

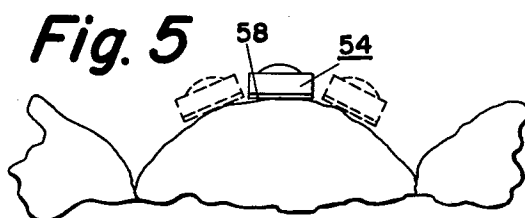
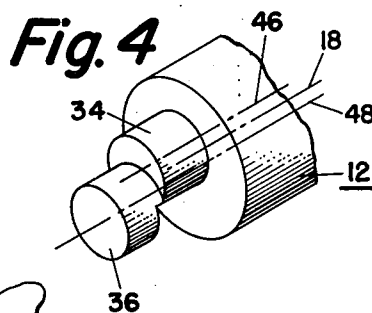
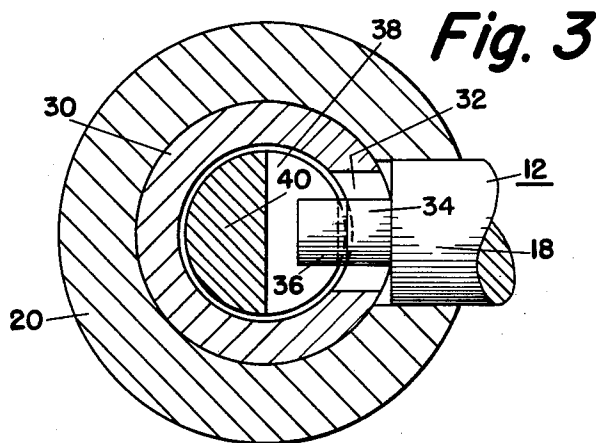
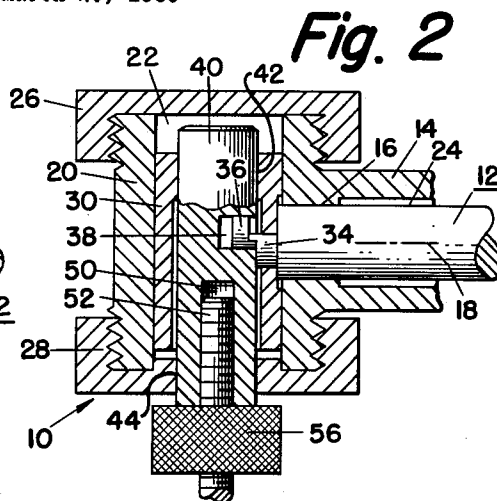
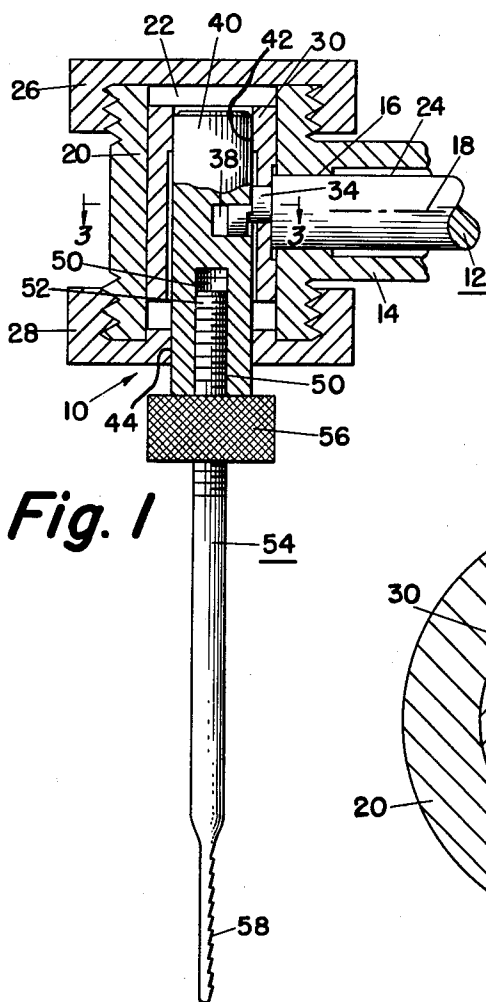
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DENTAL INSTRUMENT

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3,073,031 DENTAL INSTRUMENT

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This invention comprises a dental instrument, and more particularly a dental instrument for effecting a wide variety of cutting actions.

This invention has as an object the provision of a novel dental instrument.

This invention has as another object the provision of an oscillating cutter which may be adapted during the course of the cutting operation to conform with different angles of the surface being worked on, with little or no change in the position of the handpiece, whereby the extent of pain and discomfort experienced by the patient is minimized.

