The present invention relates to dental appliances and more particularly to a combined dental mirror and evacuator.

Dental drills, which rotate at a relatively high speed, require a constant flow of coolant applied at the point of drill contact thereby necessitating the use of evacuation means to remove the fluid from the patient's mouth. It is desirable, when using a drill of this type, to remove the coolant fluid from the patient's mouth while maintaining a clear reflecting surface on the dental mirror being used so that progress of the drilling may be observed. Heretofore it has been difficult to maintain a clear reflecting surface on the dental mirror because the coolant fog the mirror even while using an aspirator.

It is, therefore, the principal object of the instant invention to provide a dental mirror for use in combination with a fluid cooled drill which will evacuate fluid from the patient's mouth and maintain the reflecting surface of the mirror free of the coolant during use.

Another object is to provide a device of this class which will eliminate the necessity of stopping the drilling action to clear the mirror surface.

An additional object is to provide a device of this class which may be easily used in the patient's mouth by an attendant for holding the patient's lip or cheek away from the gums and teeth and which simultaneously acts as an aspirator.

Another object is to provide a device of this class which includes swivel means connected with a pressure reducing tubular member or suction tube thus permitting rotation of the device about its longitudinal axis.

Still another object resides in providing means whereby the device may be easily removed for replacement and for cleaning the device.

Yet another object is to provide a device which is removably connected to one outlet of a swivel means and wherein the other outlet of the swivel means projects laterally in right angular relation with respect to the longitudinal axis of the device thus achieving a better balance for manually manipulating the device during use.

The present invention accomplishes these and other objects by providing a tubular handle removably connected at one end to a swivel means and integrally connected at its other end to a fluid receiving end member extending outward at an obtuse angle with respect to the longitudinal axis of the handle. Means connected to the end member removably supports a mirror.

Other objects will be apparent from the following description when taken in conjunction with the accompanying two sheets of drawings, wherein:

FIGURE 1 is an elevational view of the device;
FIGURE 2 is a back or bottom view of the end member including a fragment of the handle;
FIGURE 3 is a vertical cross-sectional view, to an enlarged scale, taken substantially along the line 3--3 of FIG. 1;
FIGURE 4 is a horizontal cross-sectional view, to a similarly enlarged scale, taken substantially along the line 4--4 of FIG. 3;
FIGURE 5 is a top plan view of the mirror, per se;
FIGURE 6 is a vertical cross-sectional view, to an enlarged scale, taken substantially along the line 6--6 of FIG. 5;
FIGURE 7 is a vertical cross-sectional view taken substantially along the line 7--7 of FIG. 1; and

FIGURE 8 is an exploded view of the components forming the swivel means.

Like characters of reference designate like parts in those figures of the drawings in which they occur.

In the drawings:

The reference numeral 10 indicates the device, as a whole, removably connected at one end with a swivel means 12. The device 10 includes an elongated tubular handle and a circular head or end member 16. The head or end member 16 is preferably disk-like and has a peripheral portion integrally connected to a portion of the end of the handle 14 with the plane of the end member disposed at an obtuse angle with respect to the longitudinal axis of the handle. The end member 16 is provided with an upstanding wall 18 which curves aricuantly rearward from its forward edge or side opposite the handle in overhanging relation with respect to its bottom or back 20, as at 21.

The wall of the handle 14 is flattened from opposing sides adjacent its connection with the end member 16, as at 22, and the end edge of the handle wall merges with and is integrally connected to the end member wall 18, as at 24, leaving a transverse free edge portion of the handle wall, as at 26, for the purposes more fully described hereinbelow. The end member bottom or back 20 and its surrounding wall 18 thus forms a cup-like fluid receiving compartment 28 communicating with the bore of the handle 14.

