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(54) IMPROVEMENTS IN OR RELATING TO DENTAL HANDPIECES

(71) We, SIEMENS AKTIENGESELLSCHAFT, a German company, of Berlin and Munich, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to dental handpieces.

Dental handpieces are known which comprise a grip section, a head section mounted removably thereon, a drive shaft running through the grip section which engages with the main drive shaft of a separate drive unit when the handpiece is coupled to the drive unit and a drive shaft which runs through the head section, one end of which engages with the drive shaft in the grip section and the other end of which drives an instrument. At least one coolant conduit which is connected, when the handpiece is coupled to the drive section, to a supply line of the drive unit, runs through the grip section to the head section.

Because of the need for maintenance and servicing of the internally disposed bearing parts for the drive shaft and other mechanical components, dental handpieces of this type must be designed with the ability to be dismantled. Handpieces of this type usually consist of a grip section and a head section which can be easily dissasembled. There are also known angle handpieces in which the axis of the head section is disposed at an acute angle to the longitudinal axis of the grip section, and the head section comprises a so-called shank elbow which is the angled part of the head housing, and an angle head piece, in which the instrument may be rotatably mounted. The three parts are generally connected together by screw or clamp connections.

With handpieces of this type problems arise with the arrangement or routeing of the coolant conduits inside the handpiece sections and/or the connections between adjacent sections; more particularly this is because a relatively large number of connections for the coolant conduits have to be made because of the need to be able to dismantle the handpiece. This not only causes the manufacture of the handpiece to be more expensive, but also increases the risk of penetration of coolant into the interior of the handpiece parts, which can lead to corrosion of the bearings and other mechanical components located in the interior of the handpiece.

The invention relates to handpieces in which there is a simple and inexpensive routeing for the coolant conduit(s), and in which the possibility of leakage particularly at the connections between adjacent sections is reduced. Also the coolant conduits in a handpiece according to the present invention can be easily cleaned or replaced.

According to the present invention, there is provided a dental handpiece which comprises (i) a grip section, (ii) a head section removably mounted on the grip section at the proximal end thereof, (iii) a drive arrangement extending through the handpiece and being adapted at the proximal end thereof for connection to a dental instrument, and at the distal end thereof for connection to a separate drive unit, and (iv) at least one coolant conduit and a shell to which the or each coolant conduit is secured when the handpiece is assembled, the shell being shaped to be removably fitted into the handpiece, wherein (a) the distal end of the or each coolant conduit is attachable to a coolant supply line when the drive arrangement is connected to said drive unit; (b) the or each coolant conduit includes a rigid section which projects beyond said shell; and (c) at least a part of the or each coolant conduit extends through

the body of the grip section and/or the head section when the handpiece is assembled.

The shell to which the or each coolant conduit is secured is preferably in the form of an inner sleeve which is arranged concentrically within an outer sleeve to form part of the grip section of the handpiece when the handpiece is assembled. With this arrangement, the or each coolant conduit can be located in a groove in the inner sleeve, the groove running parallel to the axis of the inner sleeve when the handpiece is assembled. The or each coolant conduit can conveniently be held in the inner sleeve by solder or adhesive. It is also advantageous for the inner sleeve to be substantially cylindrical and to contain bearings for a drive shaft which is part of the drive arrangement.

Alternatively, the shell can be in the form of a ring which is mounted coaxially with the grip section when the hand-piece is assembled.

For a better understanding of the present invention, and to show more clearly how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 shows a cross section of a dental handpiece according to the invention;

Figure 2 shows a cross section of part of the grip section of the handpiece shown in Figure 1; and

Figure 3 shows a cross section of the shank elbow of the handpiece shown in Figure 1.

Figure 1 shows a dental handpiece with a grip section 1 removabiy connected to a head section 2 in which a dental instrument 3 can be rotatably mounted. The head section 2 comprises a shank elbow 4 and an angle head piece 5. The grip section 1, the shank elbow 4 and the angle head section 5 are detachably joined together, in that order, by means of screw or clamp connections. The grip section 1 comprises an outer sleeve 6 and an inner sleeve 7 disposed coaxially therewithin. The inner slevee 7, constitutes the shell for supporting a coolant conduit 13, and it is provided with a bearing 8 for the mounting of a drive shaft 9. Step-down or step-up gearing 11 is disposed in the shank elbow 4 between one end of a drive shaft 9 and one end of a drive shaft 10. The parts 9, 10 and 11 form the drive arrangement within the handpiece. When the handpiece is coupled to a separate drive unit (not shown) the free end of the drive shaft 9 engages with the main drive shaft of the drive unit. The outer end of the drive shaft 10 drives the instrument 3 through suitable gearing (not shown). The shank elbow 4 is designed so that an extension of the longitudinal axis of the head section 2 makes an acute angle with the longitudinal axis 12 of the grip section 1.

