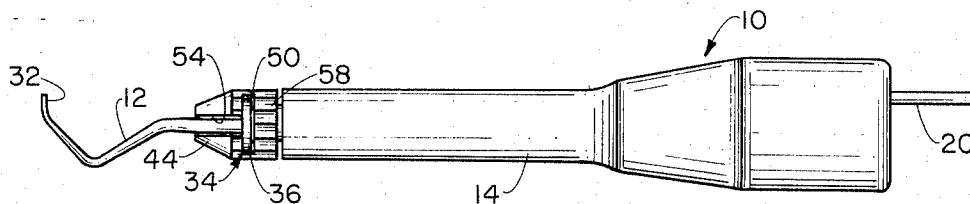


Fig. 1.

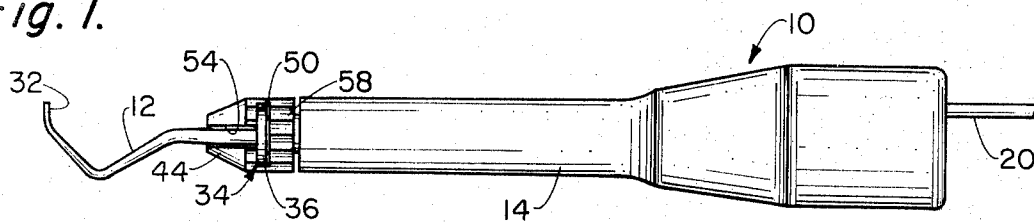


Fig. 2.

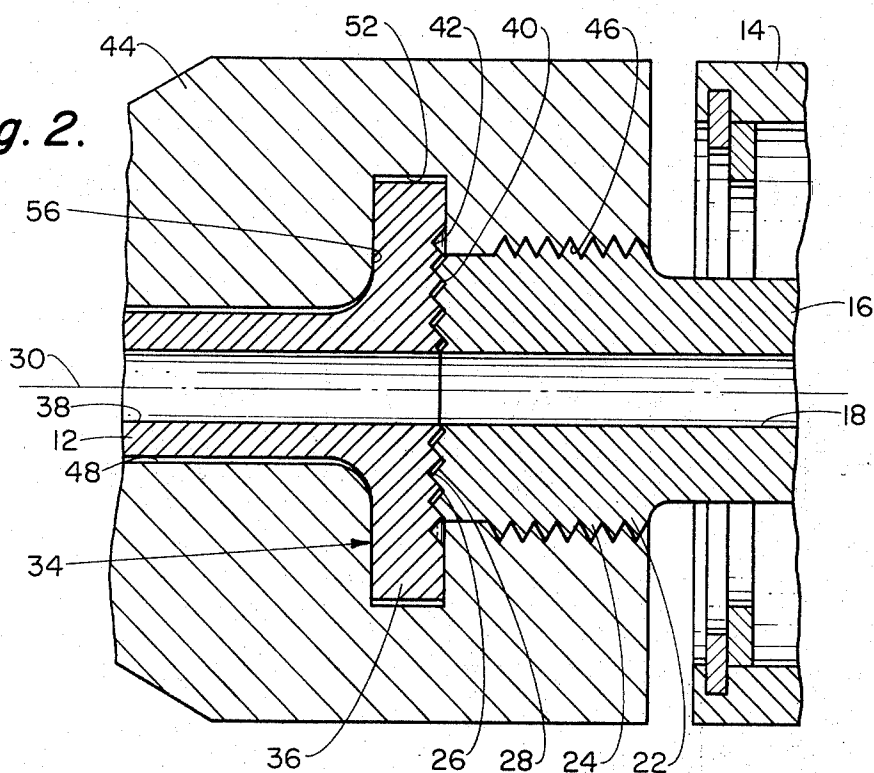


Fig. 3.

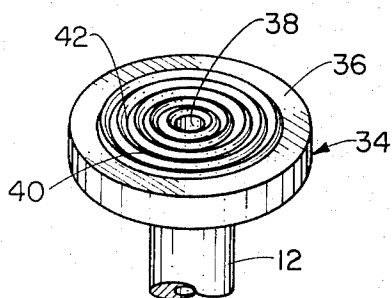


Fig. 4.

