June 30, 1953 J. MAURER ET AL 2,643,456

DENTAL HAND INSTRUMENT

Filed Feb. 23, 1951 3 Sheets-Sheet 1

FIG. 1.

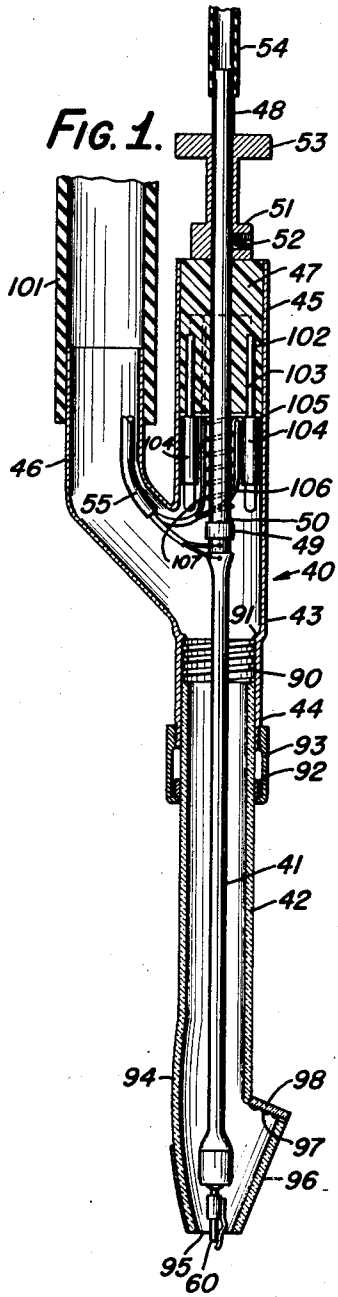


FIG. 2.

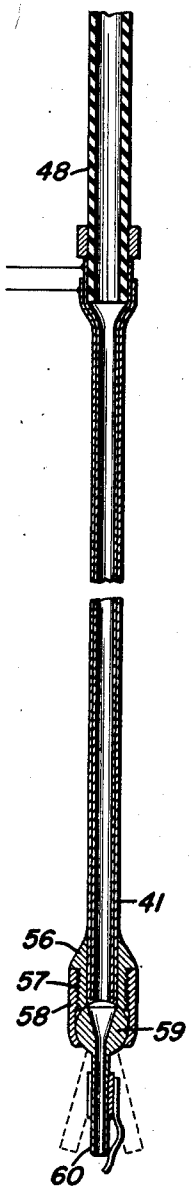


FIG. 3.

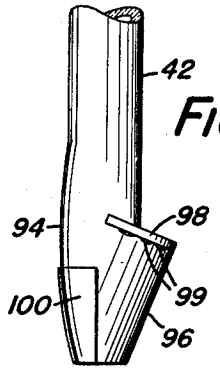
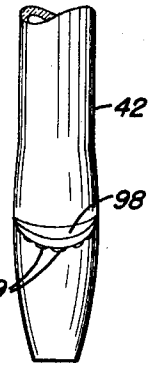


FIG. 4.



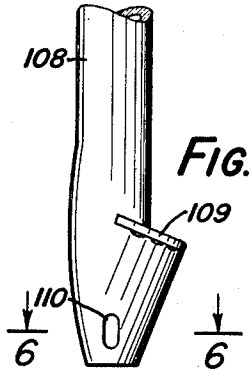
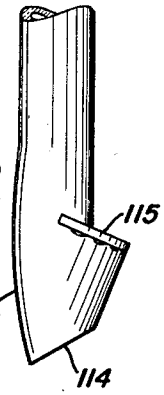


FIG. 5.

FIG. 8.



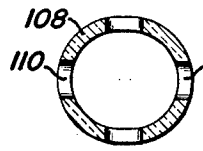


FIG. 6.

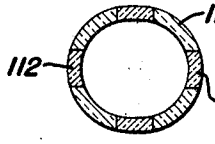


FIG. 7.

INVENTORS.
JAKOB MAURER
AND ROBERT MAURER

BY

Edward H. Rumpf

THEIR ATTORNEY

June 30, 1953 J. MAURER ET AL 2,643,456

DENTAL HAND INSTRUMENT

Filed Feb. 23, 1951 3 Sheets-Sheet 2

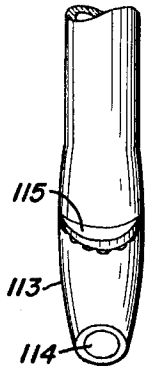


FIG. 9.