The coolant conduit 13 is a rigid unit and is mounted in a groove 14 of the inner sleeve 7. The groove 14 runs from a short radial bore 15, parallel to the longitudinal axis 12, through the grip section 1 up to the distal end of the head section, where it co-operates with a passageway 17 formed in the shank elbow 4. This passageway in turn communicates with a further passageway in the angle head piece 5 which terminates in an exit nozzle 16. In this embodiment, the conduit 13 extends through the sections 4 and 5 of the head section 2 as far as the exit nozzle 16. The coolant conduit 13 is attached to the inner sleeve 7 by adhesive or solder. Instead of the sleeve 7 a suitably designed washer could be adopted as the support shell for conduit 13; such a washer would be fixed, like the sleeve 7, in the outer sleeve 6.

Figure 2 shows the inner sleeve 7 with the coolant conduit 13 attached to it. A length L, approximately corresponding to the length of the head section 2, of the coolant conduit 13 projects beyond the grip section 1. When the section 4 and grip section 1, or section 5 and section 4, are assembled, this projecting length L of the coolant conduit is passed through the appropriately shaped passages 17 and 18, (see Figure 4).

In an alternative embodiment shown by broken lines in Figures 1 and 2, the coolant conduit 13 has a projecting part 19 of length L′ which projects beyond the inner sleeve 7. The projecting part 19 of the conduit 13 penetrates the shank 4 and runs parallel to the axis 12. The length of the projecting part 19 of the coolant conduit 13 is such that when the section 4 and the sleeve 7 are assembled a connecting piece 20 of the projecting part 19 projects out of the shank 4. On the connecting piece 20 is fitted a flexible coolant hose 21 which conveys the coolant to an exit nozzle which can be of known design. The nozzle could be, for instance, a small bore formed at the end of the angle head section 5 and directed towards the dental instrument 3. This embodiment with the projecting part 19 has the advantage that angle head sections of an earlier design with a coolant hose disposed externally may be used.

If several media e.g. water and air are to be conveyed to the exit nozzle 16, and it is required to mix them at the exit point, the grip section or the head section then carries several coolant conduits.

Compared to conventional structures, the handpiece according to the invention has a reduced number of conduit connections, which reduces the chance of leakage. A

further advantage of this invention is that the coolant is unlikely to reach the mechanical drive components and bearing parts in the interior of the handpiece.

Also if the conduit 13 becomes clogged it is only necessary to exchange the inner sleeve 7, with the conduit 13 attached, a relatively inexpensive component, and not the entire grip section or head section, which parts are relatively expensive to manufacture. If the conduit 13, which is of narrow cross section, becomes calcified it can be cleaned comparatively easily.

If the gearing between the drive shaft in the grip section and the drive shaft of the head section is of suitable dimensions the conduit 13 may be attached to the shank section 4; it may then extend as far as the nozzle 16, or open outside the shank section 4 at the point 20.

WHAT WE CLAIM IS:

1. A dental handpiece which comprises (i) a grip section, (ii) a head section removably mounted on the grip section at the proximal end thereof, (iii) a drive arrangement extending through the handpiece and being adapted at the proximal end thereof for connection to a dental instrument, and at the distal end thereof for connection to a separate drive unit, and (iv) at least one coolant conduit and a shell to which the or each coolant conduit is secured when the handpiece is assembled, the shell being shaped to be removably fitted into the handpiece wherein (a) the distal end of the or each coolant conduit is attachable to a coolant supply line when the drive arrangement is connected to said drive unit; (b) the or each coolant conduit includes a rigid section which projects beyond said shell; and (c) at least a part of the or each coolant conduit extends through the body of the grip section and/or the head section when the handpiece is assembled.

2. A dental handpiece as claimed in claim 1, wherein said shell constitutes an inner sleeve which is arranged concentrically within an outer sleeve to form part of the grip section of the handpiece when the handpiece is assembled.