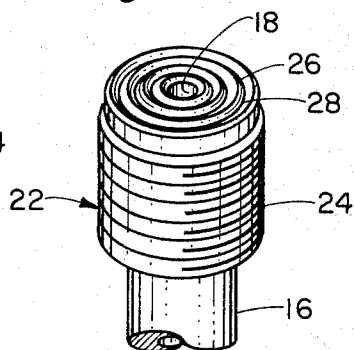
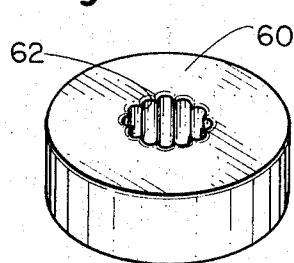


Fig. 5.



DENTAL HYGIENE TOOL

BACKGROUND OF THE INVENTION

The cleaning of teeth by a dentist is a significant portion of the dentist's business. Usually within a dentist's office the cleaning of the teeth is accomplished by means of a dental hygienist.

The dental hygienist employs the use of a plurality of tools to facilitate cleaning of the tartar from the teeth from within the teeth crevices and the open areas of the teeth. The hygienist normally employs at least a half a dozen different types of probes to efficiently clean the different areas of the teeth. It is logical that a very small headed probe would be employed within the crevices between the teeth where a relatively large headed probe would be employed upon the open areas of the teeth.

Within the past few years a new type of teeth cleaning device has been employed which uses sound waves to assist in the cleaning of the teeth. The operation of the device is such that the probe which cleans the teeth is vibrated at a minute amplitude several thousand times per minute. It has been found that this small vibration permits the hygienist to accomplish a much improved cleaning of the teeth while doing such in less time. Further, the use of a water spray to remove the loose tartar once scraped off from the teeth also increases cleaning performance.

Since the hygienist needs to employ a plurality of different types of probes for the different teeth areas, a connection arrangement must be established between the probe and the sonic actuator. This connection must be extremely strong in order for the sonic vibrations to be transmitted efficiently. In other words, this connection must be as though the probe and the actuator were an integral unit. Additionally, this connection must be fluid-tight so as to prevent leakage of water about the connection which is caused to flow through the actuator and through the probe.

Additionally, this connection must be capable of being quickly established so that the hygienist does not lose time changing probes. Further, because of the frequent interchangeability of the probes, the connection must be such so as to be substantially unaffected by wear after continued use over several years.

Previously the efforts at designing such a connection have not been a hundred percent effective in transmitting the sonic vibrations while maintaining a fluid-tight connection yet facilitating interchangeability. The connections of the prior art frequently result in leakage of water past the connection as well as losing a significant amount of the energy of the sonic vibrations. Further, the connections of the prior art took time to establish and could not be effected in just a few seconds.

SUMMARY OF THE INVENTION

The dental hygiene tool of this invention pertains to a connection between a probe and a sonic actuator which can be accomplished quickly and easily by a dental hygienist. The connecting end of the actuator is formed into a plurality of concentrically located rings with the connecting end of the probe being similarly formed into a plurality of concentrically located rings. The rings of the actuator are located about an elongated water opening within the actuator. Similarly the rings of the probe are located about an elongated water opening within the probe. The rings of the probe are to

cooperate with the rings of the actuator in an interfitting manner. The radial spacing of the rings upon the probe is slightly different than the radial spacing of the rings upon the actuator. Therefore, a slight interference fit occurs between the probe and the actuator when the connection is established which results in a tight frictional engagement between the probe and the actuator. This connection closely approaches the probe and the actuator being integrally formed. A threaded nut cooperates to bind the probe upon the actuator with the nut being readily tightened or loosened by means of a cooperating wrench.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elongated view of the tool of this invention showing the probe as it would be connected to the actuator during use;

FIG. 2 is a cross-sectional view of this invention taken along line 2—2 of FIG. 1;

FIG. 3 is a partial isometric view of the concentric ring arrangement of the probe;

FIG. 4 is a partial isometric view of the concentric ring arrangement upon the actuator; and

FIG. 5 is an isometric view of the wrench which is to be employed to effect operation of the nut which binds together the probe and the actuator.