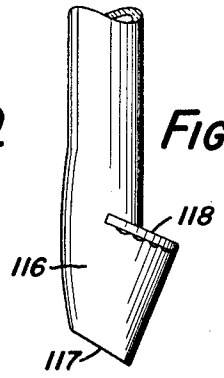


FIG. 10.

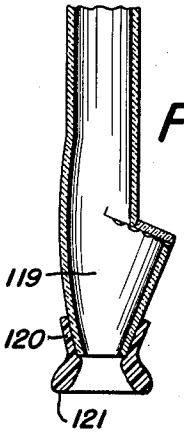


FIG. 11.

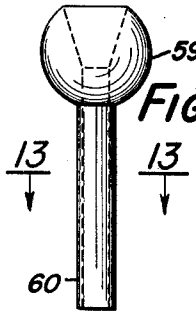


FIG. 12.



FIG 13.

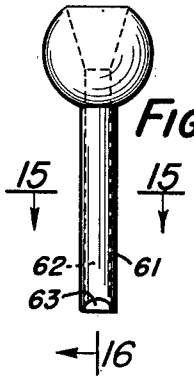


FIG. 14.

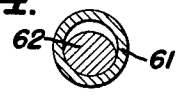


FIG. 15.

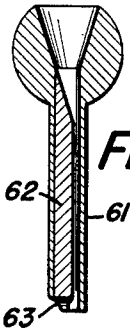


FIG. 16.

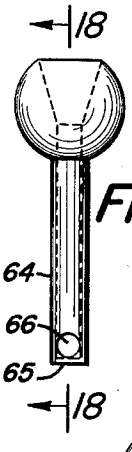


FIG. 17.

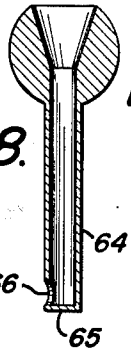


FIG. 18.

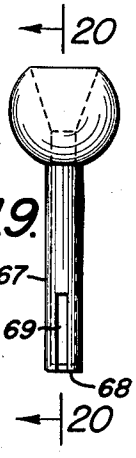


FIG. 19.

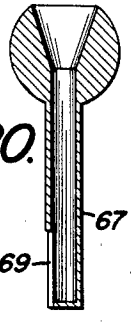


FIG. 20.

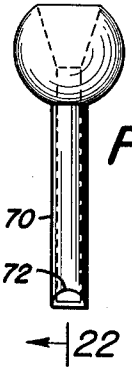


FIG. 21.

INVENTORS.
JAKOB MAURER
AND ROBERT MAURER

BY Edward W. Cumpston

THEIR ATTORNEY

June 30, 1953 J. MAURER ET AL 2,643,456

DENTAL HAND INSTRUMENT

Filed Feb. 23, 1951 3 Sheets-Sheet 3

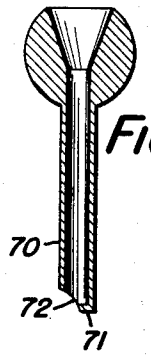


FIG. 22.

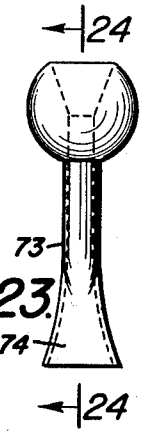


FIG. 23.

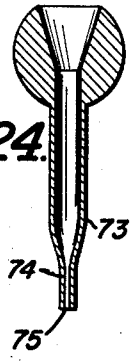


FIG. 24.

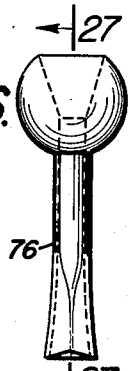


FIG. 26.

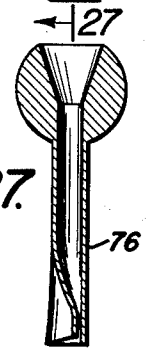


FIG. 27.

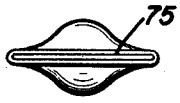


FIG. 25.

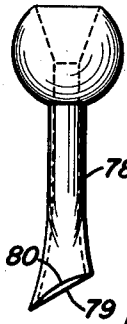


FIG. 30.



FIG. 28.



FIG. 29.

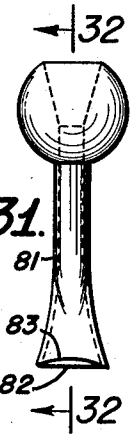


FIG. 31.

