May 5, 1959 C. A. ELLIS 2,884,695

DENTAL HANDPIECE

Filed May 31, 1957

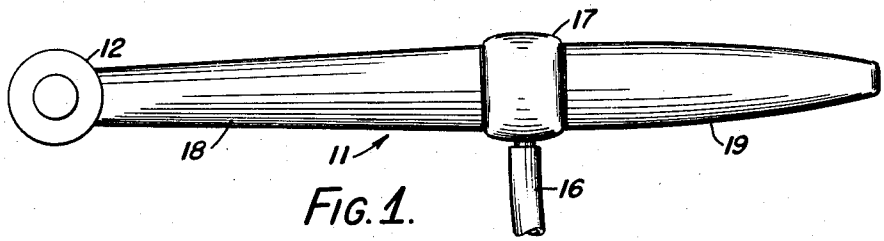


FIG. 1.

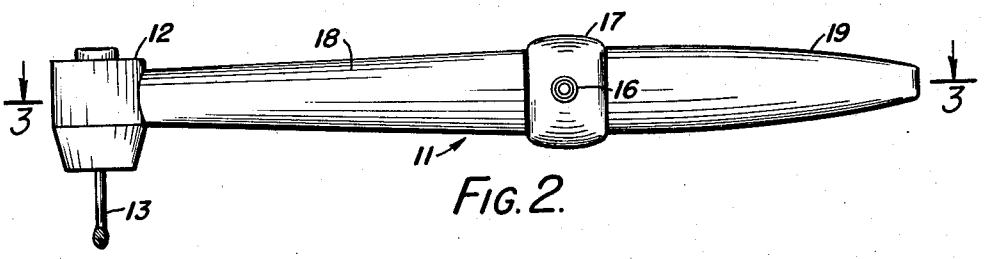


FIG. 2.

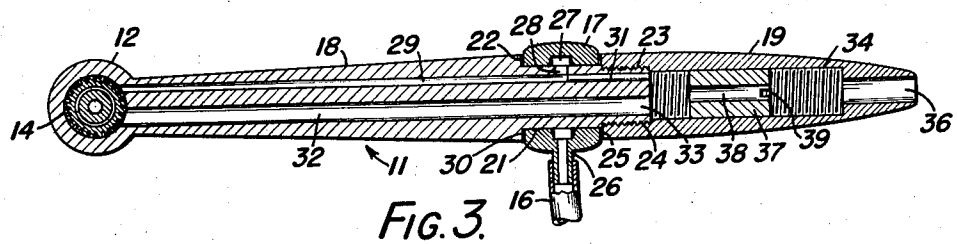


FIG. 3.

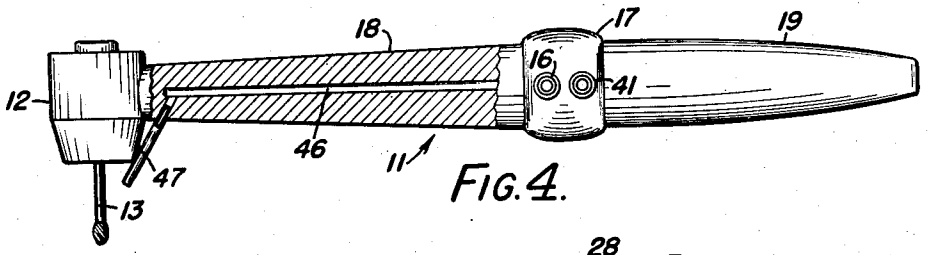


FIG. 4.