DETAILED DESCRIPTION OF THE SHOWN EMBODIMENT

Referring particularly to the drawing, there is shown in FIG. 1 the dental hygiene tool 10 of this invention being generally composed of a probe 12 and an actuator housing 14. Within the actuator housing 14 is supported an actuator 16. The actuator 16 is supported in such manner within the housing 14 so as to transmit sonic vibrations. The structure to support the actuator 16 within the housing 14 is deemed to be conventional and need not be described here in detail. It is further to be understood that sound waves are to be transmitted to the actuator 16 in a conventional manner.

The body of the actuator 16 is substantially cylindrical in configuration and includes a longitudinal central opening 18 located therethrough. The opening 18 is to provide access to the passage of water which is to be supplied to the opening 18 through conduit 20. The connecting end 22 of the actuator 16 includes external screw threads 24. At the tip of the connecting end 22 are formed a plurality of concentrically located rings 26. As a result of the forming of the rings 26, a plurality of concentrically located recesses 28 are also formed with a recess 28 being located between two adjacent rings 26. Each of the rings 26 are spaced a predetermined radial distance from the longitudinal axis 30 of the actuator 16. A typical spacing would be 0.053 of an inch for the radius of the innermost ring 26 with a spacing of 0.077 for the next ring and a spacing of 0.101 for the outermost ring.

The probe 12 includes an operating end 32 which is adapted to come into contact with a person's teeth and effect cleaning thereof. The probe 12 also includes a connection end 34 which is formed into an annular enlarged flange 36. Also formed within the probe 12 is an elongated opening 38. The opening 38 is adapted to conduct water therethrough and effect ejecting of such through an opening within the probe (not shown) adjacent the operating end 32.

The front side of the flange 36 also includes a plurality of rings 40 which are concentrically located about the opening 38. Each of the rings 40 are substantially identical to the rings 26 except for the spacing with respect to the axis 30. Located between each ring 40 is a recess 42 with there being one such recess 42 in between each pair of adjacent rings 40. The radial spacing of the recesses 42 with respect to the axis 30, is by way of example, 0.052 of an inch for the innermost recess 42 and 0.076 for the next recess and 0.100 to the outermost recess 42.

A nut 44 is to be employed as a securement means which includes an internally threaded opening 46 at one end thereof with a smaller diametered non-threaded opening 48 located at the other end thereof. A slit 50 is formed transversely within the nut 44 and is adapted to communicate with an annular chamber 52. An elongated slot 54 is also formed within the nut 44 which communicates between the free end of the nut 44 and the slit 50 and also with opening 48.

The arrangement of the nut 44 is such that the probe 12 may be placed within the nut 44 so that the flange 36 cooperates within the chamber 52 and the shaft portion of the probe 12 also cooperates with the opening 48. With the probe 12 so located, an annular shoulder 56 formed within the nut 44 abuts the back of the flange 36.

As can be readily seen from the foregoing, the probe 12 can be easily inserted and removed within the nut 44. The threaded end 46 of the nut 44 cooperates with the threads 24 of the actuator 16. With the nut 44 in an untightened state with respect to the actuator 16, the probe 12 may be readily removed and another probe inserted. To fixably position the probe 12 with respect to the actuator 16, the nut 44 is to be tightened upon the screw threads 24 until the shoulder 56 frictionally forces the flange 36 into contact with the actuator 16. To facilitate the tightening action, the external surface of the nut 44 is formed into a non-circular configuration 58. A disc-like wrench 60 is to be employed which also includes a central opening 62 therein which is to matingly cooperate with the non-circular configuration 58. The wrench 60 is to be placed upon the nut 44 so that the opening 62 cooperates with the configuration 58. The external surface of the wrench 60 may be readily grasped and facilitates the application of torque to the nut 44 to tighten such upon the actuator 16.