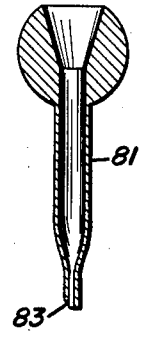


FIG. 32.

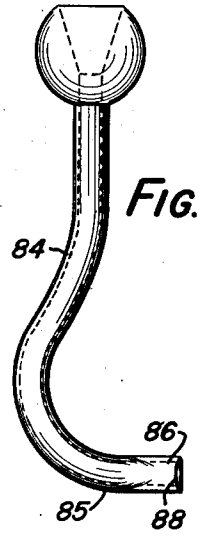


FIG. 33.



FIG. 34.

INVENTORS.
JAKOB MAURER
AND ROBERT MAURER

BY

THEIR ATTORNEY

Patented June 30, 1953

2,643,456

UNITED STATES PATENT OFFICE

2,643,456

DENTAL HAND INSTRUMENT

Jakob Maurer, Kilchberg, and Robert Maurer, Zurich, Switzerland, assignors to Ritter Company, Inc., Rochester, N. Y., a corporation of Delaware

Application February 23, 1951, Serial No. 212,222
In Switzerland February 25, 1950

20 Claims. (Cl. 32—58)

1

This invention relates to dental hand instruments or tools for operating on tooth surfaces to cut and shape the same. It has been proposed, in the patent to Jakob Maurer, No. 1,664,369, to employ a blast of fluid under pressure containing abrasive particles and operating in a manner analogous to the known sand blast, to accomplish the work previously done by burrs, drills and the like, in a more painless and rapid manner. The said patent discloses means for applying the abrasive material through one hand tool and for withdrawing the abrasive material through another tool, such as a hollow perforated ring surrounding the mouth of the patient and subjected to a sub-atmospheric pressure. In our copending application for Letters Patent of the United States, Serial No. 205,302, filed January 10, 1951, we have disclosed an improved hand tool of the above character in which the conducting means for projecting and withdrawing the abrasive mixture are unitarily and concentrically combined in a single hand tool and provided with self-illuminating and heating means to facilitate the work. One object of the present invention is to provide still further improvements in the tool for generally facilitating its use, effecting more precise shaping of tooth cavities and increasing the speed of operation and the like, as hereinafter more particularly described.

Another object of the invention is to provide a tool of the above character having practical and effective means for varying and precisely controlling the shape and direction of the blast of abrasive material, to suit different operating conditions and requirements.

Another object is the provision of such a tool having an interchangeable variety of suction nozzles to suit various operating conditions and so constructed as to facilitate visibility of the work.

A further object is to supply a tool of the character described having resiliently and adjustably mounted blast and suction nozzles for promoting the flexible application of the tool to the work.

Still a further object is to afford a tool having the above advantages in a simple and practical type of construction capable of being readily manufactured at relatively low cost.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a longitudinal sectional view of a dental hand instrument embodying the present invention;

2

Fig. 2 is an enlarged longitudinal sectional view of conducting and nozzle means thereof detached;

Fig. 3 is a side elevation, partly broken away, of suction conducting and nozzle means shown in Fig. 1;

Fig. 4 is a view of the same means, as seen from the right in Fig. 3;

Fig. 5 is a view similar to Fig. 3 but showing a modified construction;

Fig. 6 is a sectional view on the line 6—6 in Fig. 5;

Fig. 7 is a view similar to Fig. 6 but shows a modified construction;

Fig. 8 is a view similar to Fig. 3 but showing a modified construction;

Fig. 9 is a view of the same parts as seen from the right in Fig. 8;

Fig. 10 is a view similar to Fig. 8 but showing a modified construction;

Fig. 11 is a view similar to Fig. 3 but showing in section a modified construction;

Fig. 12 is an enlarged elevation of nozzle means shown in Fig. 1;

Fig. 13 is a sectional view on the line 13—13 in Fig. 12;

Fig. 14 is a view similar to Fig. 12 but showing a modified construction;

Fig. 15 is a sectional view on the line 15—15 in Fig. 14;

Fig. 16 is a sectional view on the line 16—16 in Fig. 14;

Fig. 17 is a view similar to Fig. 12 but showing a modified construction;

Fig. 18 is a sectional view on the line 18—18 in Fig. 17;

Fig. 19 is a view similar to Fig. 12 but showing a modified construction;

