Aug. 25, 1970 N. H. LIEB 3,525,154

HANDPIECE WITH WATER SPRAY

Filed April 25, 1968 4 Sheets-Sheet 1

Fig. 1.

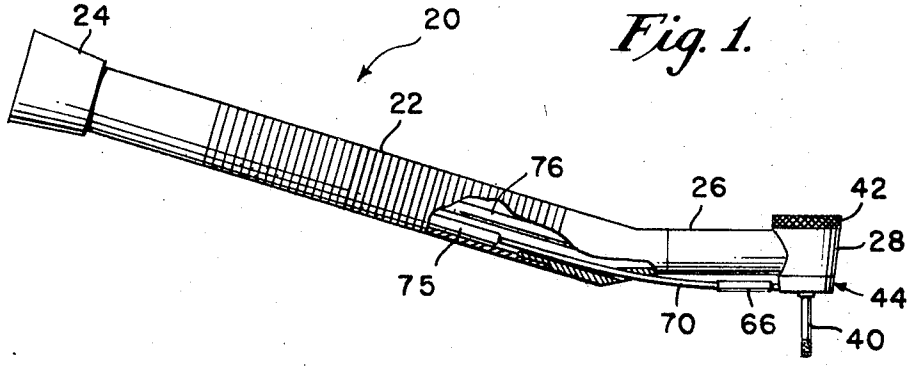


Fig. 2.

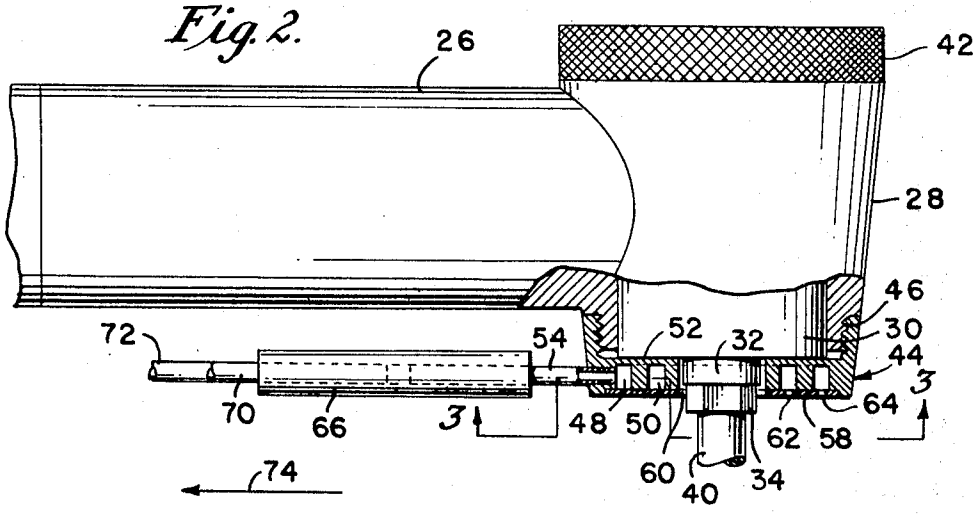


Fig. 3.

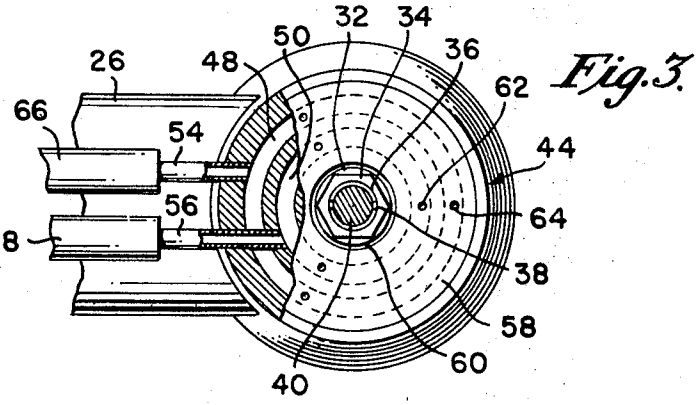
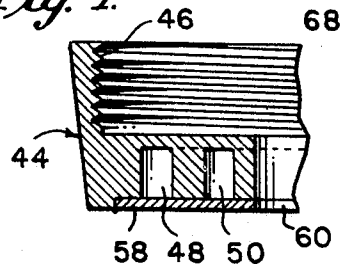


Fig. 4.



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Aug. 25, 1970 N. H. LIEB 3,525,154

HANDPIECE WITH WATER SPRAY

Filed April 25, 1968 4 Sheets-Sheet 2

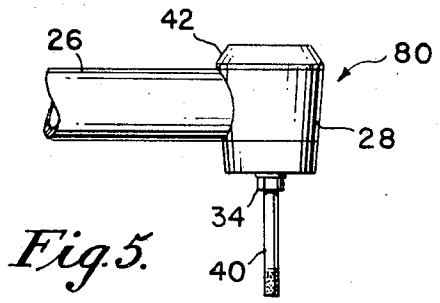

Fig. 5.

