

May 28, 1946.

V. E. BRITT ET AL

2,400,912

DENTAL APPLIANCE

Filed Dec. 29, 1944

2 Sheets-Sheet 1

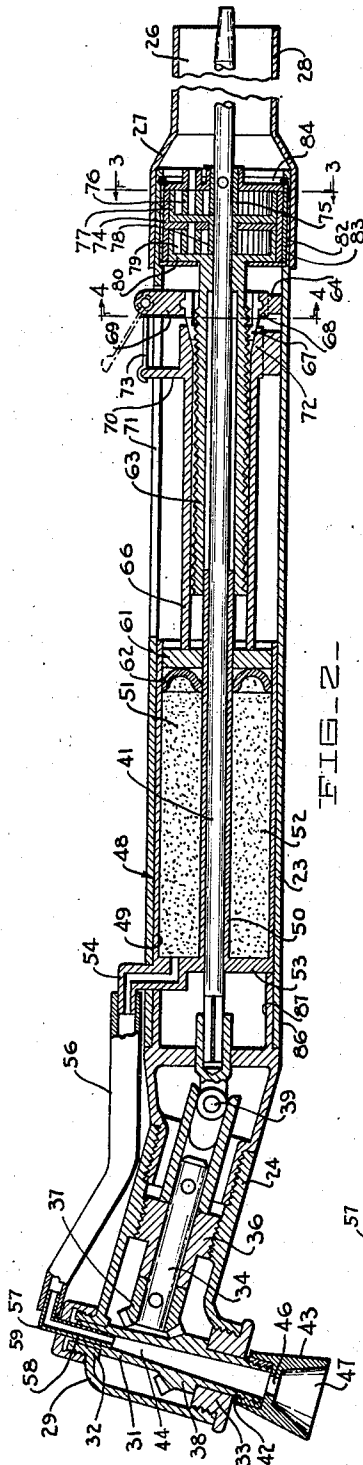


FIG. 2--

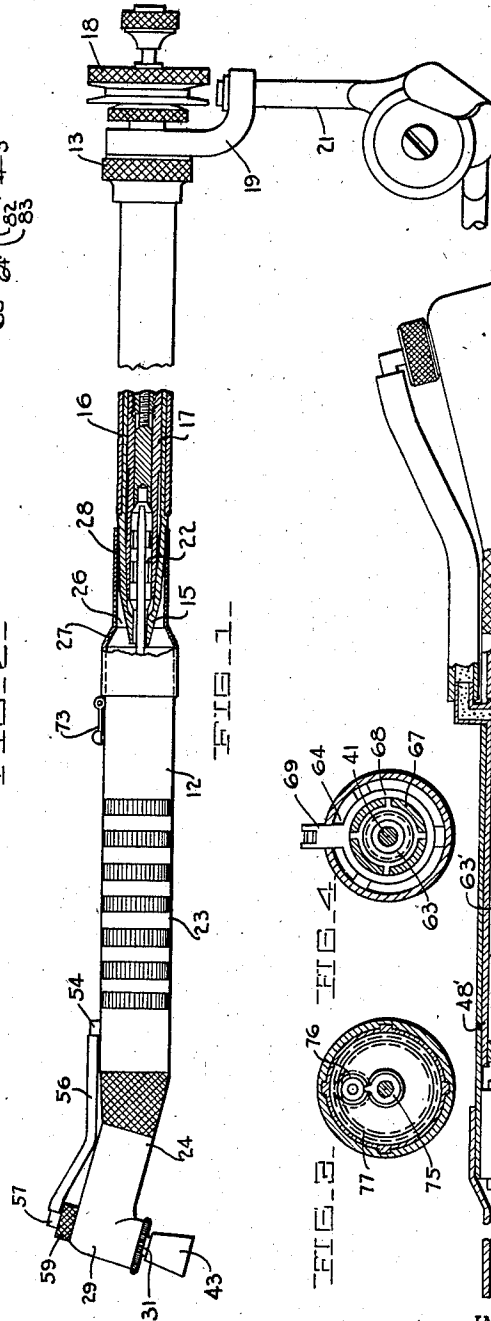


FIG. 1--

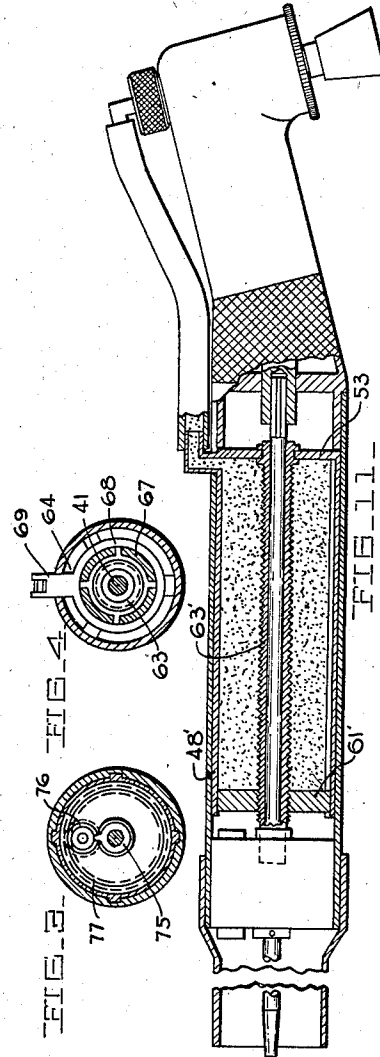


FIG. 3--

FIG. 4--

FIG. 11--