Fig. 20 is a sectional view on the line 20—20 in Fig. 19;

Fig. 21 is a view similar to Fig. 12 but showing a modified construction;

Fig. 22 is a sectional view on the line 22—22 in Fig. 21;

Fig. 23 is a view similar to Fig. 12 but showing a modified construction;

Fig. 24 is a sectional view on the line 24—24 in Fig. 23;

Fig. 25 is an enlarged bottom view of the nozzle shown in Fig. 23;

Fig. 26 is a view similar to Fig. 23 but showing a modified construction;

Fig. 27 is a sectional view on the line 27—27 in Fig. 26;

Fig. 28 is a bottom plan view of the nozzle shown in Fig. 26;

Fig. 29 is a view similar to Fig. 28 but showing a modified construction;

Fig. 30 is a view similar to Fig. 23 but showing a modified construction;

Fig. 31 is a similar view but showing a modified construction;

Fig. 32 is a sectional view on the line 32—32 in Fig. 31;

Fig. 33 is a view similar to Fig. 23 but showing a modified construction, and

Fig. 34 is a view similar to Fig. 33 but showing the nozzle as viewed from the right.

In the use of the invention, it has been found desirable and feasible to provide the conducting means for discharging the abrasive material with detachably interchangeable and adjustable nozzles of different kinds, for differentially shaping and discharging the abrasive stream in different directions and at different inclinations to the general longitudinal axis of the tube. For this purpose, the present improvements, in the preferred embodiments herein disclosed by way of illustration, are combined with a hand tool of the general character disclosed in our said pending application, comprising a tool having a body portion 40 (Fig. 1) suitably formed of metal, plastic material, or the like, carrying inner and outer tubular members 41 and 42 for projecting and withdrawing the abrasive material, respectively. These tubular members are mounted in concentric relation, as shown, so as to provide separate inner and outer passageways in the respective tubes which terminate in juxtaposed working nozzles, as hereafter described. Means are provided at the opposite end of the inner tubular member 41 for connection with a source of fluid under pressure (not shown) containing known and suitable abrasive materials or particles for projection against a tooth surface, to shape it by abrasion, as described in said patent, while the opposite end of the tubular member 42 is branched laterally and provided with means for connection with a source of sub-atmospheric pressure (not shown) for withdrawing by suction the pressure fluid and abraded material, as hereafter further described.

The tool body 40 preferably comprises a tubular portion 43 formed with a tubular end 44 for the detachable reception of the outer tubular conductor 42, the opposite end portion 43 being branched to form tubular terminals 45 and 46, the one being provided with means for connection with the abrasive material supply and the other with means for connection with the low pressure source.

The inner tubular member 41 for supplying the abrasive material, is carried in the branch 45 of the tool and extends through the outer tubular suction member 42, as shown. The tubular portion 45 of the body of the tool has tightly fitted or otherwise fixed therein a cylindrical plug 47, of rubber or similar insulating material, having a center bore slidably receiving a tube 48. Tube 48 is fixed to and supports tube 41 (Fig. 2) and carries a collar 49. A compression spring 50 is coiled about tube 48 between the collar and plug 47 and tends to move both tubes longitudinally in a resilient and yieldable manner, while an elongated collar 51, adjustably fixed to the outer end of tube 48 by a set screw 52, adjustably limits the action of the spring in sliding tube 48 and advancing tube 41 and its discharge nozzle. Collar 51 has a finger piece or knob 53

by means of which the collar may be manipulated during adjustment and by means of which the tubes 48 and 41 may be adjustably rotated in situ, to adjustably position the discharge nozzle. Tube 48 has fitted to its outer end a flexible tube 54 of rubber or the like, forming part of the means for supplying the abrasive pressure stream to the instrument, which may be of any known and suitable construction, such, for example, as disclosed in said patent. The conductor tube 41 is preferably provided with heating means, as described in our copending application to which reference may be had for further description thereof, the electrical connections for which, indicated generally at 55, are preferably carred in a self-contained manner through branch 46 of the tool to the power source.