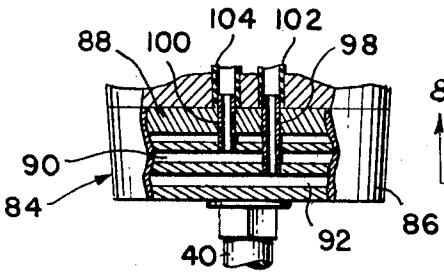

Fig. 7.

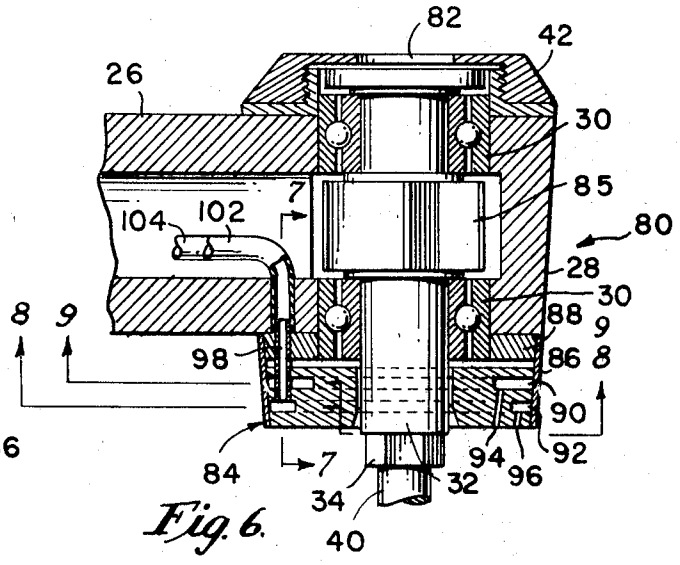

Fig. 6.

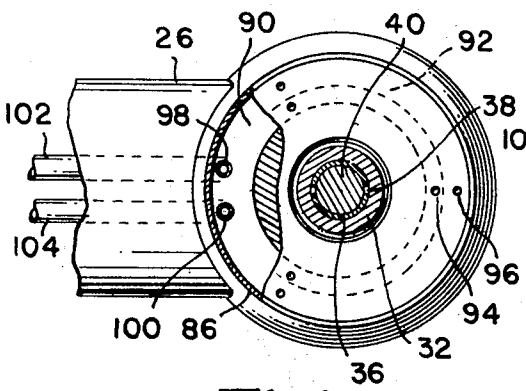

Fig. 9.

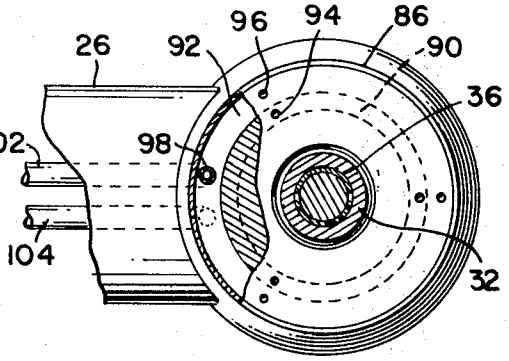

Fig. 8.

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Aug. 25, 1970 N. H. LIEB 3,525,154

HANDPIECE WITH WATER SPRAY

Filed April 25, 1968 4 Sheets-Sheet 3

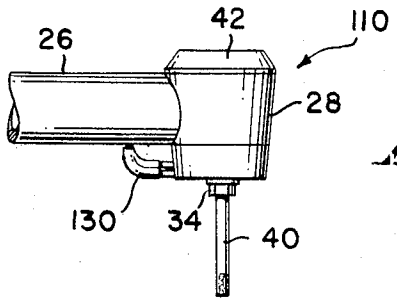

Fig. 10.

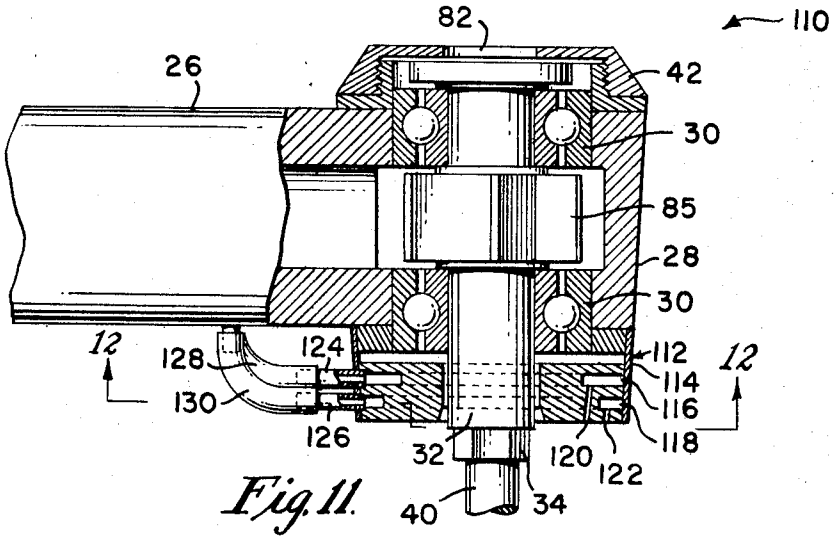

Fig. 11.