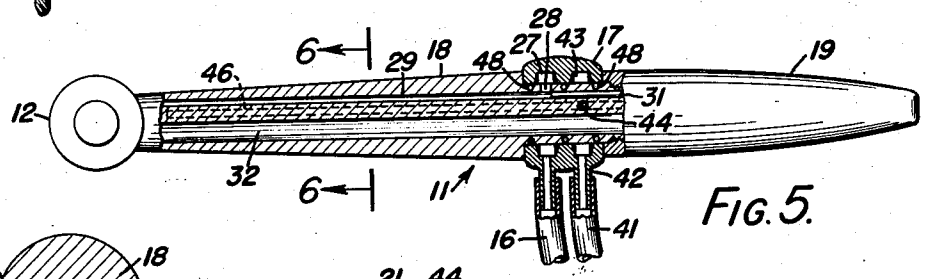


FIG. 5.

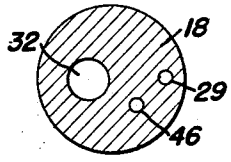


FIG. 6.

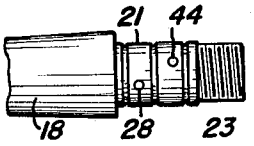


FIG. 7.

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DENTAL HANDPIECE

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12 Claims. (Cl. 32—26)

This invention relates to an improvement in a dental instrument and more particularly to an improved construction for a dental handpiece of the fluid turbine type which facilitates the connection of the handpiece to a source of pressurized fluid.

In the practice of dentistry, a highly versatile dental instrument commonly known as a handpiece is universally used by dentists today. This handpiece is held in the dentist's hand so that it may be used to perform operations such as drilling, polishing, grinding and the like, on a patient's teeth. A removable dental tool, such as a burr or drill, may be inserted in the head of the handpiece and rotated by a suitable driving mechanism contained within the handpiece. Limited speed adjusting means are generally associated with the driving mechanism so that the tool speed may be selected in accordance with the specific dental operation. In one type of handpiece designed to rotate the dental tool at a relatively high speed, a fluid turbine is rotatably mounted within the handpiece and is driven from a source of pressurized fluid such as compressed air.

In order that the dentist may use the fluid turbine type of handpiece conveniently, pressure line of suitable length is generally employed which may be connected at one end to a suitable source of pressurized air and at its other end to the handpiece. As is well understood, the dentist is often required to move the handpiece frequently during its use so as to locate it in the most suitable operating position.

It will be understood that a fixed connection at the point where the pressure line is connected to the handpiece will seriously limit the freedom of movement of the dentist's hands. A dentist is required to devote substantially all of his attention to the operation of the handpiece and entanglement of the pressure line with the handpiece or the dentist's arm would result in interference with his work, unless he compromised by frequently interrupting his work, to inspect and adjust the position of the cord. Furthermore, in many handpiece positions, a fixed connection would tend to resist movement of the handpiece by a tendency to impose a drag on the handpiece. This drag naturally increases the fatigue of the dentist and tends to inhibit the proper operation of the handpiece.

Accordingly, a primary object of this invention is to provide a new and improved construction for a dental handpiece of the fluid turbine type for connecting the handpiece to a source of pressurized fluid.

Another object of this invention is to provide a new and improved dental handpiece of the air turbine type which is easily and quickly manipulated by the dentist without interference from the air pressure line and which permits the dentist to devote his entire attention to the operation of the handpiece.

It is a further object of this invention to provide a new and novel connector for coupling a fluid pressure line to a dental handpiece of the fluid turbine type.

It is still another object of this invention to provide a new and improved construction for a dental handpiece of the air turbine type which is inexpensive to manufacture, simple in construction, and which is capable of prolonged operation without danger of breakdown.

This invention further contemplates the provision of a new and novel connector for coupling an air pressure line to a dental handpiece of the air turbine type which is arranged to permit the dental handpiece to rotate axially relative to the connector without disturbing the position of the pressure line and which may be easily constructed so as to couple to the handpiece not only the air pressure line for driving the turbine but also a line for conducting pressurized cooling water to the dental tool.