This invention has as yet another object the provision of a dental instrument in which an oscillating movement of a cutting tool is achieved without any appreciable internal off balance displacement of the rotating portion of the instrument, such as is commonly referred to as "hum," whereby the operator of such instrument may employ the same with the maximum amount of digital sensitivity or "feel."

Other objects will appear hereinafter.

For the purpose of illustrating the invention there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

Referring to the drawings wherein like reference characters refer to like parts:

FIGURE 1 is a vertical sectional view through the dental instrument of the present invention, with the cutting tip being disposed in its outermost disposition.

FIGURE 2 is a view similar to that of FIGURE 1, but with the cutting tip being disposed in its innermost disposition.

FIGURE 3 is a cross-sectional view taken on line 3-3 of FIGURE 1.

FIGURE 4 is a fragmentary perspective view revealing the outer and inner throws at the end of the drive shaft.

FIGURE 5 is a fragmentary view revealing the accommodation of the cutting tip to a surface being worked upon.

The dental instrument of the present invention is designated generally as 10 and comprises the drive shaft 12 disposed within the handle 14.

The drive shaft 12 may be operatively engaged with the spindle (not shown) of a conventional dental unit by conventional means. A wide variety of such means for operatively engaging the drive shaft of a dental instrument with a dental unit are known, and accordingly the same need not be illustrated herein.

The drive shaft 12, which has a true circular cross-section, is guided by the bearing surface 16 on the interior of the handle 14, so that the drive shaft 12 may rotate at high speed about its center line designated 18.

The handle 14 of dental instrument 10 is provided with a bored T-shaped head 20 at its outer end. The T-shaped head 20 comprises the bore 22 which is perpendicularly disposed in respect to and in communication with the bore 24 of the remainder of the handle 14. The outer surface of the T-shaped head 20 on either side of the remainder of the handle 14 is provided with male threads onto which are threadably secured the caps 26 and 28. The cap 26 is imperforate, but the cap 28 is

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provided with an opening which serves as a bearing, as will be more fully explained below.

A balance bushing 30 is provided within the bore 22 of T-shaped head 20. The balance bushing 30 is machined to a high degree of polish so that it may be smoothly reciprocated within the bore 22 of T-shaped head 20.

The wall of the balance bushing 30 is slotted for an arcuate length of approximately one hundred and eighty degrees or somewhat less than one hundred and eighty degrees to form the slot 32. The axial height of the slot 32 is sufficient to receive the inner throw 34 on the outer end of the drive shaft 12. The axial height of the slot 32 is sufficient to permit the entry of the outer throw 36 of the drive shaft 12 through the wall of the balance bushing 30 and into the slot 38 of the tool holder 40.

The tool holder 40 comprises a cylindrical rod having a highly polished surface which is smoothly received within the balance bushing 30 and smoothly guided by the bearing surface 42 at the end of the balance bushing 30 adjacent the cap 26 and by the bearing surface 44 which forms the wall of the aperture of the cap 28. The bearing surfaces 42 and 44 enable the tool holder 40 to be smoothly reciprocated upon the rotation of the drive shaft 12 as will be explained below.

The center line 46 of the inner throw 34 and the center line 48 of the outer throw 36 are oppositely disposed in respect to the center line 18 of the drive shaft 12 and are equidistant therefrom. Thus, the rotation of the drive shaft 12 is balanced notwithstanding the opposite throws 34 and 36.

The tool holder 40 is provided with a threaded socket 50 at its end which is received within the bearing surface 44. The matingly threaded end 52 of the cutting tip 54 is threadably received within the threaded socket 50. The cutting tip 54 may be secured in position by the knurled lock nut 56. Alternatively, a collet or other clamping means may be used to hold the cutting tip in position.

A wide variety of cutting tips may be utilized in the dental instrument 10 of the present invention. In the illustrated embodiment the cutting tip comprises a corrugated file-like surface 58, but it is to be understood that a wide variety of cutting surfaces may be utilized. Moreover, while in the illustrated embodiment the cutting tip 54 comprises a straight member, it is to be understood that offset or angular cutting tips may be utilized.