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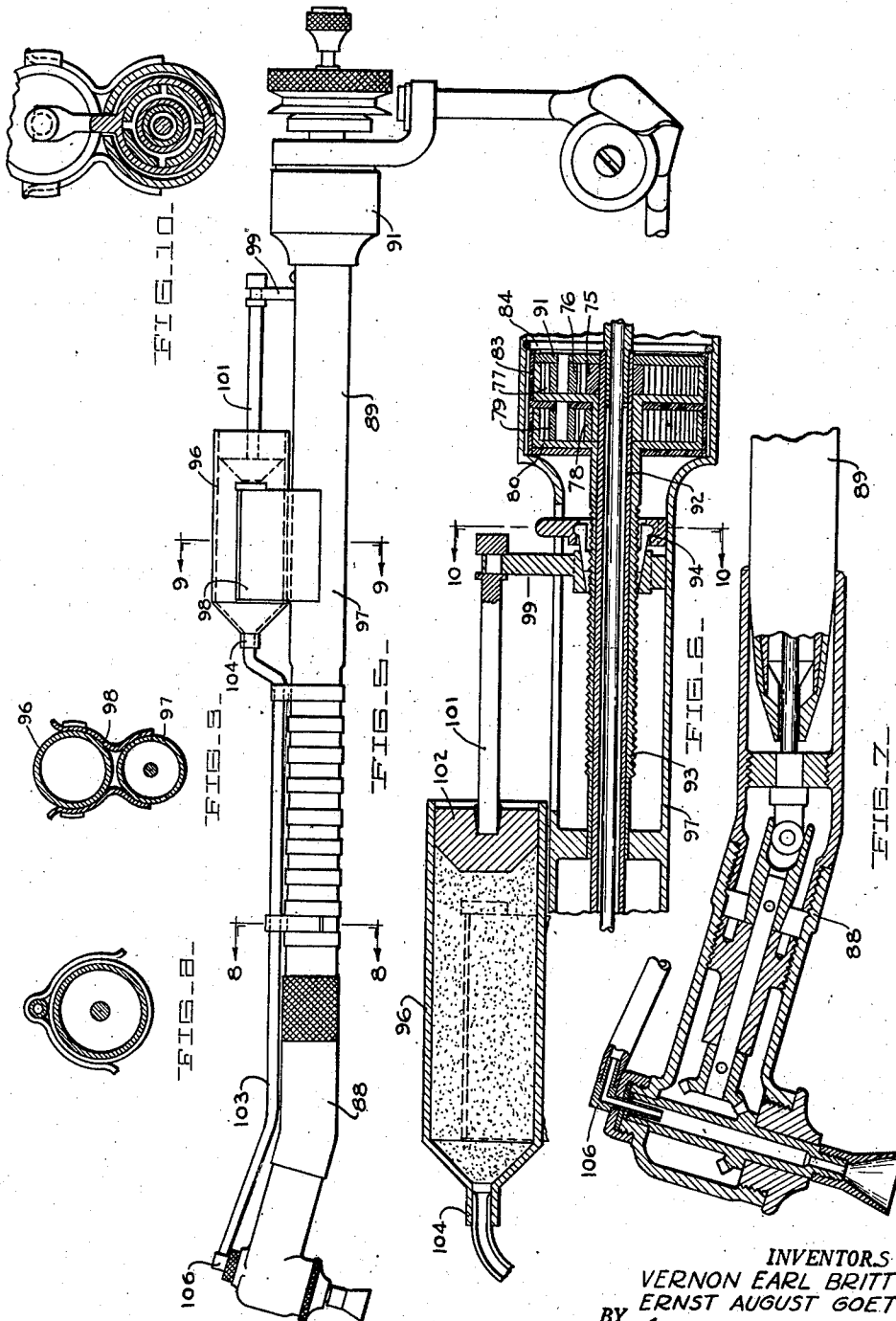
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DENTAL APPLIANCE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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DENTAL APPLIANCE

