

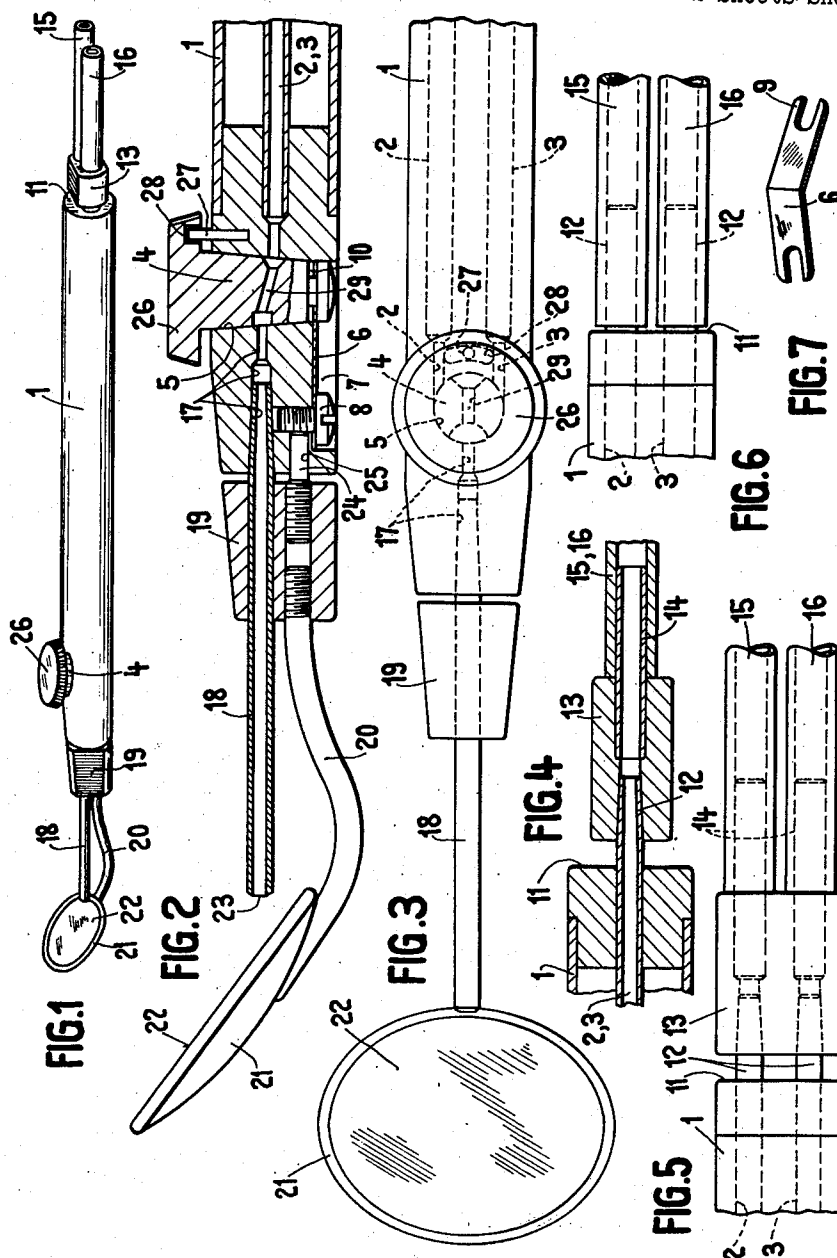
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MOUTH MIRRORS