The operation of the dental instrument 10 of the present invention is as follows:

Upon rotation of the drive shaft 12, the inner throw 34 urges the balance bushing 30 in a direction opposite to the direction which the outer throw 36 urges the tool holder 40. As heretofore noted, the center lines 46 and 48 of the inner and outer throws 34 and 36 are oppositely equidistant from the center line 18 of the drive shaft 12. The rotation of the drive shaft 12 is balanced, and moreover the reciprocation of the cutting tip 54 is smooth and balanced because while the balance bushing 30 is being urged in one direction the tool holder 40 and the cutting tip 54 are being urged in the opposite direction. This may be ascertained from a comparison of FIGURES 1 and 2 which disclose the cutting tip 54 in its outermost disposition and its innermost disposition respectively. It will be seen that when the cutting tip 54 is in its outermost disposition, the balance bushing 30 is in its disposition in which it is most closely adjacent to the cap 26. On the other hand, when the cutting tip 54 is in its innermost disposition, the balance bushing 30 is in its disposition where it is most closely adjacent to the cap 28. In this manner, balancing of the masses being moved is achieved.

The smooth facile operation of the dental instrument 10 permits close digital control and "feel" to be achieved

by the operator of the instrument, since the same is not interfered with by the "hum" which normally arises from unbalanced vibrations when an eccentric changes its rotational movement to oscillating or reciprocating movement.

The presence of the slots 32 and 38 in the balance bushing 30 and tool holder 40 respectively permit the cutting tip to be moved during operation so as to conform with different angles of the surface being worked upon. This is shown in FIGURE 5 wherein it is seen that when the cutting tip 54 is utilized on an arcuate surface, the cutting tip 54 may change its disposition from that shown in its center disposition to that shown in the phantom line dispositions. This permits the operator of the dental instrument 10 to follow a curved or irregular surface without the necessity for shutting off the dental instrument 10 and making repeated adjustments. Moreover, this enables the operator to effect working on surfaces whose irregularity is such that preset adjustment would prove difficult or impossible.

While the instrument of the present invention has been described as a dental instrument, it is of course to be understood that it may be utilized for a wide variety of other precision working manipulations, such as on jewelry, detail work in models, etc.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

It is claimed:

1. A dental instrument including a tubular handle, a bored head disposed at the end of said handle, a drive shaft rotatably received within said handle, an inner throw and an outer throw at the outer end of said drive shaft projecting into said bored head, a balance bushing reciprocally mounted within said bored head, and a tool holder reciprocally mounted within and guided by said balance bushing, with said inner throw being operatively engaged with said balance bushing and said outer throw being operatively engaged with said tool holder.

2. A dental instrument in accordance with claim 1 in which the center lines of the inner and outer throws are oppositely equidistantly disposed from the center line of the drive shaft.

3. A dental instrument including a tubular handle, a bored head disposed at the end of said handle, a drive shaft rotatably received within said handle, an eccentric at the outer end of said drive shaft projecting into said bored head, a tool holder reciprocally mounted in said bored head, a wall of said tool holder being slotted by an arcuate slot which extends for an appreciable portion of the

periphery of said tool holder, said eccentric being operatively engaged with said tool holder by communicating with walls of said slot in said tool holder, with the lateral dimensions of said slot being appreciably greater than the lateral dimensions of said eccentric, whereby upon rotation of said drive shaft said tool holder is reciprocated in respect to said bored head and may simultaneously be partially rotated in respect to said bored head.

4. A dental instrument including a tubular handle, a bored head disposed at the end of said handle, a drive shaft rotatably received within said handle, oppositely disposed throws at the outer end of said drive shaft projecting into said bored head, a balance bushing reciprocally mounted within said bored head, a wall of said balance bushing being slotted by an arcuate slot which extends for an appreciable portion of the periphery of said balance bushing and whose lateral dimensions are appreciably greater than the lateral dimensions of either of the oppositely disposed throws, one of said oppositely disposed throws being operatively engaged with said balance bushing by communicating with walls of said slot in said balance bushing, a tool holder reciprocally mounted in said bored head to reciprocate in an opposite direction in respect to the direction of reciprocation of said balance bushing, a wall of said tool holder being slotted by an arcuate slot which extends for an appreciable portion of the periphery of said tool holder, with the lateral dimensions of said arcuate slot in the wall of said tool holder being appreciably greater than the lateral dimensions of either of said oppositely disposed throws, the other of said oppositely disposed throws being operatively engaged with said tool holder by communicating with walls of said slot in said tool holder, whereby upon rotation of said drive shaft said tool holder is reciprocated in respect to said bored head and may simultaneously be partially rotated in respect to said bored head.

5. A dental instrument in accordance with claim 4 in which the center lines of the oppositely disposed throws are oppositely equidistant from the center line of the drive shaft.

6. A dental instrument in accordance with claim 5 in which the oppositely disposed throws comprise inner and outer throws, and in which the inner throw is operatively engaged with walls of the slot of the balance bushing and in which the outer throw is operatively engaged with walls of the slot of the tool holder.

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