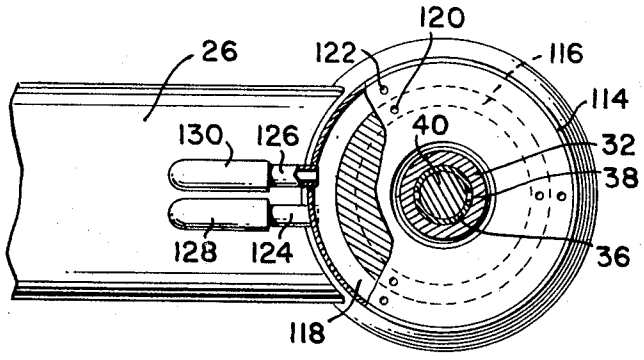

Fig. 12.

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Aug. 25, 1970 N. H. LIEB 3,525,154

HANDPIECE WITH WATER SPRAY

Filed April 25, 1968 4 Sheets-Sheet 4

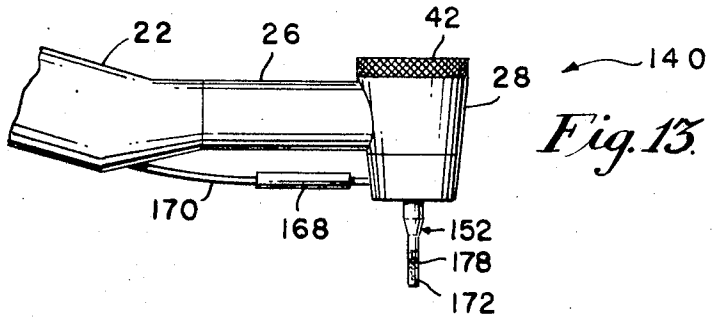

Fig. 13.

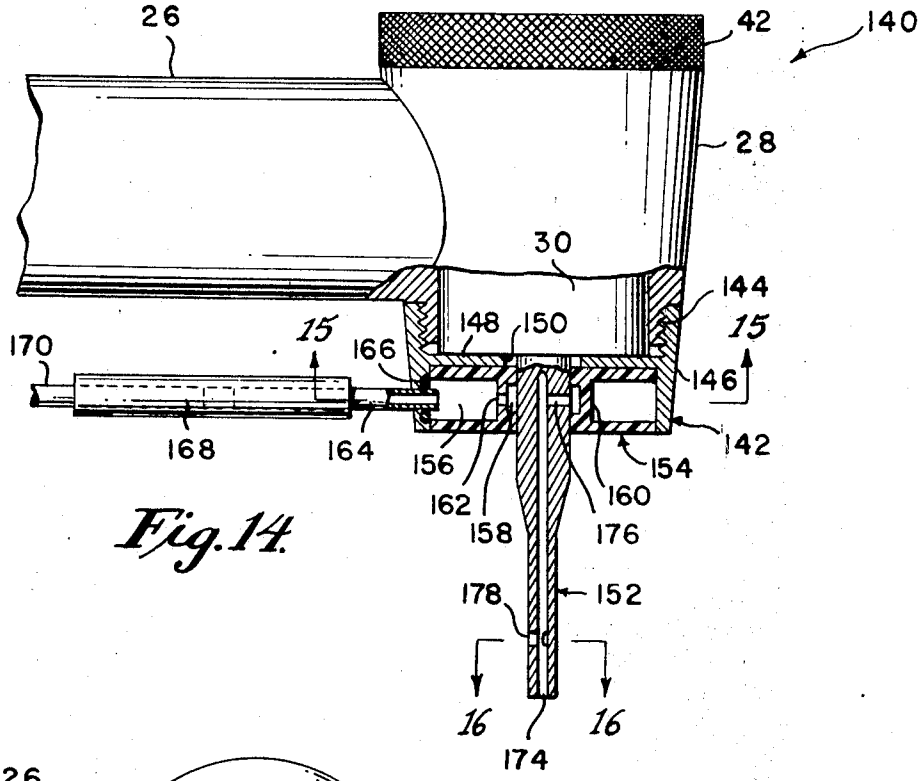

Fig. 14.

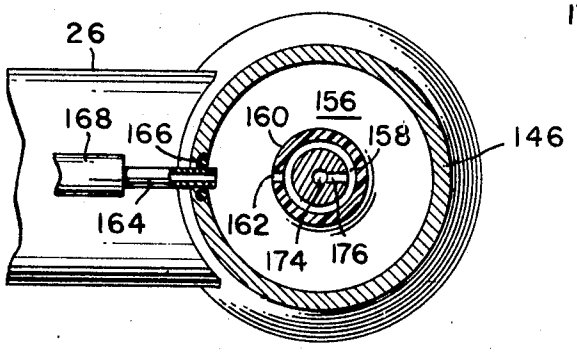

Fig. 15.

