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HIGH SPEED DENTAL DRILL

Erich Hoffmeister, Biberach (Riss), Germany, assignor to Alois Kaltenbach and Erich Hoffmeister, responsible partners of Kaltenbach and Voight, a kommanditgesellschaft, Biberach (Riss), Germany

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This invention relates to high speed dental drills of the contra-angle type, either with or without a knee portion, wherein a turbine driven by compressed air is disposed within the head of the contra-angle. The compressed air for driving the turbine is introduced through the main body of the handpiece as is also the water to be supplied to the front face end of the head and the air exhausted from the turbine is discharged through the front and back ends of the head as well as through the interior of the handpiece.

In previous instruments of this kind, a disadvantage has been found to exist in that when the air is exhausted from the rear end of the head in one or more powerful jets acting in the direction of the turbine rotor axis, it is annoying to the patient. For example, if the occlusal surface of a lower posterior tooth is being treated, the powerful air stream exiting from the back end of the head is directed against the upper teeth and vice versa.

This invention effectively eliminates these disadvantages by the provision of one or more holes for the turbine exhaust in the back chamber wall of the head; these holes being shielded by a cap which forms a ring-shaped slot opening radially or axially or in both directions towards the exterior which serves to reduce the pressure of the exiting compressed air.

In accordance with a preferred form of the invention, the cap may be formed integrally with the rear chamber wall of the head. Alternatively, it may also be inserted into the rear chamber wall or removably attached thereto by a threaded connection.

Another feature of the invention consists in the provision of an opening in the cap in axial alignment with the turbine rotor to provide for the insertion of a tool ejector of a know type.

In order to prevent an excessive amount of air to escape through the tool ejecting opening in the cap, the clearance between the chamber wall and the rotating shaft of the turbine is reduced to a minimum.

A further characteristic of the invention consists in the conveying of the turbine exhaust which exits through the front chamber wall of the head through an annular clearance opening disposed between the shaft of the turbine rotor and the front chamber wall of the head. By utilizing this clearance opening, the previously used exhaust openings become superfluous. The cross-sectional area of the annular clearance opening at the front end of the head is so dimensioned that the air compressed within the head can escape in equal amounts from the front and rear walls in order to prevent axial displacement of the turbine rotor.

Another feature of the invention is the provision of an annular chamber in the front wall of the head which communicates with the water-conveying tube and which is provided with one or more openings through the front wall disposed at an angle with respect to the axis of the head. In this manner, it is possible to obtain one or more streams of water on the area being treated to provide more uniform and consequently better cooling.

In the drawings; FIG. 1 represents a vertical cross section of one form of contra-angle head in accordance with the present invention; FIG. 2 is a cross-section taken on

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the line II—II of FIG. 1; FIG. 3 is a horizontal cross-section taken on the line III—III of FIG. 1; FIG. 4 is a vertical cross-section of a modified form of contra-angle head; FIG. 5 is a cross-sectional view of another modification of contra-angle head taken on the line V—V of FIG. 6, and; FIG. 6 is a plan view of the device shown in FIG. 5.

In the drawings, the casing for the head is indicated by the numeral 1, and disposed therein is a turbine rotor 2. The shaft 3 of the rotor is supported in bearings 4 and 5. The rear chamber wall of the casing 1 is indicated by the numeral 6, while numeral 7 indicates the front chamber wall. As shown in FIG. 3, the compressed air is supplied to the turbine through conduit 8, while the major portion of the exhausted air is carried back through the handpiece through conduit 9.

In accordance with well known practice with devices of this type, the compressed air supplied to the turbine rotor 2 is not completely returned through conduit 9, but a portion of this air is used to lubricate the bearings 4 and 5 by passing through these bearings and discharging from the front and rear walls of the head respectively. In the drawings, it can be seen that the air conveyed through the rear bearing 5 enters an enlarged circular chamber 10 from where it exits through openings 11. The openings 11 in the present invention are of a large enough cross-section so that substantially all of the air passing through the rear bearing 5 can discharge through the openings 11.

The openings 11 are covered by a disc-shaped cap 12, the outer edge of which forms a circular slot 13 permitting the air to escape radially outwardly to the atmosphere as shown in FIGS. 1 through 4. By this arrangement, the pressure of the exhausting air is reduced and directed laterally in a sufficiently weakened form so that it is no longer objectionable.