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2 Sheets-Sheet 1



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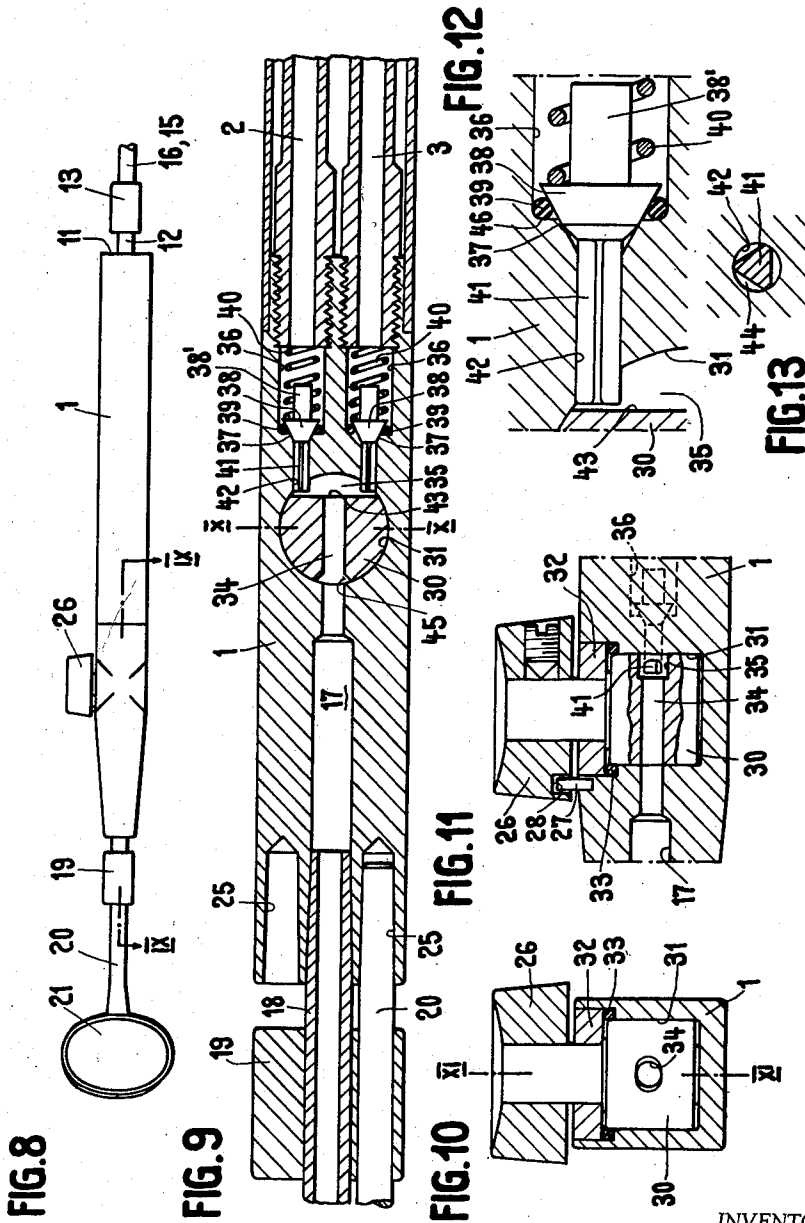
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## MOUTH MIRRORS

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Filed May 13, 1958, Ser. No. 734,983

Claims priority, application Switzerland Oct. 25, 1957

4 Claims. (Cl. 32—69)

During the treatment of a tooth, for instance during milling, the dentist holds in one hand the instrument and in the other hand the mouth mirror by means of which he can observe the working zone. Often the mirror becomes blurred due to the breath of the patient or is soiled by tooth chips or similar materials. Likewise, if the tooth is milled in presence of water, as is often made now for attenuating the pains of the patient, the mirror image is distorted, so that a correct observation is no longer possible. Up till now the dentist had to remove from time to time the mirror out of the mouth of the patient in order to clean the mirror. He had therefore to interrupt his work and deposit his instrument, this involving great waste of time.

Devices are already known which avoid removing the mirror out of the mouth of the patient. Thus, for instance, it has been proposed to project onto the surface of the mirror cleaning water supplied by a water conduit, while the mirror remains in the buccal cavity. In these known mirrors a nozzle adapted to project water onto the tooth being milled traverses the mirror surface and has close in front of the mirror surface a lateral opening supplying water for cleaning the mirror. These known devices have the drawback that water flows in a direction parallel to the mirror surface, so that the cleaning action is inadequate. Moreover, when the mirror is cleaned exclusively with water, this water adheres to the mirror surface, so that the image obtained is highly distorted.