Other objects and advantages of this invention will be particularly set forth in the claims and will be apparent from the following description, when taken in connection with the accompanying drawings, in which:

Fig. 1 is a plan view of a dental handpiece constructed in accordance with the invention;

Fig. 2 is a side view of the dental handpiece of Fig. 1;

Fig. 3 is a sectional view taken substantially along the line 3—3 of Fig. 2 in the direction of the arrows;

Fig. 4 is a side view, partially in section, of a modification of the dental handpiece of Fig. 1;

Fig. 5 is a plan view, partially in section, of the modification of Fig. 4;

Fig. 6 is a sectional view taken substantially along line 6—6 of Fig. 5 in the direction of the arrows; and

Fig. 7 is a partial view of the handpiece of Figs. 4–5 with the fluid connector removed.

Referring now to Figs. 1–3, there is shown a dental handpiece constructed in accordance with the invention and generally known as the fluid turbine type of handpiece. The dental handpiece comprises an elongated casing, designated generally by the numeral **11**, and a head **12** suitably arranged in a conventional manner to receive a dental tool such as a burr **13**.

The dental tool or burr **13** is arranged to be rotated by means of a turbine drive mechanism designated generally by the numeral **14** and rotatably mounted in the dental handpiece head **12** in any suitable manner. The turbine **14** is driven by a source of pressurized fluid and in the illustrated embodiment compressed air is the fluid preferably used. The tool **13** is drivably connected to the turbine drive mechanism **14** by being mounted on the turbine axis, or if desired, the tool **13** may be driven in any suitable manner such as by gearing or the like. In the embodiment shown, the tool is removably inserted axially of the turbine so as to be driven directly thereby. If desired, a tapered fit may be used to position the tool **13** in the head **12**. It should be understood that the structure by which the dental tool **13** is removably connected to the turbine **14** forms no part of this invention and therefore, is not described in detail.

Means have been provided to conduct the pressurized fluid or compressed air from its source (not shown) to the handpiece. More specifically, a pressure line or hose **16** is suitably connected at one end to a source of compressed air such as a compressor and at its other end to the dental handpiece by means of a sleeve member **17** which is positioned on the casing **11** as shown in Figs. 1–3. It should be understood that although the casing **11** may be constructed as a unitary construction, it is preferably divided into a forward section **18** and a rear section **19**, which are arranged to be threadedly connected in a fixed relationship (Fig. 3). It should be further understood that the air compressor employed to operate the turbine drive mechanism **14** may be of any suitable type which is commonly found in dentists' offices or may be installed therein so as to appropriately supply compressed air to the dental handpiece as well

as to other air pressure operated devices generally found in such offices.

In order that the handpiece be conveniently manipulated with dexterity by the dentist during the drilling operation, the casing section 18 is arranged so as to be grasped within the hand of the dentist with the head 12 extending in a forward direction. The connector 17 is therefore located sufficiently to the rear of the casing 11 so that the dentist's hand may be accommodated between the head 12 and the connector. As shown in Fig. 3, the casing section 18 is provided with a longitudinally extending portion 21 of reduced diameter forming a shoulder 22 and which is threaded at 23 adjacent its end opposite the shoulder 22. The casing section 19 is provided with an internally threaded recess 24 which may be threadedly engaged with the threaded portion 23 to couple the casing sections 18, 19 in the assembled relationship of Figs. 1–3.

The connector 17 is formed as an annular member or sleeve having an inner diameter for mounting it in freely rotating relationship on the casing portion 21 between the shoulder 22 and the end face 25 of the rear section 19. The outer periphery of the cylindrical portion 21 therefore forms a bearing surface for the connector 17 and the connector may rotate freely with only negligible friction while it is restrained from axial movement by means of the shoulder 22 and the end face or shoulder 25 of the casing rear section 19 when the casing sections 18, 19 have been assembled in relationship of Fig. 3. If desired, thin washers or spacers 30, as shown, may be located at each end of the connector 17 so as to reduce the rubbing friction between the connector and the shoulders 22, 25.