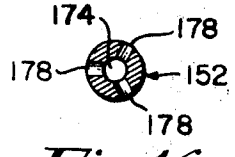

Fig. 16.

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Patented Aug. 25, 1970

3,525,154

HANDPIECE WITH WATER SPRAY

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Int. Cl. A61c 1/08
U.S. Cl. 32—28 15 Claims

ABSTRACT OF THE DISCLOSURE

A dental handpiece comprising a hollow body member and a turbine housing at one end thereof. A spray cap is removably secured to the turbine housing and a source of water for the spray cap is internally mounted in the hollow body member. A water spray for a drilled tooth is provided by the spray cap.

This invention relates to a dental handpiece, and more particularly, to a dental handpiece having an integral water spray device provided thereon.

It is known to supply the necessary rotative power to a dental bur by means of a round belt pulley system operatively connected to a source of power. Recently, the demands of high speed dentistry have improved these round belt pulley systems and have provided other systems such as air and water driven turbines to effect dental cutting tool speeds of up to 400,000 r.p.m.

The use of these high speed systems has resulted in another problem, that of the generation of large amounts of frictional heat in a tooth. It has therefore become necessary to cool the tooth during the drilling thereof. The method of cooling which is used almost exclusively is that of directly supplying a water spray against the tooth while the drilling is being carried out.

Although it has been found that water will effectively cool the tooth, various problems have arisen with prior art water sprays. In U.S. Pat. No. 3,120,706, owned by the assignee hereof, there is shown an air driven dental handpiece with a water spray which is slidably mounted in order to enable the dentist to position the spray adjacent the bur used for drilling a tooth. The water spray shown in this patent has proved to be completely effective for its intended use. However, there is one problem which has been found with this water spray. When drilling a tooth with a high cusp, it is possible for the cusp to block the spray. Since there is only a single source of spray for the device shown in U.S. Pat. No. 3,120,706, cuspal blockage can effectively prevent a large amount of the coolant water from being delivered to the desired location on the drilled tooth.

An improvement on the device shown in aforementioned U.S. Pat. No. 3,120,706 is shown in U.S. Pat. No. 3,199,196, also owned by the assignee hereof. In the latter patent, the single source for the water spray is replaced by an arcuate, substantially circular water spray tube. The circular water spray tube provides a plurality of sources of water spray around the dental bur. Thus, if one of the ports for the water spray should become blocked by the cusp of a tooth, coolant water will still reach the drilled area from the other ports of the spray device.

The device of this invention is an improvement over the spray device shown in U.S. Pat. No. 3,199,196. In this device, a plurality of ports is provided in a spray head for a dental handpiece. To this extent, the device of this invention enjoys all of the advantages of the device shown in U.S. Pat. No. 3,199,196. However, one of the problems encountered with respect to the device shown

in U.S. Pat. No. 3,199,196 was that it was extremely difficult to form a tube into the arcuate, substantially circular shape required for obtaining the plurality of ports for the spray. In this connection, it must be borne in mind that the turbine housing for an air driven dental handpiece is extremely small, and therefore it is extremely difficult to bend the tubing which would be small enough to be adapted for use with a turbine driven handpiece. Because of this, it has been found that there was a pressure drop for the water spray when the water was forced through the entire circumference of the arcuate spray tube. The resultant effect was that it was extremely difficult to obtain a uniform spray. Contrasted with this, the spray head of this invention is formed by a machining operation, and therefore the channels carrying the water and air will have a uniform width throughout their entire length. This will result in uniform pressure and a uniform spray volume through all of the ports of the spray head.

Another advantage over the arcuate tube spray device is that the bending of the tubes necessarily resulted in a large diameter for the spray tubes. This was because a small diameter too often resulted in tube blockage during the bending operation. The spray head of this invention which is formed from a machining operation permits the use of water and air channels of much smaller diameter than those of the bent tubes. This permits greater concentricity of the coolant around the dental bur, and therefore, a smaller volume of coolant water is needed to obtain the desired cooling effect. This in turn results in less chance of gagging by the patient and improved vision for the dentist.

There are devices in the prior art which have a water spray provided in a turbine housing for a turbine driven dental handpiece. However, these devices are formed directly in the housing which is unitary. If the port for the water spray should become clogged, and cannot readily be cleaned, the entire turbine housing would have to be replaced. Contrasted with this, the spray head of this invention is readily removable from the end of a turbine housing. Thus, the spray head serves the combined function of an end cap and a means of providing a coolant spray adjacent a rotating dental bur.

If the device of this invention should become clogged, it is readily removable from the dental handpiece and can be cleaned from either the entrance end for the water and air or the exit ports. Additionally, if cleaning becomes too difficult, the entire spray head can be replaced. This is an important feature to a dentist that finds the spray head has become clogged during use. Thus, it will not be necessary for a dentist to take the time required to clean the spray head while he is operating on a patient. All he will have to do is replace the spray head, which is quickly and easily done, and continue working on the patient.

In another aspect of this invention, the water from the spray cap is delivered through the bur secured in the handpiece. To accomplish this, the bur is provided with a hollow bore which is in fluid communication with the end cap.