3. A dental handpiece as claimed in claim 2, wherein the or each coolant conduit is located in a groove in the inner sleeve, when the handpiece is assembled.

4. A dental handpiece as claimed in claim 2 or 3, wherein the or each coolant conduit is held in the inner sleeve by solder or adhesive.

5. A dental handpiece as claimed in claim 2, 3 or 4, wherein the inner sleeve is substantially cylindrical and contains bearings for a drive shaft which is part of said drive arrangement.

6. A dental handpiece as claimed in claim 1, wherein said shell is in the form of a ring which is mounted coaxially with the grip section when the handpiece is assembled.

7. A dental handpiece as claimed in any preceding claim, wherein the or each coolant conduit is held by the grip section and extends beyond the grip section by an amount corresponding to the length of the head section, the head section being provided with passages such that when the handpiece is assembled the extension(s) of the conduit(s) fit(s) into the passages in the head section.

8. A dental handpiece as claimed in any preceding claim, in which the head section comprises a shank elbow and an angle head piece.

9. A dental handpiece as claimed in claim 8, wherein the or each coolant conduit passes from the grip section through the shank elbow and terminates outside the shank elbow such that a flexible hose may be attached to the end of the or each coolant conduit.

10. A dental handpiece substantially as hereinbefore described with reference to, or as shown in the accompanying drawings.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

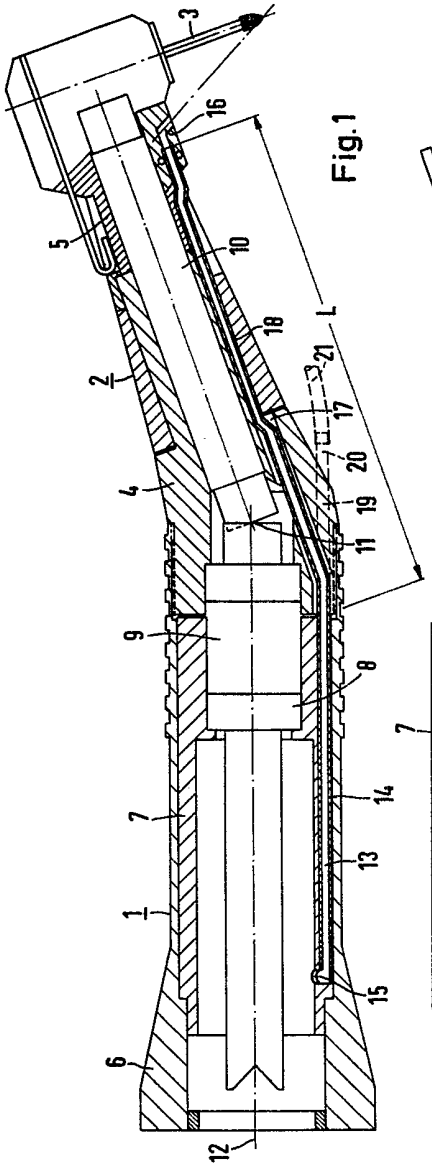

Fig.1

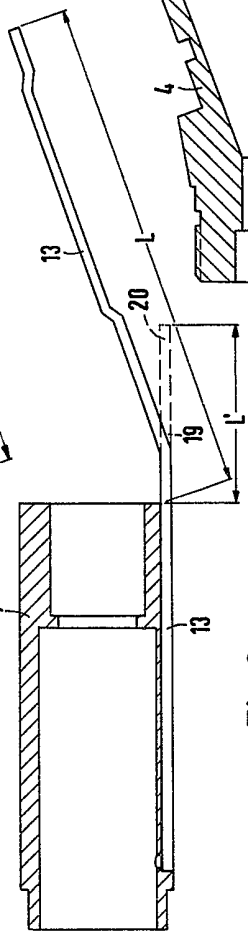

Fig.2

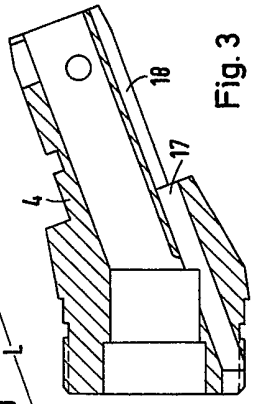

Fig.3