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14 Claims. (Cl. 32-26)

The invention relates to an appliance incorporated in the member generally used by dentists for supporting for rotation the drill bits, abrasive wheels, and other tools, commonly called a dental handpiece.

An object of the invention is to provide means either as an attachment to or a built in part of the handpiece for feeding to the tool carried by the handpiece a continuous supply of an abrasive or other compound in the form of paste.

Another object of the invention is to provide an appliance of the character described which can be incorporated with the dental handpiece without materially increasing the size or weight of the unit or interfering with the normal use of the handpiece.

A further object of the invention is to provide an appliance of the character described in which the supply of the material to the tool will be effected by operation of the handpiece and will at all times be under the control of the operator.

A still further object of the invention is to provide an appliance of the character described in which the material to be delivered by the appliance can be contained in a magazine attached directly to or contained within the supporting body of the handpiece and furthermore it is an object to permit replenishment of the supply of material in the appliance in a very easy and quick manner.

And additional object of the invention is to so design the appliance that while the material is caused to pass through certain of the rotating parts such as the tool supporting mandrel of the handpiece there will be no danger of any portion of the material escaping into the bearings or between any other of the surfaces of relatively moving parts within the handpiece.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawings:

Figure 1 is a side elevation of the means of our invention as applied to a conventional dental handpiece, parts being broken away and shown in section.

Figure 2 is an enlarged longitudinal vertical

sectional view of the attachment shown in Figure 1.

Figures 3 and 4 are transverse sectional views taken on the lines 3-3 and 4-4 of Figure 2.

5 Figure 5 is a side elevation of the means of our invention embodied in a form different from that shown in Figures 1 and 2.

Figures 6 and 7 are enlarged fragmentary longitudinal sectional views of the forward and 10 rear portions of the appliance as shown in Figure 5.

Figures 8 and 9 are transverse sectional views of the appliance taken on the lines 8-8 and 9-9 of Figure 5.

15 Figure 10 is a transverse sectional view of the appliance taken on the line 10-10 of Figure 6.

Figure 11 is a longitudinal sectional view of a handpiece attachment showing a still further modified form of the invention.

20 As above set forth, the means of our invention is arranged to be applied to a dental handpiece and may be incorporated as a built in part thereof or combined therewith as an attachment. In the embodiment illustrated in Figures 1 and 2, the 25 means is incorporated in an attachment or extension 12 designed to be affixed to an end 15 of a conventional handpiece 13 to provide a contra-angle head for holding the various dental tools, such as drill bits, grinding points and the like.

30 In the design of dental handpiece illustrated, the handpiece includes a hollow supporting body 16 in which is mounted for rotation a tubular spindle 17 arranged to be driven by a pulley 18, the body being borne by a bracket 19 extending 35 from an articulated frame 21, on which is carried driving parts for rotating the pulley in the well known manner. In this type of handpiece, a chuck 22 is located within the end portion 15 of the body 16 for receiving and holding the stem or mandrel of a tool or the shaft of an extension 40 member, such as a contra-angle attachment.

As here shown, the attachment 12 comprises a tubular body or housing formed of two main 45 sections 23 and 24, the section 23 being designed at one end for attachment to the end 15 of the handpiece, while the section 24 is secured to the other end 6 of the section 23 and forms the head or tool bearing portion of the attachment. Attachment of section 23 to the body 16 of the 50 handpiece is preferably effected by inserting the end portion 15 into the bore 26 of the section 23, the bore being preferably slightly tapered so as to facilitate engagement with the tapered exterior of handpiece portion 15. If desired and 55 as here shown, the portion of the section designed

to engage the body 16, is in the form of a coupling 27 firmly secured to the section and having an adapter portion 28 arranged to fit over the portion 15.