The invention aims at overcoming the above-mentioned drawbacks by the fact that the mirror surface is first rinsed with a liquid, e.g. water, and then the liquid still adhering to the mirror surface is blown out by a jet of gas under pressure, particularly by a jet of compressed air. It is possible to control the supply of liquid and air from the mirror handle. The buccal mirror according to the invention is provided with at least one discharge nozzle opening in front of the mirror surface. Preferably the nozzle extends along the longitudinal axis of the mirror handle and opens at a point lying near the intersection of the longitudinal axis of the handle with the mirror surface, the said surface making an obtuse angle with the said longitudinal axis.

The accompanying drawings show, by way of example, two embodiments of the mouth mirror according to the invention.

Fig. 1 is a perspective view of the first embodiment.

Fig. 2 is an axial section, at an enlarged scale, of the front portion of the handle of the first embodiment with the mirror mounted.

Fig. 3 is a top view corresponding to Fig. 2.

Fig. 4 is an axial section of the rear portion of the handle of the first embodiment, with a plug for the connection of the supply pipes for water and air.

Fig. 5 is a top view corresponding to Fig. 4.

Fig. 6 is a top view similar to Fig. 5, showing another connection means of the supply pipes.

Fig. 7 is a perspective view of the pressing spring for

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the plug of the three-way cock of the first embodiment for selectively controlling water and air supply.

Fig. 8 is a perspective view of the second embodiment.

Fig. 9 is a sectional view, at an enlarged scale, taken along the line IX—IX in Fig. 8.

Fig. 10 is a sectional view taken along the line X—X in Fig. 9.

Fig. 11 is a sectional view taken along the line XI—XI in Fig. 10.

Fig. 12 is a view, partially in section, at an enlarged scale, of a valve.

Fig. 13 is a cross-sectional view of the valve rod.

The handle 1 of the first embodiment illustrated in the drawings is traversed by a water pipe 2 and a compressed air pipe 3, from its rear end 11 up to a three-way cock the plug of which is rotatably mounted in the conical bore 5 of the handle 1 and is pressed by the leaf spring 6 as shown in Fig. 7 against the wall of the bore 5. The leaf spring 6 is arranged in a recess 7 of the handle 1, in which it is secured by means of a screw 8. One of the fork-shaped ends 9 of the spring 6 engages an annular groove 10 of the plug 4. Both pipes 2 and 3 project from the rear end 11 of the handle 1 and constitute conical plug pins 12. On these pins 12 a sleeve or plug 13 can be removably mounted. The sleeve 13 has two connecting pieces 14 on which are mounted the supply pipes 15 and 16 respectively for water and air. The pipes 15 and 16 are preferably flexible and are made for instance of rubber or synthetic material. In the modified embodiment illustrated in Fig. 6, the supply pipes 15 and 16 are directly mounted on the ends 12 of the pipes 2 and 3 projecting from the rear end 11 of the handle 1. On the side of the plug 4 remote from the pipes 2 and 3 is provided a single bore 17 connected to the bore 5 of the three-way cock. In this bore 17 is arranged a pipe 18 extending in the direction of the longitudinal axis of the handle 1 and forming a discharge nozzle 23 at its front end. The pipe 18 is secured to a mounting 19 on which is also screwed the support 20 of the mirror 21. The mirror surface 22 makes an obtuse angle with the longitudinal direction of the handle 1 and therefore also with the axis of the pipe 18. The nozzle 23 of the pipe 18 lies near the intersection of the longitudinal axis of the handle 1 with the mirror surface 22, that is to say, with reference to Fig. 2, near the lower portion of the mirror surface 22. In the mounting 19 is also screwed a pin 24 which enters a bore 25 of the handle 1 and serves as a plug, as does also the conical end of the pipe 18. The mounting 19 with the mirror 21 and the pipe 18 can, therefore, be separated from the handle 1, thus affording the advantage that the mirror 21 can be removed from the handle 1 when it has to be sterilized. The plug 4 of the three-way cock has a round control knob 26 which the dentist can actuate very easily with the same hand which holds the handle 1. The rotation of the knob 26 is limited by a pin 27 secured to the handle 1 and engaging a groove 28 of the knob 26.