The other or nozzle end of the inner conductor 41 is preferably provided with an enlargement or head 56 (Fig. 2) having a threaded end 57, as shown. Screwed on this head is a sleeve 58 and the ends of the head and sleeve are shaped to form a partly spherical socket for a substantially ball-shaped element 59, as shown. This element is extended at one side to provide a tubular discharge nozzle 60, the bore of which extends through the element 59 and is enlarged to maintain communication between the nozzle and conductor 41. Nozzle 60 is thus readily detachable from its conductor by unscrewing sleeve 58 and is mounted on the conductor for adjustment by rotation about its own axis as well as adjustment universally to different inclinations to the axis of the conductor. The nozzle is universally adjustable to project the abrasive material in various lateral directions and at various inclinations, to facilitate the formation of various surfaces in a tooth cavity. The nozzle is thus readily detachable and replaceable to substitute different nozzles for different purposes, as hereafter more fully described, and the nozzle is frictionally retained in adjusted position upon the conductor by screwing up the sleeve 58.

Nozzle 60 may have a variety of forms, as illustrated in Figs. 12 to 34, inclusive. Its discharge end may have the form of a plain straight tube, as shown in Figs. 2, 12 and 13. This form may be varied to control the shape and direction of the discharged abrasive blast, as by reducing the size and shape of the bore of a similar nozzle 61, by the insertion of a filler strip 62 of generally elliptical cross-section, as shown in Figs. 14, 15 and 16. Strip 62 is frictionally or otherwise secured in the nozzle and the end of the strip and one side wall of the nozzle may be notched or cut away, as at 63. The nozzle bore is thus shaped to produce an abrasive stream of greater width than thickness and generally of curved or crescent shape and to discharge the same in a direction extending more or less laterally to the nozzle and the concave width of the stream, as may be desired for operating in a corner or other cavity shape.

Another nozzle form is shown in Figs. 17 and 18 in which the end of nozzle 64 is closed by an end wall 65 and the adjacent side wall is apertured by a circular discharge opening 66, to direct a circular abrasive stream laterally, substantially at right angles to the axis of the nozzle. A somewhat similar nozzle form is shown in Figs. 19 and 20 in which the nozzle 67 has a closed lower end 68 as before but has a lateral opening in the shape of a slot 69 extending longitudinally on the side wall to project a correspondingly shaped lateral blast of abrasive ma-

terial against a more extensive side wall of a cavity. Figs. 21 and 22 show a further variation of this general nozzle form in which the nozzle 70 has its lower end closed only partially, as by a wall 71, and the remainder cut away along with a portion of the adjacent side wall, to form a substantially semi-circular opening 72 for projecting an abrasive stream of corresponding shape in a downward and lateral direction, as sometimes found desirable.

Figs. 24 to 34 inclusive illustrate another variety of nozzle having a discharge opening of generally flattened or slot-like shape. In Figs. 23, 24 and 25, the nozzle 73 has its discharge end flattened and extended laterally, as at 74 to produce a slot-like discharge opening 75 adapted to discharge a flattened abrasive stream of greater width than thickness and in a plane parallel with the longitudinal axis of the nozzle, for forming portions of a tooth cavity for which this shape is suited.

Figs. 26 to 29, inclusive, show similar forms of nozzles with flattened discharge openings except that the nozzle 76 of Figs. 26, 27 and 28 has its flattened discharge end formed to an angular, substantially V-shape, as shown, while Fig. 29 shows another form in which the discharge opening 77 is curved from end to end of the slot, as shown, to produce flattened abrasive streams of correspondingly angular or curved shape from side to side thereof.

Fig. 30 illustrates a nozzle 78 generally similar to that shown in Fig. 23 except that the nozzle end is inclined to its longitudinal axis, as at 79, and one side wall is slightly cut away or shortened as at 80, to produce a flattened abrasive stream extending in a downward and lateral direction. Figs. 31 and 32 show a nozzle 81 of a form generally similar to that of Fig. 23, with the discharge slot 82 extending normally to the axis of the nozzle, except that one side wall is slightly cut away, as at 83 to produce a flattened abrasive stream having its sides at the same elevation but extending in a generally downward and lateral direction.

Figs. 33 and 34 show a further modification in which the nozzle 84 has its discharge end curved to extend in a lateral direction, as at 85, with its extremity flattened, as at 86, to produce slot-like discharge opening 87, one side of which may be slightly cut away, as at 88, to produce a flattened stream lying generally in a plane parallel to the longitudinal axis of the nozzle.