The inner surface of the end member bottom has, integrally connected thereto, a pair of upstanding pillars or supports 30 positioned in spaced-apart relation with respect to the end member wall 18 and in spaced relation with respect to the juncture of the handle and end member. A resilient member or spring 32, in the embodiment shown preferably a length of rod-like spring steel material, is connected by one end portion to the inward surface of the end member back 20 between the supports 30, as at 34, and is arcually curved across the inner surface of the bottom 20 toward the forward overhanging portion of the wall 18. The free end portion of the spring member 32 is arcually turned forward toward the wall, as at 36, and then turned upwardly a selected distance, as at 38. An image reflecting member, preferably a mirror 40, of the type conventionally used in dental mirrors, having a diameter slightly less than the diameter of the end member 16, is positioned within the end member back 20 between the supports 30 and the arc of the mirror 40 rearward toward the juncture of the end member wall and handle 14 so that the forward edge portion of the mirror is maintained in spaced relation with respect to the wall 18 and its overhanging lip portion while an arc of the periphery of the mirror is disposed against an arc of the inner wall 18 adjacent the juncture of the latter with the handle. The height of the supports 30 is preferably such that the plane of the arc of the upper surface of the mirror, adjacent the handle 14, is disposed slightly below the plane defined by the upper edge of the wall 18 at its junction with the handle 14. The forwardly disposed edge or arc of the mirror, supported by the free end portion of the spring member 32, is spaced below the plane defined by the upper edge of the overhanging portion of the wall 18 thus positioning the plane of the upper surface of the mirror on a plane inclined forwardly and downwardly within the space 28 defined by the end member wall. The upstanding portion 38 of the spring member is preferably a length substantially equal to the thickness of the mirror 40. A recess or notch 42 is formed on the periphery of the mirror 40 (FIGS. 5 and 6) for notching an arc of the spring member projection 38 to facilitate positioning the mirror when inserting the latter into the end member 16.

The free end edge portion 26 of the handle extends...
transversely in spaced relation above the plane of the mirror to form an opening, as at 44, for the purposes which will readily be apparent.

The end member back 20, adjacent an arc of its forward edge portion, is provided with a series preferably five equally spaced-apart small diameter apertures 46. The apertures 46 are positioned in the back wall 20 at the juncture of the outer flat surface of the back 20 with the arcuate portion of the wall 18. The spacing between the apertures 46 is preferably approximately 30° so that the spacing between the outermost apertures 46 encompasses an arc of approximately 120° extending end angular on either side of a diametral line of the end member 16 extended forwardly from the axis of the handle 14.

Referring more particularly to FIGS. 7 and 8, the swivel 12 includes a tubular body portion 50 having an intumescence lip portion 52 at one end to form an annular shoulder 54. A rotating sleeve 56 has its outer wall closely received by the inner wall 55 of the housing 50 and is seated at one end on the shoulder 54. The inner wall 58 of the sleeve 56 closely receives the periphery of the end portion of the handle 14. The inner wall of the sleeve 56 is provided, intermediate its ends, with an annular groove 60 for nesting an O-ring 62 which cooperatively seats within an annular groove or recess 64 formed on the periphery of the handle 14 adjacent its end opposite the end member 16. Thus when the handle 14 is rotated about its longitudinal axis, the sleeve 56 is rotated within the housing 50.

A tubular member or stop 66 is closely received by and is fixed to the inner wall 55 of the housing 50 and is seated against the end of the sleeve 56 opposite the shoulder 54. The stop 66 is provided with an inwardly directed flange 68 forming an annular shoulder 69 for limiting the inward movement of the adjacent end of the handle 14. The diametric distance across the inner limit of the flange 68 is substantially equal to the bore of the handle 14. The end of the housing 50, opposite its connection with the handle 14, is closed and sealed by a cap 70 having a rabbeted edge portion, as at 72, which nests the end edge portion of the housing 50. The housing 50 is provided with a lateral port 74 which cooperatively receives one end of a tubular extension 76. The other end of the extension 76 is frictionally inserted within the free end portion of a pressure reducing or suction tube 78 connected with a continuous air-flow vacuum pump, not shown.

**Operation**

In operation the device 10 is inserted into the swivel means 12 which is in turn connected with the suction pump tube 78 as disclosed hereinabove. The end portion of the handle and end member 16 is inserted into the patient's mouth wherein the obtuse angle of the end member, with respect to the longitudinal axis of the handle 14 permits the mirror to be used in a conventional manner. Since the handle 14 is freely rotatable within the swivel 12, the end member 16 may be positioned in the patient's mouth with the back surface 20 facing against the patient's cheek or lips to hold the same in spaced relation with respect to the gums or teeth. Fluid, discharged by the water-cooled high speed drill collecting within the mouth cavity of the patient, is picked up by its rotating cup-shaped portion of the end member 16 and through the apertures 46 by the suction effect through the bore of the handle 14.