When the mirror surface 22 placed in the buccal cavity of the patient is blurred or dirty, the dentist, without removing from the mouth the mirror or the instrument, turns the plug 4 by means of the knob 26 from the position illustrated in Fig. 3, in which the connection between the pipe 18 and both supply pipes 2 and 3 is cut off, in the counter-clockwise direction in Fig. 3 until the bore 29 of the plug 4 is in communication with the pipe 2, so that water under pressure is discharged from the nozzle 23 and is projected against the mirror surface 22. Then, the dentist turns the control knob 26 in the clockwise direction in Fig. 3 until the bore 29 of the plug 4 is in communication with the compressed air pipe 3, so that a jet of compressed air is discharged from the nozzle 23 and is projected against the mirror surface 22, thus

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blowing out the water particles adhering to the mirror surface. These operations may be effected while the mirror is in the mouth of the patient and the dentist is still milling a tooth. Experiments have shown that the mirror surface 22 becomes absolutely clean after the projection of compressed air. Thereafter the dentist brings back the plug 4 into the position of Fig. 3. If the mirror image is blurred because of dry powder issuing from a tooth, it may be kept clean by means of a current of compressed air acting continuously.

In the second embodiment illustrated in Figs. 8 to 13, the same parts are denoted by the same reference numerals as in the preceding example.

Whereas in the example of Figs. 1 to 7 the control knob 26 is placed above when the mirror surface 22 is oriented upwards, the control knob 26 of the second embodiment is arranged laterally when the mirror surface looks upwards. The position of the control knob 26 is therefore shifted by 90° with respect to the vertical, towards left or right according to the manner in which the mirror is mounted on the handle. This arrangement of the control knob facilitates the dentist in the handling of the mirror, since it is easier to actuate a knob arranged laterally than a knob looking upwards. As shown in Fig. 9, the handle 1 has two recessed holes 25 diametrically opposed with respect to the bore 17. According to whether the support 20 of the mirror 21 is inserted into the upper or lower hole 25 (Fig. 9), the mirror surface 22 is oriented towards the front or the rear with respect to the drawing plane of Fig. 8. In Fig. 8 the mirror surface looks towards the rear and the control knob 26 extends upwards. If the mirror surface is oriented upwards, the control knob 26 is therefore on the left side of the handle 1. This is the position in which the dentist introduces the mirror from the left into the mouth of the patient. If the mounting 19 is turned over so that the support 20 enters the other recessed hole 25, the control knob 26 lies at the right of the handle 1 when the mirror surface looks upwards. This is the position in which the dentist introduces the mirror from the right into the mouth of the patient. It is therefore possible, with this second embodiment of the mouth mirror of the invention, to adapt the position of the control knob 26 to the side from which the dentist wishes to introduce the mirror into the mouth of the patient.

The control knob 26 of the second embodiment is no longer connected to the plug of a three-way cock, but, as shown in Figs. 9, 10 and 11, to a control cylinder 30 rotatably mounted in a bore 31 of the casing 1. The cylinder 30 is held axially by a washer 32 forced into the casing 1. The space between the washer 32 and the cylinder 30 is sealed by means of a sealing ring 33 consisting, for instance, of a so-called "O-ring" available on the market. The control cylinder 30 has a radial bore 34 communicating at one end with the bore 17 and opening at the other end into a milled out portion 35 of the cylinder 30. The supply pipes 2 and 3 for water and compressed air are each connected with a valve bore 36 of the casing 1 having a conical valve seat 37 at its end remote from the pipes 2 and 3. The conical valve body 38 carries a sealing ring 39 bearing against the shoulder 46 and has on the side near to the pipes 2 and 3 a guiding pin 38' for a coil spring 40. The spring 40 bears with one end against the valve body 38 and with its other end against the end face of the pipe 2 or 3 respectively. On the end of each valve body near to the control cylinder 30 is secured a valve rod 41 of triangular section (Fig. 13). These rods 41 are arranged in cylindrical bores 42 which open into the milled out portion 35 of the control cylinder 30. The rods 41 end near the bottom 43 of the milled out portion 35.