It is therefore an object of this invention to provide a dental handpiece with a novel water spray.

It is another object of this invention to provide a novel spray head for use on an air driven dental handpiece.

These and other objects of this invention are accomplished by providing a dental handpiece including a hollow body member and a turbine housing at one end of said hollow body member, said turbine housing including rotary chuck means therein adapted for securing a dental bur, said hollow body member including a conduit adapted to deliver a liquid, a removable cap secured on said turbine housing, said cap being at one end of said

turbine housing and adjacent the position wherein a dental bur can be inserted in said rotary chuck, said cap having at least one channel for reception of a liquid, and said cap being releasably connected to said conduit.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a side elevational view, partly in section, of a first embodiment of the handpiece with water spray of this invention;

FIG. 2 is an enlarged side elevational view, partly in section, of the turbine end of the handpiece of FIG. 1;

FIG. 3 is a sectional view taken along the line **3—3** of FIG. 2;

FIG. 4 is an enlarged fragmentary sectional view of the spray cap of the device of FIG. 1;

FIG. 5 is a fragmentary side elevational view of the second embodiment of the handpiece with water spray of this invention;

FIG. 6 is an enlarged sectional view of the device shown in FIG. 5;

FIG. 7 is a sectional view taken along the line **7—7** of FIG. 6;

FIG. 8 is a sectional view taken along the line **8—8** of FIG. 6;

FIG. 9 is a sectional view taken along the line **9—9** of FIG. 6;

FIG. 10 is a fragmentary side elevational view of the third embodiment of the handpiece with water spray of this invention;

FIG. 11 is an enlarged sectional view of the device shown in FIG. 10;

FIG. 12 is a sectional view taken along the line **12—12** of FIG. 11;

FIG. 13 is a fragmentary side elevational view of the fourth embodiment of the handpiece with water spray of this invention;

FIG. 14 is an enlarged side elevational view, partly in section, of the front end of the device shown in FIG. 13;

FIG. 15 is a sectional view taken along the line **15—15** of FIG. 14; and

FIG. 16 is an enlarged sectional view taken along the line **16—16** of FIG. 14.

Referring now in greater detail to the various figures of the drawings wherein similar reference characters refer to similar parts, a handpiece with water spray embodying the present invention is shown at **20** in FIG. 1. Device **20** basically comprises an elongated hollow housing **22** having an adaptor nut **24** at one end for connection of water and air tubing. The other end includes a contra-angle extension **26** having a turbine housing **28** on the end thereof.

Turbine housing **28** includes a turbine cartridge comprising upper and lower ball bearings **30** (only the outer race of lower ball bearing **30** is shown in FIG. 2), a rotor shaft **32** having an extension with a hexagonal outer surface **34** and a collet chuck **36** (FIG. 3) having a pair of jaws separated by openings **38**.

To the extent described, the handpiece can be the same as that shown in prior U.S. Pats. No. 3,120,706 and No. 3,199,196. Thus, as explained in greater detail in Pat. No. 3,120,706, collet **36** is threadedly secured within rotor shaft **32**. Together, the collet and the rotor shaft provide a rotary chuck for a dental bur. The threaded advancement of the collet within the rotor shaft causes a compression of the jaws of the collet, thereby securing a dental bur **40** in place. The rotor shaft is held against rotation when the collet is moved through the use of a wrench placed over the hexagonal head **34** or through the use of a finger which passes through the turbine housing **28** into the rotor blades, as shown in U.S. Pat. No. 3,120,706. The collet is then advanced by inserting a square or hexagonal whench into a square or hexagonal hole in the top of the collet and threadedly rotating the collet relative to the internally threaded rotor shaft.

It is to be understood, however, that the specific rotary chuck used with the handpiece is not critical to the invention, and any chucking means known in the art can be used in the handpiece of this invention. For instance, a plastic sleeve collet can be used or a spring loaded collet, such as that shown in U.S. Pat. No. 3,074,167, can be used. One end of turbine housing **28** is closed by removable end cap **42**. The other or bottom end is closed by a removable spray head **44** which serves as an end cap. Cap **44** is internally threaded, as shown at **46**, and is threadedly secured on turbine housing **28**. End cap **44** includes a pair of coaxial spaced annular grooves **48** and **50**. Grooves **48** and **50** can be formed by a machining operation directly on a blank which is formed into cap **44**. Alternatively, they can be formed by securing a pair of spaced rings on the upper surface **52** of the end cap.

A tube **54** projects from one side of the end cap **44** and is in fluid communication with groove **48**. A second tube **56** projects from the end cap **44** adjacent tube **54** and is in fluid communication with groove **50**. A disk **58** is placed over grooves **48** and **50** and effectively seals the grooves to form closed channels. Disk **58** is also provided with a plurality of holes **64** which are in fluid communication with groove **48**. Holes **62** and **64** are aligned, as seen in FIG. 3. Although the holes are shown in FIG. 2 as projecting vertically downward, they can be angled in the direction of bur **40**.