Within the outer end portion 29 of the head section 24 is a mandrel 31 which is mounted for rotation in angular relation to the longitudinal axis of the main body of the attachment in bearings 32 and 33 at opposite sides of the end portion 29. A driving connection for the mandrel is afforded by means of a shaft 34 mounted in a bearing 36 in the head section and having affixed thereto a bevel gear 37 meshing with a bevel gear 38 affixed to the mandrel. Shaft 34 which is also angularly disposed with respect to the axis of section 23 is connected by means of a universal joint 39 to a shaft 41 for detachable connection adjacent the end portion 15 with the spindle 17 of the handpiece 13. As will be understood, the outer end of shaft 41 is arranged to engage in the chuck 22 when the end 15 of the handpiece is inserted in the bore 26, and in this manner when the attachment is operatively connected to the handpiece, shaft 41 will be rotated by the spindle 17 in the same manner as a tool stem or mandrel inserted in the chuck.

As is well known, it is customary for dentists, particularly when grinding or polishing a patient's teeth, to apply to the teeth or the grinding or polishing tool, a quantity of an abrasive or polishing substance usually in the form of a paste. This operation as heretofore conducted involves frequent interruption of the grinding or polishing operation, entails conduction of the operation with varying amounts of the paste, and the application of the paste in an uncertain and relatively inefficient manner. In view of the foregoing, our appliance is designed to provide, under control of the operator, a continuous and steady supply of an appropriate amount of the paste to the tip of the tool while the latter is being rotated and applied to the teeth, the paste being withdrawn from an ample supply stored in a magazine or reservoir carried by the appliance. As will be clear from Figure 2, the mandrel 31 is positioned in the head portion 29 with one end 42 protruding outwardly therefrom and formed to receive and support thereat for rotation with the mandrel a tool or tip such as the polishing cup 43. The mandrel, it will be noted, is formed with a longitudinal passage 44 which as here shown extends completely through the mandrel and is arranged to register with an opening or passage 46 provided in the tool 43 and leading to the exposed recess 47 therein. Means is provided for feeding to the passage in the mandrel and into the opening 46, a continuous supply of the substance which is desired to be used in the operation such as the abrasive or polishing paste above referred to. Arranged as shown in Figure 2, within the body section 23 of the attachment is a container or magazine 48 having an outer shell 49 which is preferably formed separate of and fits the wall of the section and an inner shell 50 which is disposed about the shaft 41 and forms in part with the shell 49 a storage or supply chamber 51 for the paste 52. One end of the container 48 is closed by a wall 53 and has provided therein an outlet nipple 54 which is connected as here shown by means of a flexible tube 56 to an elbow 57 leading directly into the mandrel passage 44 at the end 58 opposite the cup 43. Since the mandrel is designed to rotate, the portion of the elbow or connection 57 disposed within the passage is

preferably fitted loosely against the passage walls and in order to provide against leakage or escape of the paste through the end 58, a stuffing box 59 is provided on the adjacent portion of the section 24 and formed to enclose the end 58 and the connection 57. Desirably the walls of passage 44 are formed to diverge from the inlet to the delivering end as a means of facilitating the flow of the paste through the passage.

As a means of forcing the paste from the chamber 51 into the various passages to the recess 47 in the tool, there is mounted for reciprocation in the chamber a plunger 61 which engages the shell 49 and has formed therein a central opening to accommodate the shaft 41 and the shell 50 therearound. At the inner side of the plunger is preferably provided a flexible packing disc 62 formed to engage both shells, and thus provide a sealed joint thereat. As will be clear, when the chamber 51 is filled with paste and the plunger is in the retracted position shown in the drawings, on appropriate forward movement of the plunger the paste will be forced out through the nipple 54, and thence through the tube 56 and passages 44 and 46.