The outer tubular conductor 42 is preferably formed of moldable transparent plastic material such, for example, as Lucite, although it may be made, in part or in whole, of a harder transparent material such as a hard glass, quartz or the like. This conductor is of substantially larger diameter than the inner conductor 41, so as to leave therebetween a passageway of substantial volume for withdrawing air and waste products by suction. Its inner end is slidably fitted in the tubular end 44 of the tool body 40 and a coiled compression spring 90 is interposed between the inner end of tube 42 and a shoulder 91 of the body, to resiliently advance the tube and its terminal nozzle. A collar 92 fixed about the tube is arranged to engage an inwardly turned flange at the end of a sleeve 93 which is threadedly secured to the end of the portion 44 of the tube body, so as to provide a stop for limiting the outward movement of the conductor tube 42 by the spring.

The outer or nozzle end of tubular conductor 42 is slightly enlarged as at 94 and has an open nozzle end 95, as shown. This nozzle end is preferably flared outwardly on the one side, as at 96, to produce an open shoulder portion 97 covered by a plate 98 of hard transparent material, such as quartz, capable of resisting cutting by the abrasive material and through which the operator may observe the inner discharge nozzle and work. The edges of the opening in shoulder 97, under the window plate 98, are preferably notched, as at 99 (Figs. 3 and 4), to permit the inflow of air and deflect and reduce the impact of abrasive particles against the under side of the window plate. The side wall of the nozzle is preferably provided, as at its rear portion, with a suitable reflecting or mirror surface 100 for reflecting light toward the operating area.

Suction conductor 42 communicates through end 44 of the tool body with branch 46 of the body, the outer end of which is adapted for the attachment of a flexible conductor 101, of rubber or the like, for connection with a suitable source of sub-atmospheric pressure for producing a suction in member 42 and its nozzle 95, for withdrawing and discharging the air, abrasive and waste materials from the operating area. It will thus be seen that the concentric conductors 41 and 42 and associated parts thus provide separate passageways for supplying the abrasive material in a blast against the tooth surface and for withdrawing the air and abraded materials, as more fully described in our said copending application.

The tool is also provided with self-contained means for illuminating the nozzles and working area, for which purpose plug 47 of the tool body is formed with a plurality of sockets 102 (Fig. 1) for receiving and holding the terminal posts 103 of a plurality of electric lamps 104, the terminal casings of which are in contact with an electrical conducting plate 105 on the inner end of plug 47. This plate is connected with one wire 106 of an electrical circuit having its other wire 107 carried through and insulated from plate 105 and connected through plug 47 with the terminal posts 103 of the lamps. These circuit wires are also preferably carried in self-contained fashion through the branch 46 of the body, as shown.

The lamps 104 are preferably provided in a sufficient number to outline substantially a circle or ring in tubular portion 43 of the body, substantially opposite the inner end of the outer or suction conductor 42, so that the light from the lamps is reflected from the inner surfaces of the tubular portion 43 and enters the passageway within conductor 42, as well as within the transparent walls of the conductor, being thus transmitted through the conductor and its walls to and beyond tube nozzle 95. The tool is thus equipped with self-contained lamp means and for means for projecting the light on the working surface, to aid the vision and to facilitate the work of the operator.

The outer or suction conductor 42 is preferably supplied in a variety of forms for interchangeable association with the tool socket 44, to suit the particular conditions and requirements of the work to be performed. Thus, a conductor 108 may be provided (Figs. 5 and 6), which, in addition to an observation window plate 109, as previously described, is formed with a plurality of lateral window openings 110 in its side walls adjacent the nozzle opening, through which the operator may inspect the tooth cavity and the position

and operation of the inner blast nozzle 60. The suction within the conductor tends to draw air in these inspection openings, thus preventing the escape of the abrasive materials and the openings may be positioned so that the incoming air tends to carry the abrasive material away from the under side of the inspection plate 109, so as to reduce the abrasive action thereon. A similar suction conductor and nozzle 111 (Fig. 7) may be provided in which such lateral window openings as 110 may be closed by inserts 112 of hard glass, quartz or the like, adapted to resist cutting by the abrasive materials.

Similar suction conductors and nozzles may also be provided in which the nozzle opening, instead of lying in a plane normal to the nozzle axis, may be inclined thereto in different directions. Thus, a similar nozzle 113 may be provided (Figs. 8 and 9) in which the nozzle opening 114 is inclined inwardly toward the side of the nozzle having the observation window plate 115, as shown. A similar nozzle 116 may be provided (Fig. 10) in which the nozzle opening 117 is inclined inwardly toward the side of the nozzle opposite the observation window 118. These various suction nozzle forms have been described in an exemplary way and it is contemplated that still other forms may be provided for interchangeable association with the tool as conditions may be found to require.