A flexible tube **66** is slidably mounted on tube **54** and a flexible tube **68** is slidably mounted on tube **56**. Tubes **66** and **68** can be made of any resilient material, such as rubber or plastic. A suitable plastic tube is that sold under the trademark Tygon. Tubes **66** and **68** are in turn connected to rigid metal tubes **70** and **72**, respectively (FIG. 2). The metal tubes, in turn, pass into the hollow body **22** of handpiece **20** (FIG. 1) where they are each secured to individual flexible tubes **75**. The flexible tubes **75** are in turn secured to rigid conduits within housing **22**. The metal tubing **70** and **72**, flexible tubes **75** and the rigid conduits are the same as those shown in aforementioned U.S. Pat. No. 3,199,196. Handpiece **20** will also include a rigid tube **76** for furnishing air to rotate the turbine of the handpiece.

The handpiece **20** is used in the normal manner for the drilling of teeth. When the handpiece is actuated, water will pass through tubing in hollow body **22**, through tube **70**, tube **66** and into groove **48**, from which it will be directed downwardly toward bur **40** through holes **64**. Air will pass through the tube in hollow body **22**, through tube **72**, tube **68** and into groove **50** from which it will pass through holes **62** in the direction of bur **40**. The air serves to atomize the water as the two are mixed. If desired, the air and water channels can be reversed, and therefore water will pass through groove **50** and air will pass through groove **48**. Where an excess amount of water is desired, it is possible to pass water through both grooves **48** and **50**.

When it is desired to clean or change the spray cap **44**, tubes **70** and **72** and their associated flexible tubes **66** and **68** are slid rearwardly in the direction of arrow **74** in FIG. 2. The tubes are readily slidable in this direction because of the flexible tubing **75** within hollow body **22**. Thereafter, end cap **44** can be threadedly removed from the turbine housing **28** and cleaning can be accomplished by passing fine wires through tubes **54** and **56** and through openings **62** and **64**. The end cap **44** can then be threadedly replaced in turbine housing **28**. The tubes **54** and **56** are positioned in the end cap in such a manner that they will be in the position shown in FIGS. 2 and 3 when the end cap **44** is threadedly secured in place.

An important feature of having both end caps **42** and **44** removable is that the turbine cartride comprising the ball bearings, the rotor shaft, the rotor blades and the collet can easily be removed and replaced by the dentist.

If both end caps were not removable, replacement would be more difficult. Thus, as seen in U.S. Pat. No. 3,120,706 the replacement of the turbine cartridge is easily accomplished through removal of the two end caps.

A second embodiment of the handpiece of this invention is generally shown at **80** in FIG. 5. Device **80** can be a part of the same handpiece as that shown in FIG. 1 and will include a contra-angle extension **26** with a turbine housing **28** and an upper end cap **42**. As seen in FIG. 7, end cap **42** is provided with a central opening **82** for insertion of a wrench to advance collet **36** (FIG. 8). Device **80** also includes upper and lower ball bearings **30**, a rotor shaft **32** having a hexagonal end **34** and rotor blades **85**. A dental bur **40** is secured by the collet in the same manner as that described for device **20**.

In this embodiment an end cap **84** is provided which is secured at the bottom of turbine housing **28** by a pressed fit between the wall **86** of the end cap over a reduced collar **88** at the bottom of the turbine housing. In this embodiment an upper annular grove **90** is formed in the end cap and a lower annular groove **92** is formed in the end cap. A plurality of holes **94** connects groove **90** with the exterior of end cap **84**. A plurality of holes **96** connects grove **92** with the exterior of end cap **84**. As seen in FIG. 8, holes **94** and **96** are aligned. As seen in FIG. 6, holes **94** are interior of holes **96**, and all of the holes are angled inwardly toward bur **40**.

As seen in FIG. 7 a tube **98** is in fluid communication with groove **92** and projects upwardly therefrom through the top wall of end cap **84**. A second tube **100** is in fluid communication with groove **90** and projects vertically upward through the top of end cap **84**. When the end cap is secured in place on the handpiece, tube **98** is telescoped into tube **102** which passes through contra-angle extension **26** and hollow body **22**. Likewise, tube **100** is telescoped in liquid tight communication into tube **104** within the hollow body of the handpiece.

The device **80** is used in the same manner as the device **20**. Thus, water will pass through tube **102** into groove **92** and out through openings **96**. Air will pass through tube **104** into groove **90** and out through openings **94**. If desired, the water and air supply lines can be reversed, or water can be passed through both grooves.

When it is desired to change or clean the end cap **84**, it is pulled vertically downward from the turbine housing **28** for removal. After cleaning it is pressed in place with the tubes **98** and **100** being inserted in tubes **102** and **104**, respectively. Tubes **102** and **104** can be made from a rigid plastic which is cemented in place. Alternatively, they can be formed from stainless steel and taper joints can be provided for the rapid seating of tubes **98** and **100** in tubes **102** and **104**. In either case, a liquid tight seal is obtained.