Movement of the plunger to force the material from the chamber 51 is arranged to be effected by power applied from the spindle 17. For converting the rotative power of the shaft to effect rectilinear movement of the plunger there is provided a screw 63 adapted to be rotated by the shaft and having engaged therewith by means of a correspondingly threaded clutch 64, a stem 66 arranged to engage the plunger exteriorly of the chamber. The screw is here shown in the form of an exteriorly threaded sleeve surrounding the shaft and loosely fitted within the stem 66 which is also preferably of tubular construction. Clutch 64 comprises a set of jaws 67 supported in a ring 68 slidably fitted in the section 23 and having an arm 69 riding in a slot 71 in the section to keep the ring and jaws from rotating. The jaws are normally held in a retracted position out of engagement with the screw, but may be moved into engagement by a contraction ring 72 affixed to the end of stem 66 and held from rotating by an arm 70 in the slot 71, the contraction being effected when both rings are moved into cooperative relationship as illustrated in Figure 2. The rings may be held in operative relation with the jaws engaged with the screw by means of a catch 73, and it will thus be clear that with the jaws held in contracted position, the clutch, the stem, and the plunger will be moved longitudinally when the screw is rotated. It is important to note that with the plunger advancing means designed as thus described, no portion thereof including the screw will come in contact with the paste in the chamber, and furthermore since the screw is not required to extend through the plunger or other part of the container 46, the difficulty of maintaining the chamber in a sealed condition will be avoided.

Since the speed of rotation of the spindle and shaft is normally required to be relatively high, such as about 1800 revolutions per minute, it becomes advisable with the appliance in the form shown, to provide for a considerable reduction in speed in respect to the screw in order that the paste will be delivered to the tool gradually and the delivery of the paste afforded either continuously or intermittently over a relatively long period of time during the operation of the appliance. For example, the chamber 48 will be large enough to contain a supply of paste sufficient for delivery

of a desired quantity to the tool for a period of operation amounting to approximately ten minutes. Then with the screw provided with 30 threads per inch, and with a stroke of the plunger of approximately two inches, to substantially evacuate the chamber, it will be advisable that a speed reducing mechanism be operatively inserted between the shaft 41 and the screw which will reduce the speed of the screw to approximately 6 revolutions per minute. In accordance with the above, there is interposed between the shaft and screw a speed reducing unit 74, or a design which will provide for a maximum reduction in the speed within minimum space, and as here shown the unit 74 is in the form of a chain of gears 75 to 80 inclusive, arranged in a planetary relationship in a well known manner; the gears 75 and 80 being secured to the shaft and screw respectively. The unit 74 is positioned directly within a portion 82 of section 23 of the appliance preferably adjacent the end 28 and such portion can be readily enlarged as in the embodiment illustrated in Figures 5 and 6, to accommodate a larger size of said unit. Desirably the unit is enclosed within a housing 83 which is fitted within the portion 82 and is secured against rotation relative thereto. A snap ring 84 engaging the outer end of the casing and a groove in the portion 82 is provided in order to hold the unit against longitudinal displacement.

Since the arm 70 projects from the slot 71 such arm provides an indicator for apprising the operator of the progress of the plunger within the container, and then he may readily gauge the amount of paste remaining in the container, and as a positive as well as automatic means for preventing the plunger from striking the end wall 53 of the container, the screw is foreshortened sufficiently so that before the plunger may reach the wall, the jaws will become disengaged from the screw and thereby prevent further advance of the plunger by the screw.

As an important feature of the appliance, the container 48 is preferably made in the form of a removable cartridge or capsule, so that replenishment of the paste in the appliance may be effected by simply replacing the empty container with a charged refill cartridge. Desirably the plunger, and preferably the tube 56 are included as pre-assembled parts of the refilled cartridge, and in this manner the contents thereof will be kept in a clean and sanitary condition before, as well as after, the cartridge is inserted in the appliance, and at the same time there will be no necessity for cleaning out any of the passages leading from the cartridge to the mandrel. In order to facilitate ready removal of exhausted cartridges and re-insertion of charged, the sections 23 and 24 are demountably connected at a point adjacent the end 53 of the cartridge, and are provided thereat with telescopic portions 86 and 87 which are frictionally held together, the portions being suitably recessed to accommodate the nipple 54, which extends from the container and serves to maintain the sections in alignment and against rotational displacement. In order to retract the stem in connection with the refilling operation, it is merely necessary to release the catch 73 and operate the appliance with the shaft rotated in a reverse direction until the jaws are retracted sufficient to release them from engagement with the screw threads, the clutch and stem members may then be freely retracted manually to starting position and reengaged for the advancing operation.