In order to connect the pressure line 16 to the connector 17, a fitting 26, preferably integrally formed with the connector, is inserted within one end of the line 16 and suitably secured thereto by any appropriate means. It should be understood that the other end of line 16 (not shown) is connected in the conventional manner to a source of pressurized air. The fitting 26 communicates with an inwardly opening, continuous, annular groove 27 formed within the inner wall of the connector. In any position of the connector 17, this annular groove 27 overlies a radial duct or port 28 located within the casing portion 21 which communicates with a longitudinally extending passageway 29 in the casing section 18. It will be seen that this passageway 29 is sealed at its end opposite the head 12 by means such as an insert or plug 31. The forward end of passageway 29 communicates with the turbine drive mechanism 14 so as to direct the compressed air onto the impeller blades of the turbine. It will be noted that this high pressure passageway 29 is relatively narrow in cross section.

Means have also been provided to permit the flow of air discharged from the turbine drive mechanism 14 to the exterior of the handpiece. More specifically, a second longitudinally extending passageway 32, preferably of somewhat larger diameter than the inlet passageway 29 to accommodate the expanded air from the turbine, is provided in the casing section 18 and is preferably located generally parallel to the inlet passageway 29. As is well known, air discharged from the turbine will flow into the adjacent end of passageway 32 and will subsequently flow out of the passageway rear end 33. This air then moves into a threaded bore 34 in the casing section 19 and is discharged to atmosphere through an outlet passage 36 communicating with the bore 34, after passing through a central bore 38 in a counterweight or sleeve 37.

In the operation of the handpiece illustrated in Figs. 1–3, the appropriate dental tool 13 to be used is inserted as shown in Fig. 2 and the pressurized air supplied through pressure hose 16 is fed into the annular groove 27 of the connector 17 through the tubular fitting 26. As previously explained, the groove 27 overlies the radial port 28 in any position of rotation of the connector 17. Therefore, compressed air traveling in the groove 27 will always move through the port 28 from which it is fed through the longitudinal passageway 29 directly into the turbine 14. The compressed air therefore drives the turbine 14 in the well known manner so as to rotate the dental tool 13 whereupon the air is subsequently discharged from the turbine through the longitudinal passageway 32, casing passage 34, sleeve passage 38, and casing passage 36 to the atmosphere.

It can readily be seen that if the connector 17 or a similar connector were held in a fixed position relative to the casing 11 during the frequent manipulations and handpiece position changes made by the dentist as he operates the handpiece, the pressure line 16 would be a constant source of interference as it would require frequent checking by the dentist to avoid entanglement. Furthermore, it would tend to resist any movement of the handpiece around its axis and thus seriously hamper the effective application of the dental tool. However, with the construction illustrated, the dental handpiece casing 11 may be rotated easily relative to the connector 17. The connector 17 will therefore remain in such a position that the junction between the line 16 and connector 17 is below the handpiece where it interferes the least with the work of the dentist. This not only reduces the likelihood of entanglement with the pressure line 16 but adds considerably to the ease with which the dentist may operate the handpiece.

It will be noted in Fig. 3 that the bore 34 of the casing rear section 19 is internally threaded so as to receive the externally threaded sleeve or counterweight 37. The counterweight 37 is provided with a slotted end 39 as well as the previously described central bore 38. This counterweight 37 may be moved axially to an adjusted position within the casing section 19 for balancing the handpiece. A suitable tool, such as a screw driver may be inserted through the passageway 36 into engagement with slot 39 to adjust the axial position of the counterweight. The bore 38 permits the discharge air entering the casing bore 34 to flow therethrough and move to the outside of the handpiece.

Referring now to Figs. 4–6 there is shown a modfication of the invention wherein a dental handpiece similar to the type illustrated in Figs. 1–3 is provided with means to deliver a stream of cooling fluid such as water onto the dental tool 13. Similar numerals have been used to designate similar parts in the modification of Figs. 4–6.