Such suction nozzles may be provided with flexible tips for sealing the nozzle to the surfaces around the cavity of the tooth under treatment, so as to prevent the escape of the abrasive and abraded materials. Such a flexible tip may be made of rubber, soft plastic or similar materials and may have the form, for example, shown in Fig. 11 in which a nozzle 119 is equipped with a sleeve-like rubber tip 120 one end of which is frictionally or otherwise secured over the nozzle extremity, while its other end 121 is adapted to be pressed against the surfaces of a tooth around the cavity under treatment to seal the joint between the nozzle and the tooth as described above. It is also contemplated that the tooth under treatment may be protected by the application thereto of a template of rubber or other elastic material formed with a suitable work opening. The inner surface of the template may consist of material of an adhesive nature so that the template may be applied to cover and protect the tooth except at the work opening through which the dentist may operate the tool. Such a template affords a yielding surface around the work opening against which the suction nozzle may be pressed to effect a tight seal for the purpose described. Similar templates may be fitted over the adjacent teeth to protect them against abrasion.

It is apparent from the above description that the invention provides the unitary illuminated hand piece or tool of our said application with a series of fully adjustable and readily interchangeable pressure and suction nozzles of various forms and shapes for facilitating the work of the dental operator in meeting the various conditions and requirements encountered in the preparation of a tooth cavity. Such interchangeable suction nozzles, while maintaining the described illumination, provide increased visibility of the nozzle for projecting the abrasive material and of the work area. The conducting tubes with their nozzles are mounted in the tool body in a way which provides for adjustment of their relative lengths and either or both nozzles are yieldably supported to enable the operator to apply them effectively for cutting the tooth and for sealing the suction nozzle to the cutting area. Such improvements facilitate the precise formation of the desired cavity shapes, reduce the escape of the abrasive and abraded material into the mouth and increase the speed and comfort with which such operations may be performed.

Parts of the construction herein disclosed are disclosed and claimed in our copending patent application, Serial No. 205,302.

It will thus be seen that the invention accomplishes its objects and while it has been herein disclosed by reference to the details of preferred embodiments, it is to be understood that such disclosure is intended in an illustrative, rather than a limiting sense, as it is contemplated that various modifications in the construction and arrangement of the parts will readily occur to those skilled in the art, within the spirit of the invention and the scope of the appended claims.

We claim:

1. A unitary dental hand tool comprising an elongated body of relatively small size in cross section adapted for insertion in the mouth and provided with conductors terminating in juxtaposed nozzles, means connected with one of said conductors and adapted for connection with a source of fluid under pressure containing abrasive material for projecting the same through said conductor and the nozzle thereof against a tooth surface, said nozzle for abrasive material having a relatively small opening for confining a jet of said material to particular portions of said tooth area, means connected with the other of said conductors and adapted for connection with a source of sub-atmospheric pressure for withdrawing said fluid and material through said other conductor and the nozzle thereof by suction after abrading contact with said tooth surface and means for detachably connecting said pressure conductor with the nozzle thereof for detaching and replacing said nozzle.

2. A dental hand tool as specified in claim 1 in which the nozzle of said pressure conductor is provided with an adjustable connection with said conductor by which the longitudinal axis of said nozzle may be adjustably inclined to the axis of said conductor for projecting the abrasive material at a desired inclination against a tooth surface to be shaped.

3. A dental hand tool as specified in claim 1 in which the nozzle of said pressure conductor is connected to said conductor for rotary adjustment about the nozzle axis and for universally adjusting the inclination of said nozzle axis to the axis of said conductor to project said material in various lateral directions and at various inclinations.

4. A dental hand tool as specified in claim 1 in which the nozzle of said pressure conductor is connected to said conductor by a ball and socket joint for universally adjusting the direction in which said material is projected.

5. A dental hand tool as specified in claim 1 in which the nozzle of said pressure conductor has a discharge outlet opening laterally through a side wall of said nozzle for projecting said abrasive material laterally against an upstanding side wall of a tooth cavity.

6. A dental hand tool as specified in claim 1 in which the nozzle of said pressure conductor has its longitudinal axis curved laterally with a laterally opening outlet of slot-like shape elongated in a direction lying in the plane of said nozzle, for projecting said abrasive material laterally

against an upstanding side wall of a tooth cavity.

7. A dental hand tool as specified in claim 1 in which the nozzle of said pressure conductor has a discharge opening of slot-like shape for projecting said abrasive material in a flattened stream of greater width than thickness.