In the embodiment where the means of our invention is incorporated directly as a part of the dental handpiece, delivery of the paste to the mandrel will be arranged for irrespective of whether the mandrel is supported directly by the handpiece or is carried by an attachment 88 applied to the handpiece as an accessory thereto, as illustrated in Figures 5, 6, and 7. In this embodiment as illustrated, the handpiece 89 has included therein the speed reduction means 91 which is here shown of the same design and construction as the unit 74 and is secured directly to the spindle 92, the screw 93, and the clutch 94. Preferably the paste container 96 is arranged to be removably carried on the exterior of the handpiece housing 97 and affixed thereto by means of a spring clip 98, and the member 99 of the clutch is extended outwardly of the housing 97 to engage the stem 101 which is arranged to bear against the plunger 102 of the container 96. It will thus be clear that the functioning of the paste expelling mechanism is similar in operation to the arrangement illustrated in connection with the first mentioned embodiment. Delivery of the paste from the container to the mandrel is afforded by means of a tube 103 which is attached at one end to the outlet nipple 104 of the container and at the other end to the mandrel connection 106.

It will be noted that since the paste container is associated with the handpiece not only can the attachment be of relatively short length but the exterior thereof, as in the previous embodiment, is devoid of any obstructive protuberances, and therefore the appliance may be inserted within the oral cavity and otherwise operated with the same facility as appliances which lack the advantages of the present invention.

In Figure 11 we have shown an additional form of the invention of the type in which the paste supply means is incorporated with the attachment rather than to the hand piece. The structure in this embodiment is of a more simplified nature than as shown in Figure 1. The plunger 61' of the paste container 48' is simply threaded for engagement with the screw 63' which is rotatably supported in a bearing portion in the end wall 53' of the container so that upon rotation of the screw the plunger will be advanced to expel the paste.

We claim:

1. In a dental appliance, the combination with a dental handpiece having a tubular body member and a rotatable spindle mounted therein and operatively associated with a chuck adjacent one end of said member, of a tubular extension member detachably secured to said body member at said end thereof, a shaft mounted for rotation in said extension member and detachably engaged at one end with said chuck, a tool mandrel carried by said extension member and operatively connected to the other end of said shaft and having a passage extending longitudinally there-through, a polishing tool carried at one end of said mandrel having an opening exposed thereon and communicating with said passage, a magazine containing an abrasive or the like carried by one of said members and with the interior in communication with said mandrel passage, an ejector mounted for movement in said magazine for expelling said abrasive therefrom into said passage, and a driving connection between said shaft and ejector.

2. A dental appliance in accordance with claim 1, in which said magazine is positioned within said extension member.

3. A dental appliance in accordance with claim 1, in which said magazine is in the form of a container without said members and mounted upon one of said members.

4. In a dental handpiece, a tubular body member, a unit mounted for rotation therein, a speed reduction means for said unit adjacent one end of said body, a rotatable mandrel at the other end of said body having a driving connection with said unit and provided with a passage therethrough, an abrading tool carried by said mandrel exteriorly of the body and having an opening communicating with said passage and leading to the exterior of the tool, a reservoir for abrasive material carried by said body member and having the interior thereof in communication with said passage, and means operative by said rotatable unit to discharge the material from said reservoir into said passage on rotation of the unit.

5. In a dental appliance of the character described, a tubular body member, a driving unit extending longitudinally through said member, a rotatable mandrel supported in said member in angular relation to said unit and having a passage therethrough, a tool carried by said mandrel at one end thereof and outwardly of the body and having an opening in communication with said passage, a reservoir for paste or the like carried by said member, a conduit from said reservoir extending into said passage, and power operated means operating independently of said tool for expelling the material from the reservoir through said conduit.

6. In a dental appliance of the character described, a tubular body member, a driving unit extending longitudinally through said member, a rotatable mandrel supported in said member in angular relation to said unit and having a passage therethrough, a tool carried by said mandrel at one end thereof and outwardly of the body and having an opening in communication with said passage, a reservoir for paste or the like carried by said member, a conduit from said reservoir extending into said passage, means for expelling the material from the reservoir through said conduit and a speed reduction means operatively connected to said unit and with said ejector means.

7. In a dental appliance of the character described, a tubular body member, a driving unit extending longitudinally through said member, a rotatable mandrel supported in said member in angular relation to said unit and having a passage therethrough, a tool carried by said mandrel at one end thereof and outwardly of the body and having an opening in communication with said passage, a reservoir for paste or the like carried by said member, a conduit from said reservoir extending into said passage, means for expelling the material from the reservoir through said conduit, a speed reduction means connected to said unit, and means releasably connecting said reduction means to said ejector to advance the ejector upon rotation of said unit.