More specifically, it is often desirable to cool the dental tool 13 during its operation by means such as a spray of cooling water and through the novel construction of the invention a source of cooling water under pressure may be supplied simultaneously with the pressurized air employed to drive the turbine 14. A water hose 41 suitably connected at one end to a source of cooling water (not shown) is connected at its other end to a second tubular fitting 42 on the connector 17. The fitting 42 communicates with a second annular groove 43 arranged in coaxially spaced parallel relationship with the annular groove 27. It will be noted in Fig. 4 that the two fittings 26, 42 and grooves 27, 43 are symmetrically spaced for convenience of design on the connector.

The annular groove 43 communicates in any position of rotation of the connector 17 with a second radial port 44 (Fig. 7) which is radially and longitudinally spaced on the casing portion 21 relative to the air inlet port 28. The radial port 44 communicates with a longitudinally extending passageway 46 shown in Figs. 5, 6 which is connected at its forward end to a diagonally arranged water discharge nozzle 47, suitably mounted on the casing 18 as shown in Fig. 4. The rearward end of passageway 46 being obstructed by a sealing plug (not shown). As is well known, the nozzle 47 is arranged to deliver a stream of cooling water onto the dental tool 13.

With the construction shown in Figs. 4–6, advantages may be obtained similar to the construction of Figs. 1–3 in that the dentist may more easily and conveniently manipulate the dental handpiece and the interference by the water hose **41** and the compressed air hose **16** is greatly minimized. As previously described, the connector **17** is so mounted that the handpiece may rotate freely relative thereto while supplying both compressed air and cooling water through the hoses **16, 41** in any position of rotation. In order to reduce leakage of air and water between the bearing surface on casing portion **21** and the connector **17**, sealing members such as O-rings **48** may be employed as shown in Fig. 5. Washers or spacers **49** may also be used between the connector **17** and the adjacent shoulders or casing sections **18, 19** as in the embodiment of Figs. 1–3.

While there has been shown and described the preferred forms of mechanisms of the invention, it will be apparent that various changes and modifications may be made therein, particularly in the form and relation of parts, without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. A dental handpiece comprising, in combination, a casing, a fluid pressure operated turbine rotatably mounted in said casing for driving a dental tool, an inlet in said casing, means in said casing for conducting pressurized fluid from said inlet to said turbine, means for exhausting said fluid from said turbine, a sleeve member rotatably and coaxially mounted on said casing, a passageway in said sleeve, means carried by said sleeve for connecting said passageway to an associated source of fluid pressure and said passageway being arranged to communicate with said inlet in any rotative position of said sleeve member on said casing.

2. A dental handpiece in accordance with claim 1 including means on said casing for restraining said sleeve member against axial movement.

3. A dental handpiece comprising, in combination, an elongated casing, a fluid pressure operated turbine rotatably mounted in said casing for driving a dental tool, a longitudinally extending portion of reduced diameter in said casing defining shoulder means, means for exhausting said fluid from said turbine, an inlet in the outer periphery of said casing portion, means in said casing communicating said inlet with said turbine, a sleeve member rotatably mounted on said casing portion in coaxial relationship therewith, said sleeve member being restrained against axial movement by said shoulder means, an annular groove in said sleeve member arranged to overlie said inlet in any position of rotation of said sleeve member and means carried by said sleeve member for connecting said groove to an associated source of fluid pressure.

4. The handpiece of claim 3 wherein said means for connecting said sleeve member groove to said source of fluid pressure includes a flexible pressure line arranged to be connected at one end to an associated source of pressurized fluid and a tubular fitting on said sleeve member communicating at one end with said groove and the other end of said fitting being adapted for connection to the other end of said pressure line.

5. A dental handpiece in accordance with claim 3 wherein two cooperating casing sections are provided which are arranged to be assembled into a unitary casing, said sections being arranged to provide said sleeve member retaining shoulders when in the assembled relationship.