The mirror 40 is easily removed from the end member - 16 for cleaning the instrument or replacing the mirror by simply inserting a small instrument, not shown, into the opening or space 44 between the end edge surface 26 of the handle and the adjacent arc of the mirror to force the mirror against the spring means 32 wherein the rearward arcuate edge of the mirror maybe lifted out of contact with that portion of the wall 18 normally contacting a peripheral portion of the mirror surface. The mirror is replaced within the end member 16 by positioning the groove 42 against the spring member portion 33 and forcing the opposite arcuate edge portion of the mirror downwardly within the wall 18 against the supports 30 in a snapping action.

Obviously the invention is susceptible to some change or alteration without defeating its practicality, and it therefore do not wish to be limited to the preferred embodiment shown in the drawings and described herein, further than I am limited by the scope of the appended claims.

1 claim:
1. A dental instrument, comprising: an elongated tubular handle; external connecting means at one end of the handle for connection with a suction line; a shallow cup shaped end member connected to the end of said handle opposite the first said end, said end member disposed at an obtuse angle with respect to the longitudinal axis of said handle, said end member forming a fluid receiving compartment communicating with the liquid passageway in said handle; an arcuate resilient member connected at one end to the inner surface of said end member adjacent its connection with said handle and positioned at its other end portion in closely spaced relation with respect to the inner surface of that portion of the wall of said end member opposite its connection with said handle; and an image reflecting member removably positioned on said resilient member within said end member and extending between the free end of said resilient member and that portion of the wall of said end member opposite its connection with said handle in a plane inclined with respect to the principal plane of said end member.

2. Structure as specified in claim 1 in which said image reflecting member forms an inclined portion in said end member and divides the fluid receiving compartment whereby the suction line draws fluid received by said end member across both surfaces of said image reflecting member.

3. A dental evacuating instrument, comprising: an elongated tubular handle; swivel means connected to one end portion of said handle for rotative movement of said handle about its longitudinal axis, said swivel means having an outlet port normal to the longitudinal axis of said handle and adapted to be connected with a pressure reducing tubular member; a substantially circular end member connected to the other end of said handle at an obtuse angle with respect to the longitudinal axis of said handle, said end member having a surrounding upturned wall portion forming a fluid receiving compartment communicating with the bore of said handle; an arcuate resilient member connected at one end to the inner surface of said end member adjacent its connection with said handle and positioned at its other end portion in closely spaced relation with respect to the inner surface of that portion of the wall of said end member opposite its connection with said handle and an image reflecting member removably positioned on said resilient member within said end member and that portion of the wall of said end member opposite its connection with said handle in a plane inclined with respect to the principal plane of said end member.

4. A dental evacuating instrument, comprising: a tubular handle; a substantially circular end member connected to one end of said handle at an obtuse angle with respect to the longitudinal axis of said handle, said end member having a surrounding upturned wall portion forming a fluid receiving compartment communicating with the bore of said handle; an arcuate resilient member connected at one end to the inner surface of said end member adjacent its connection with said handle and positioned at its other end portion in closely spaced relation with respect to the inner surface of that portion of the wall of said end member opposite its connection with said handle; and an image reflecting member removably
5 positioned on said resilient member within said end member and extending between the free end of said resilient member and that portion of the wall of said end member opposite its connection with said handle in a plane inclined with respect to the principal plane of said end member.

5. A device of the class described, comprising: an elongated tubular handle; a substantially circular end member connected to one end of said handle at an obtuse angle with respect to the axis of said handle, said end member having an arcuate surrounding wall forming a fluid receiving compartment communicating with the bore of said handle; a support connected to the inner surface of said end member adjacent its connection with said handle; a resilient member connected to the inner surface of said end member adjacent its connection with said handle and projecting toward that portion of said wall opposite its connection with said handle; and an image reflecting member removably positioned on said support within said end member and extending between the free end of said resilient member and that portion of said wall connected with said handle in a plane inclined with respect to the principal plane of said end member.

6. Structure as specified in claim 5 and tubular swivel means connected with the end portion of said handle opposite said end member permitting rotation of said handle about its longitudinal axis, said swivel means having a lateral port, at right angle with respect to the longitudinal axis of said handle, adapted for connection with a suction line.

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