When the nut 44 is tightened, the rings 26 are to cooperate within the recesses 42. However, it is to be noted that this cooperation is not to perfectly mate. In other words, as previously described, the radial spacing of the rings 26 is not exactly equal to the radial spacing of the recesses 42. This is done for the purpose so that a slight interference fit will occur between each ring 26 and an edge of its respective recess 42. This interference fit makes the frictional binding between the probe 12 and the actuator 16 more positive such that, when the nut 44 is tightened, the relationship between the probe 12 and the actuator 16 is so strong that it is substantially similar to the probe 12 and the actuator 16 being integral. This type of relationship is highly desired in order to facilitate efficient transmission of the sonic vibrations from the actuator 16 through the probe 12 to the operating end 32. It is the slight movement of the operating end 32 upon a person's teeth

which is caused by the sonic vibrations which results in the cleaning action of the teeth.

It is to be considered within the scope of this invention to vary the spacing of the rings 26 and 40 so that the desired amount of interference fit therebetween will occur. It is also considered to be within the scope of this invention to vary the configuration of the rings, it being shown that each of the rings have an outer substantially pointed surface. However, a contoured outer surfaced ring could be employed if desired.

What is claimed as new in support of Letters Patent is:

1. A dental hygiene tool comprising:

an elongated actuator movable by sonic vibrations, said actuator having an actuating end and an opposite connecting end, said connecting end including a first connection means;

a probe having an operating end and a connection end, said operating end adapted to clean teeth, said connection end including a second connection means; and

securement means to bind together said probe and said actuator with said first and second connection means frictionally cooperating together, said first and second connection means comprising at least one protuberance and one recess cooperating together in an interference relationship.

2. A tool as defined in claim 1 wherein:

said actuator and said probe each being constructed of an extremely hard material.

3. The tool as defined in claim 2 wherein:

said actuator and said probe being constructed of steel.

4. A dental hygiene tool comprising:

an elongated actuator movable by sonic vibrations, said actuator having an actuating end and an opposite connecting end, said connecting end including a first connection means;

a probe having an operating end and a connection end, said operating end adapted to clean teeth, said connection end including a second connection means;

securement means to bind together said probe and said actuator with said first and second connection means frictionally cooperating together, said first and second connection means establishing an interference relationship with each other; and

said first connection means comprises a plurality of concentric rings resulting in the forming of a plurality of concentrically spaced apart ridges interspersed with a plurality of concentrically spaced apart recesses, said second connection means comprises a plurality of concentric rings resulting in the forming of a similar array of ridges and recesses, the ridges of said first connection means to cooperate within the recesses of said second connection means, the radially outward spacing of said ridges of said first connection means being different than the radially outward spacing of the ridges of said second connection means, whereby an exact mating interfitting relationship between said ridges and recesses is avoided to thereby establish an interference relationship therebetween.

5. A tool as defined in claim 4 wherein:

said actuator including a first elongated opening therethrough, said probe including a second elongated opening therein, said first and said second

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elongated openings to cooperate together to form a water passage, with said first and second connection means cooperating together a fluid-tight connection is established to prevent leakage of water from said openings.

6. A tool as defined in claim 1 wherein:

said securement means comprises a nut which is screw threadingly connected upon said actuator, said probe to be fixedly positioned by abutment means within said nut, upon tightening of said nut said second connection means is caused to be frictionally engaged with said first connection means.

7. A tool as defined in claim 6 wherein:

the exterior surface of said nut is formed non-circular, a wrench device including a non-circular opening substantially similar to the non-circular configuration of said nut, the opening of said wrench to matingly cooperate with said non-circular configuration of said nut to facilitate tightening and loosening of said nut.

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8. A dental hygiene tool comprising:

an elongated actuator movable by sonic vibrations, said actuator having an actuating end and an opposite connecting end, said connecting end including a first connection means;

a probe having an operating end and a connection end, said operating end adapted to clean teeth, said connection end including a second connection means;

securement means to bind together said probe and said actuator with said first and second connection means frictionally cooperating together, said first and second connection means establishing an interference relationship with each other;

said first connection means comprises a plurality of protuberances, said second connection means comprises a plurality of recesses, said interference relationship being established by a not perfect mating of said protuberances within said recesses.

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