6. A dental handpiece comprising, in combination, a first casing section having a head at one end thereof, a fluid pressure operated turbine rotatably mounted in said head for driving a dental tool, a longitudinally extending portion of reduced diameter on the other end of said first casing section forming a shoulder, a radially extending inlet on said casing portion, a passageway in said casing

for communicating said inlet with said turbine, a second passageway in said casing forming an outlet from said casing for a fluid discharged from said turbine, a second casing section arranged to be threadedly connected to said first casing portion to form a unitary casing, a sleeve member rotatably mounted on said first casing portion and restrained from axial movement by said shoulder and one end of said second casing section, an annular groove in said sleeve member arranged to overlie said inlet in any position of rotation of said sleeve member and a tubular fitting on said sleeve member communicating at one end with said groove and arranged to be connected at its other end to a source of pressurized fluid.

7. A dental handpiece comprising, in combination, an elongated casing, a fluid pressure operated turbine rotatably mounted in said casing for driving a dental tool, means associated with said casing for directing a stream of cooling fluid on said dental tool, a pair of inlets in said casing, means in said casing for conducting pressurized fluid from one of said inlets to said turbine, means for exhausting said fluid from said turbine, means in said casing for conducting cooling fluid from the other inlet to said fluid directing means, means rotatably supported on said casing for connecting said inlets with an associated source of pressurized fluid and cooling liquid, respectively, said connecting means being arranged to permit said casing to rotate freely while maintaining said inlets in continuous communication with said source of pressurized fluid and cooling liquid.

8. A dental handpiece comprising, in combination, an elongated casing, a fluid pressure operated turbine rotatably mounted in said casing for driving a dental tool, a nozzle on said casing for directing a stream of cooling fluid on said dental tool, a pair of inlets in said casing, means in said casing for conducting pressurized fluid from one of said inlets to said turbine, means for exhausting said fluid from said turbine, means in said casing for conducting cooling fluid from the other inlet to said nozzle, a sleeve member rotatably mounted on said casing in coaxial relationship therewith, a pair of coaxially arranged annular grooves in said sleeve member each arranged to overlie one of said inlets in any position of rotation of said sleeve member, and means carried by said sleeve member for connecting said grooves to a source of pressurized fluid and cooling fluid respectively.

9. A dental handpiece comprising, in combination, a casing, a fluid pressure operated turbine rotatably mounted in said casing for driving a dental tool, means for conducting a pressurized fluid to said turbine, means for exhausting said fluid from said turbine, means for conducting cooling fluid to said dental tool including an inlet on said casing, means rotatably supported on said casing for connecting said inlet with an associated source of cooling liquid, said connecting means being arranged to permit said casing to rotate freely while maintaining said inlet in continuous communication with said source of cooling liquid.

10. A dental handpiece comprising, in combination, a forward casing section having a head at one end thereof, a fluid pressure operated turbine rotatably mounted in said head for driving a dental tool, a rear casing section, means for fixedly coupling said forward and rear casing section to form a unitary handpiece casing, a longitudinally extending bore in said rear casing section, a counterweight in said bore being arranged for longitudinal movement therein so as to provide an adjustable counterbalancing force therein.

11. A dental handpiece for supporting and driving a rotary tool, said handpiece comprising, in combination, a casing of a shape adapted to be held in the hand, fluid driven means adjacent to the forward end of said casing for driving said rotary tool, the portion of said casing adjacent to said fluid driven means being adapted to be held in the fingers for manipulating said rotary tool, and

a member adapted for connection to a source of fluid under pressure, said connecting member being rotatably mounted on said casing rearwardly of said finger location.

12. A dental handpiece for supporting and driving a rotary tool, said handpiece comprising, in combination, a casing of a shape adapted to be held in the hand, fluid driven means adjacent to the forward end of said casing for driving said rotary tool, the portion of said casing adjacent to said fluid driven means being adapted to be held in the fingers for manipulating said rotary tool, and

a member adapted for connection to a source of fluid under pressure, said connecting member being rotatably mounted on said casing in a position between said finger location and the rear end of said casing.

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