The cap 12 and the rear chamber wall 6 may be formed integrally as is shown in the drawings. However, the cap 12 could be formed separately and provided with threads for removable insertion in the wall 6.

The inner portion of the cap 12 which may be recessed to receive the upper end of the rotor shaft 3 is formed so that the clearance, indicated at 14, between the recess and the shaft is reduced to the minimum amount necessary for free rotation of the shaft so that as little as possible of the exhaust air will pass through the annular space 14. An opening 15 may also be provided in the cap 12 which will permit the introduction of an ejector tool as is well known in the art.

In FIGS. 1 to 3 as well as 5 and 6, the chamber wall 6 is fastened securely to the casing 1. On the other hand, in the modification shown in FIG. 4, the wall 6 is threaded, as at 16, for a removable connection with the housing 1.

In the modifications shown in FIGS. 5 and 6, the outer edge of the cap 12 is joined to the end wall 6 so that no air escapes in a radial direction. In this modification, the cap is provided with one or more circular slots 17 in its upper surface which allows the air to escape in an axial direction, but under reduced pressure.

In this embodiment, the air exhausted from the bearing 5 passes through the holes 11 into a circular chamber 18 due to the fact that the holes 11 are offset circumferentially with respect to the slots 17. The air stream is broken up by virtue of its passage through chambers 10 and 18, whereby its original force is further reduced so that it will no longer produce an objectionable jet when it leaves through the axial openings 17.

The air exhausted from the turbine through the front bearing 4 is discharged into the atmosphere through the annular recess 19 and the annular clearance space 20

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between the rotor shaft 3 and the front wall 7. Although the air exhaust at the front end of the head is not usually disturbing, the arrangement according to the present invention is an improvement over the previous arrangement of a series of air holes in that a much more uniform exhaust is provided by utilization of the annular clearance space 20.

Another improvement in the present invention is exemplified by the fact that the front chamber wall 7 is provided with an interior circular chamber 21 which is in communication with the water-conveying tube 22. The front wall of the casing is also provided with one or more discharge openings 23 through which the water may discharge from the chamber 21 into the atmosphere as shown in FIG. 2. The openings 23 are disposed at an angle with respect to the axis of the head 1 so that the streams of water strike the front end of the rotating tool or the area being treated.

I claim:

1. In high speed contra-angle dental handpieces, the combination including, handle means, cylindrical housing means having front and rear end walls secured to one end of the handle means, gaseous fluid-driven turbine means having hollow shaft means to removably receive a tool therein, gaseous fluid-lubricated anti-friction bearing means to position the turbine means within the housing means, said handle means being provided with means to supply gaseous fluid to the interior of the housing means, said rear wall being provided with annular chamber means, said rear wall being provided with an opening in communication with said annular chamber means and the interior of the housing and also provided with an annular opening in communication with the chamber means and the atmosphere, said front wall being provided with an opening in communication with the interior of the housing means and the atmosphere, and means to supply coolant fluid to a tool positioned in said shaft means.

2. The invention as defined in claim 1, wherein said rear wall is provided with an opening in alignment with said shaft means to receive an ejector tool.

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3. The invention as defined in claim 1, wherein one end of said shaft means is spaced from the interior of said rear wall only an amount sufficient to prevent frictional engagement therebetween.

4. The invention as defined in claim 1, wherein said opening in the front wall surrounds said shaft means and is of larger diameter than the shaft means to permit a portion of the gaseous fluid in the housing to escape therethrough.

5. The invention as defined in claim 1, wherein said front wall is provided with an annularly extending interiorly disposed chamber, and said means to supply coolant fluid includes conduit means provided in said handle in communication with said annular chamber and a plurality of openings provided in the front wall in communication with said annular chamber.

6. The invention as defined in claim 1, wherein said annular opening in communication with the chamber in the rear wall and the atmosphere is positioned to direct exhausted fluid in an axial direction, and said opening in communication with said chamber in the rear wall and the interior of the housing is offset with respect to said annular opening.

7. The invention as defined in claim 1, wherein said annular chamber in the rear wall is defined by a pair of axially spaced radially extending portions, the outermost of said portions being generally disc-shaped and overlying said opening in the rear wall in communication with the interior of the housing.

8. The invention as defined in claim 7, wherein said pair of axially spaced portions are integrally formed.

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