8. A dental hand tool as specified in claim 1 in which the nozzle of said pressure conductor has a discharge opening in the shape of a curved slot for projecting said abrasive material in a thin wide stream of curved shape from side to side thereof to effect corresponding shaping of a tooth surface.

9. A dental hand tool as specified in claim 1 in which the nozzle of said pressure conductor has a discharge opening of slot-like shape and has one lateral side of the slot cut back shorter than the other side for projecting said abrasive material in a flattened stream of greater width than thickness and in a direction extending laterally from the shortened lateral side of the slot.

10. A dental hand tool as specified in claim 1 in which the pressure conductor is mounted on said body for longitudinal sliding movement to advance and retract the nozzle thereof and is provided with resiliently yieldable means for slidably moving said conductor and advancing said nozzle.

11. A dental hand tool as specified in claim 1 in which the suction conductor is mounted on said body for longitudinal sliding movement to advance and retract the nozzle thereof and is provided with resiliently yieldable means for slidably moving said conductor and advancing said nozzle.

12. A dental hand tool as specified in claim 1 in which the pressure and suction conductors are both mounted on said body for longitudinal sliding movement to advance and retract the nozzles thereof and are provided with resiliently yieldable means for slidably moving said conductors and advancing said nozzles.

13. A dental hand tool as specified in claim 1 in which means are provided for detachably mounting said suction conductor on said body for detaching and replacing said conductor and its nozzle.

14. A dental hand tool as specified in claim 1 in which the nozzle of the suction conductor has its extremity formed of yieldable material for sealing the space between the nozzle and the tooth around the work area.

15. A dental hand tool as specified in claim 1 in which the conductors are concentrically arranged and the other suction conductor is formed with an observation opening for observing the operation of the inner pressure nozzle and the work area.

16. A dental hand tool as specified in claim 14 in which the observation opening is covered by a plate of hard, abrasion resisting, transparent material.

17. A unitary dental hand tool comprising a body provided with conductors terminating in juxtaposed nozzles, means connected with one of said conductors and adapted for connection with a source of fluid under pressure containing abrasive material for projecting the same through said conductor and the nozzle thereof against a tooth surface, means connected with the other of said conductors and adapted for connection with a source of sub-atmospheric pressure for withdrawing said fluid and material through said other conductor and the nozzle thereof by suction after abrading contact with said tooth surface and means for mounting said conductors on said body for longitudinal sliding movement provided with resilient means for yieldably advancing said conductors and the nozzles thereof.

18. A unitary dental hand tool comprising a body provided with inner and outer tubular conductors terminating in juxtaposed nozzles in concentrically spaced relation, means connected with the inner conductor and adapted for connection with a source of fluid under pressure containing abrasive material for projecting the same through said conductor and the nozzle thereof against a tooth surface, means connected with the other of said conductors and adapted for connection with a source of sub-atmospheric pressure for withdrawing said fluid and material through said other conductor and the nozzle thereof by suction after abrading contact with said tooth surface, and means for detachably mounting said nozzles for detaching and replacing the same.

19. A unitary dental hand tool comprising a body provided with inner and outer tubular conductors terminating in juxtaposed nozzles in concentrically spaced relation with each other, means connected with the inner conductor and adapted for connection with a source of fluid under pressure containing abrasive material for projecting the same through said conductor and the nozzle thereof against a tooth surface, and means connected with the other of said conductors and adapted for connection with a source of sub-atmospheric pressure for withdrawing said fluid and material from said other conductor and the nozzle thereof by suction after abrading contact with said tooth surface, said outer conductor being formed with an observation window for observing the pressure nozzle of the inner conductor and the work area.

20. A unitary dental hand tool comprising a body provided with inner and outer tubular conductors terminating in juxtaposed nozzles in concentrically spaced relation with each other, means connected with the inner conductor and adapted for connection with a source of fluid under pressure containing abrasive material for projecting the same through said conductor and the nozzle thereof against a tooth surface, and means connected with the other of said conductors and adapted for connection with a source of sub-atmospheric pressure for withdrawing said fluid and material through said other conductor and the nozzle thereof by suction after abrading contact with said tooth surface, the nozzle of said other suction conductor having its extremity formed of yieldable material for sealing the space between the nozzle and the tooth around the work area.

JAKOB MAURER.
ROBERT MAURER.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,730,348	Anstiss	Oct. 8, 1929
2,455,514	Mead	Dec. 7, 1948
2,483,176	Bishop et al.	Sept. 27, 1949