A third embodiment of this invention is generally shown at **110** in FIG. 10. Device **110** includes all of the details of the other embodiments including the contra-angle extension **26**, the turbine housing **28** and the upper end cap **42** having a central opening **82**. Device **110** is similar to device **80** in that an end cap **112** includes an outer wall **114** which is secured on turbine housing **28** through a pressed fit. An upper groove **116** and a lower groove **118** are provided having angled openings **120** and **122**, respectively. In this embodiment, a horizontally extending tube **124** is in fluid communication with annular groove **116** and a horizontally extending tube **126** is in fluid communication with annular groove **118**. Tubes **124** and **126** are connected with air and water conduits or tubes in contra-angle extension **26** through the use of flexible tubing **128** and **130**, respectively. Tubing **128** and **130** can be rubber or plastic.

The device of embodiment **110** is used in the same manner as the previous embodiments. Thus, air and water can be used in either the upper or lower grooves, or water can be passed through both grooves. As a further modification, of embodiment **110**, end cap **112** can be threadedly secured in place instead of using the pressed fit.

A fourth embodiment of this invention is generally shown at **140** in FIG. 13. Device **140** includes all of the details of the other embodiments including hollow housing **22** having contra-angle extension **26** and a turbine housing **28**. An end cap **42** is placed on the upper portion of the turbine housing and ball bearings **30** are mounted within the turbine housing. In this embodiment, an end cap **124** is threadedly secured on the bottom of turbine housing **28**, as shown at **144** in FIG. 14. End cap **142** includes an outer substantially cylindrical, but slightly tapered, wall **146** and a horizontal disk **148**. Disk **148** includes a central opening **150** through which a dental bur **152** projects.

A water jacket **154** is secured within wall **146** and abuts upper disk **148**. Water jacket **154** is preferably formed from a plastic having a low coefficient of friction, such as Teflon (polytetrafluoroethylene) or nylon. The water jacket is held in place within wall **146** by any of the means conventionally used for securing plastics to metal, such as crimping or adhesives. Set screws can also be used for obtaining the required securement. Water jacket **154** includes an outer annular channel **156** and an inner anular channel **158**. The two grooves are separated by an annular wall **160** but are in fluid communication through the use of one or more holes **162**.

A metal conduit **164** projects into groove **156**. An O-ring **166** provides a liquid tight connection between conduit **164** and end cap **142**. The O-ring is held in place by water jacket **154**. Conduit **164** is connected to a flexible rubber or plastic tube **168** which is in turn connected to a rigid tube **170** which enters housing **22**. Tube **170** is in turn connected to a flexible tube within housing **22**, as is shown and described with respect to the embodiment of this handpiece shown in FIGS. 1 to 4.

Dental bur **152** includes the conventional cutting or abrasive surface **172**. However, the bur also includes a central axially extending bore **174** which projects upwardly from the bottom end of the bur. Bur **152** also includes an upper radially extending bore **176** which connects bore **174** with channel **158**. Although only one bore **176** is shown, if desired, the number can be increased. The lower end of bur **152** includes three equally spaced radially extending bores **178** (FIG. 16). Bores **178** project inwardly from the exterior of bur **152** and terminate at bore **174**.

The use of device **140** is similar to the use of the other handpieces embodying this invention. However, in this embodiment, only a water spray will be used, rather than a mixture of air and water. Thus, water will enter the rear of housing **22**, pass through the internal tubing within the housing, leave the housing through tube **170** and enter water jacket **154** through conduit **164**. The water within channel **156** will then pass through hole **162** into channel **158**. From channel **158** the water will pass through bore **176** and down through bore **174**. The water will leave bore **174** axially through the bottom of the bore and radially through holes or ports **178**.

One of the advantages of device **140** over the other devices of this invention is that the water will be completely localized in use and will be applied directly to the point where needed. Thus, the purpose of the water spray is to cool and lubricate the position on the tooth which is being drilled. Since the water used with this embodiment of the invention will pass through the bur doing the drilling, the water automatically is discharged at its intended point of use. For this reason, atomization of the water is not necessary, and therefore, there is no need for an air line to be used in connection with a water line for obtaining the atomization used in the other embodiments. If desired, air can be added to the water used in this embodiment by connecting the air and water lines which are in housing **22** exteriorly of the housing and feeding a mixture of air and water into flex-

ible tube **168**. However, the one disadvantage of doing this is that the air and water pressures must be equal to prevent the water from backing up into the air line or the air from backing up into the water line. In view of the difficulty of obtaining these equal pressures, as a matter of convenience, only water will normally be furnished to the bur, without any additional air.

The water jacket **154** is made from a material having a low coefficient of friction because the jacket must serve the dual function of sealing the water within channel **158** while at the same time permitting the free rotation of bur **152**. Teflon is ideally suited for this use.

The number of openings connecting channel **158** with channel **156** and the number of radially extending bores **176** and **178** within bur **152** can be varied to suit the needs of the user. For most applications, a single opening **162** and a single bore **176** are sufficient. The three bores **178** are advantageous for obtaining uniform distribution of the water within the drilled tooth.