8. In a dental appliance, a tubular body member having a hollow head section and a hollow body section providing a handle for the member, a shaft mounted for rotation in said body handle section and having an extension positioned within said head, a rotatable mandrel mounted in said head in angular relation to said shaft and having a driving connection therewith, said mandrel having a longitudinal passage extending therethrough, a tool arranged for mounting on said mandrel to project outwardly of said head, a

fixed conduit extending through said head and into engagement with said mandrel in communication with said passage, a stuffing box about said conduit and the portion of the mandrel with which it is engaged, and a reservoir for paste carried by the handle section of said member having the interior thereof in operative communication with said conduit.

9. In a dental handpiece, a tubular body member providing a handle portion, a unit mounted for rotation therein, a speed reduction means for said unit adjacent one end of said body, a rotatable mandrel at the other end of said body having a driving connection with said unit and provided with a passage therethrough, an abrading tool carried by said mandrel exteriorly of the body and having an opening communicating with said passage and leading to the exterior of the tool, a reservoir for abrasive material carried by said body member along said handle portion and having the interior thereof in communication with said passage, and means operatively connected with the speed reduction means for forcing the material from the reservoir for supply to said tool.

10. In a dental appliance for supporting a rotatable tool carrying mandrel, a tubular body member providing a handle portion, a rotatable unit mounted therein and having a connection with said mandrel for rotating same, a cartridge removably fitted within the handle portion of said body and arranged to contain a charge of material of paste-like consistency and having a discharge opening therein, a plunger in said container mounted to expel the material upon advance therein, means extending through said handle portion for advancing said plunger, and means providing a passage from said discharge opening to said mandrel.

11. A dental appliance in accordance with claim 10, characterized by a tube extending through said cartridge and said plunger and surrounding said unit and combining with the cartridge walls to seal the contents thereof from the exterior of the cartridge.

12. In a dental appliance, the combination with a dental handpiece having a tubular body and a rotatable unit mounted therein and arranged to have a tool mandrel carried by the unit, a cartridge removably fitted within said body and arranged to contain a charge of material of paste-like consistency and having an outlet therefrom, a connection for delivering material from said outlet to said mandrel, said cartridge having affixed thereto a tubular portion fitting around said unit and sealing the material therefrom, a plunger mounted in said cartridge movable therethrough to expel the material through said outlet, a stem engaging said plunger outwardly of said cartridge, a rotatable threaded sleeve surrounding said unit and arranged for operative connection with said stem to move the stem longitudinally of said body and advance said plunger on rotation of said unit, and means interconnecting said unit and sleeve to reduce the relative speed of rotation of said sleeve with respect to said unit.

13. In a dental appliance, the combination with a dental handpiece having a tubular body and a rotatable unit mounted therein and arranged to have a tool mandrel carried by the unit, a cartridge removably fitted within said body and arranged to contain a charge of material of paste-like consistency and having an outlet therefrom, a connection for delivering material from said

outlet to said mandrel, said cartridge having af-
fixed thereto a tubular portion fitting around said
unit and sealing the material therefrom, a plung-
er mounted in said cartridge movable there-
through to expel the material through said out-
let, a hollow stem operatively engaging the said
plunger outwardly of said cartridge and disposed
about said unit, a rotatable screw threaded sleeve
positioned within said stem and surrounding said
unit and part of the tubular portion of the car-
tridge, a speed reduction means interconnecting
said unit and sleeve to rotate the sleeve at a lesser
speed than the unit, and a clutch member releasably and operatively connecting said sleeve
and stem for relative longitudinal displacement
upon rotation of the sleeve.

14. A dental appliance adapted for attachment

to a dental handpiece having a rotatable tool
chuck, comprising a tubular body, a paste con-
tainer removably fitted within said body, a shaft
extending through said container and arranged
for operative connection with said chuck, a ro-
tatable mandrel carried by said body operatively
connected for rotation with said shaft, means to
convey the paste from the container to the man-
drel, a screw surrounding said shaft and extend-
ing through said container, a plunger fitting in
said container and supported therein for longi-
tudinal displacement and against rotational dis-
placement, a speed reduction means mounted in
said body connected and operatively interposed
between said screw and shaft.

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