As with the other embodiments, end cap **142** may be secured in place by a pressed fit instead of the threaded connection. An additional advantage of this embodiment is that the bur **152** is internally cooled by the water passing through its central bore.

Although the various embodiments of this invention have been described as being used with air driven turbine handpieces, it is to be understood that the spray caps are adapted for use with any dental handpiece. Additionally, any of the rotary chucking devices known to the art can be used for holding the dental bur **40** or **152** in place.

Without further elaboration, the foregoing will so fully illustrate my invention that others may, by applying current or future knowledge, adopt the same for use under various conditions of service.

What is claimed as the invention is:

1. A dental handpiece including a hollow body member and a turbine housing at one end of said body member, said turbine housing including rotary chuck means therein adapted for securing a dental bur, said hollow body member including a conduit adapted to deliver a liquid, a removable cap secured on said turbine housing, said cap being at one end of said turbine housing and adjacent the position wherein a dental bur can be inserted and held in said rotary chuck, said cap having at least one channel for reception of a liquid, said cap being releasably connected to said conduit, said dental bur being mounted in said rotary chuck and having an axially extending bore, an upper radially extending bore which is in fluid communication with said axially extending bore and the exterior of said bur, and a lower radially extending bore which is in fluid communication with the exterior of said bur and said axially extending bore, said upper radially extending bore being in fluid communication with said channel whereby water entering said channel will pass through said channel into said upper radially extending bore, down through said axially extending bore, and out through said lower radially extending bore, said cap having a circular opening at the center thereof, said bur being mounted in a fluid-tight relationship with respect to said opening, whereby all water within said channel will pass from said channel into said upper radially extending bore, down through said axially extending bore, and out through said radially extending bore, and a portion of said cap contacting said dental bur to form said fluid-tight relationship, said portion comprising a plastic having a low coefficient of friction.

2. The dental handpiece of claim **1** wherein said plastic comprises polytetrafluoroethylene.

3. The dental handpiece of claim **1** wherein said cap includes two channels which are in fluid communication,

said channels being concentric, with the innermost of said channels being positioned at said opening in said cap and being exposed thereto.

4. The dental handpiece of claim **1** wherein said dental bur includes a plurality of lower radially extending bores with each of said lower bores being in fluid communication with the exterior of said bur and with said axially extending bore.

5. A dental handpiece including a hollow body member and a turbine housing at one end of said body member, said turbine housing including rotary chuck means therein adapted for securing a dental bur, said hollow body member including a first conduit adapted to deliver a liquid and a second conduit adapted to deliver air, a removable cap secured on said turbine housing, said cap being at one end of said turbine housing and adjacent the position wherein a dental bur can be inserted and held in said rotary chuck, said cap having an opening through which said dental bur can be inserted, said cap having two channels formed therein, one of said channels being in fluid communication with said liquid delivery conduit, the other of said channels being in fluid communication with said air delivery conduit, said cap having at least one bore connecting each of said channels, with the exterior of said cap, said bores being adapted to discharge liquid and air from said channels in the direction of said dental bur when said dental bur is mounted within said rotary chuck.

6. The dental handpiece of claim **5** wherein said two channels are concentric.

7. The dental handpiece of claim **5** wherein one of said channels is positioned below the other of said channels.

8. The dental handpiece of claim **5** wherein said cap includes a plurality of bores connecting each of said channels with the exterior of said cap, said bores being adapted to discharge fluid from said channels in the direction of said dental bur when said bur is mounted within said rotary chuck.

9. The dental handpiece of claim **5** wherein said conduits are slidably mounted within said handpiece, and are secured to conduits which are in fluid communication with said channels by flexible tubing.

10. The dental handpiece of claim **5** wherein each of said channels has a conduit in fluid communication therewith, said channel conduits extending exteriorly of said cap, said channel conduits being releasably secured to the conduits of said hollow body member.

11. The dental handpiece of claim **6** wherein said channel conduits extend radially of said cap.

12. The dental handpiece of claim **10** wherein said channel conduits extend axially of said cap.

13. The dental handpiece of claim **5** wherein said cap is secured on said turbine housing by a pressed fit.

14. The dental handpiece of claim **5** wherein said cap is threadedly secured on said turbine housing.

15. The dental handpiece of claim **5** wherein said turbine housing includes a removable end cap on the end opposite said one end.

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ROBERT PESHOCK, Primary Examiner

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,525,154 Dated August 25, 1970

Nathaniel H. Lieb

It is certified that errors appear in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

(1) Column 3, line 75, cancel "whench" and insert therefor --wrench--.

(2) Column 4, line 73, cancel "cartride" and insert therefor --cartridge--.

(3) Column 5, line 20, cancel "grove" and insert therefor --groove--.

(4) Column 6, line 25, cancel "anular" and insert therefor --annular--.

(5) Column 6, line 74, cancel "exteriorly" and insert therefor --exteriorally--.

(6) Claim 11, line 1, cancel "6" and insert therefor --10--.

SIGNED AND
SEALED
NOV 3 1970

(SEAL)
Attest:

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