In the position of Fig. 9 both valves 38 are closed. Neither water nor air can, therefore, enter the bore 17. Now, if the dentist somewhat turns the control cylinder 30 by means of the control knob 26 in the clockwise

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direction in Fig. 9, the bottom 43 of the milled out portion 35 repels the valve rod 41 corresponding to the pipe 2 against the action of the corresponding spring 40, so that the valve corresponding to the pipe 2 opens and water may enter through the pipe 2, the valve bore 36, the space 44 left free in the cylindrical bore 42 by the valve rod 41, the milled out portion 35 and the radial bore 34 of the cylinder 30, into the bore 17. As the movement of rotation of the cylinder 30 is very small and the radial bore 34 is flared out at its end 45, the communication between the bore 34 and the bore 17 is guaranteed in spite of the rotation of the cylinder 30. If the dentist brings back the control knob 26 into the position of Fig. 9, the water supply is cut off. If he turns the knob 26 in the counter-clockwise direction in Fig. 9 from the position illustrated in Fig. 9, the valve corresponding to the compressed air pipe 3 opens and compressed air may be lead into the bore 17 in a manner similar to that described for water. Actuating of the control knob 26 is still facilitated by the fact that when the knob is brought back into its neutral position of the control cylinder 30, the compressed springs 40 promote this movement, so that the dentist need not use much force for actuating the knob 26 and, therefore, is not hindered in his work.

Instead of conical valves disk valves might also be used. It would also be possible to shorten the handle between the control cylinder 30 and the recessed holes 25 by lengthening the mounting 19 and tapering the mounting 19 towards the mirror 21, the mirror thus obtained having a particularly handy shape. Instead of a plug or sleeve 13 it would also be possible, in the second embodiment, to provide a direct connection of the pipes 15 and 16 as shown in Fig. 6.

Two diametrically opposed control knobs might also be secured to the control cylinder 30, sealing rings 33 having then to be placed at both ends of the cylinder 30. In this case, it would no longer be necessary to turn over the mounting 19 if the direction of introduction of the mirror into the mouth of the patient has to be changed.

What I claim is:

1. A dental mirror comprising an elongate handle having a liquid supply conduit and a gas supply conduit provided with external connecting means at one end of the handle for connection to a liquid supply and a gas supply, respectively, said handle having a discharge passage opening upon the opposite end thereof, a valve mounted in said handle movable between positions connecting only the liquid supply conduit or only the gas supply conduit to said discharge passage and a further position blocking said discharge passage from both of said supply conduits, said handle also having, in said opposite end thereof, a recess in spaced parallelism with said discharge passage, a sleeve having a pair of spaced bores therein, a plug member projecting from one of said bores and removably engaged within said recess, a shank projecting from said one bore oppositely of said plug and having a mirror mounted on the free end thereof disposed at an obtuse angle to the axis of said handle and transverse the axis of the other bore, and an elongate discharge tube projecting through said other bore in said sleeve and having one end removably engaged in said discharge passage of the handle with the opposite end of the tube projecting into close proximity to and directed at the base of said mirror disposed closest to said sleeve, the engagement of said plug member and said discharge tube in said handle retaining said mirror in fixed angular relation to said handle, whereby during use the mirror may be cleaned by first connecting said discharge tube to the liquid supply conduit to wash the reflective surface of the mirror and then connecting the tube to the gas supply conduit for drying the reflective surface of the mirror and said sleeve with said mirror and said discharge tube may be removed from said handle for sterilization.

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2. The device of claim 1 wherein said valve means includes a tapered bore formed in the handle to communicate with said supply conduits and said tube, a tapered plug rotatably seated in said bore having a passage formed therethrough, said passage having a widened mouth at the portion near the tube so that the plug may be rotated to selectively communicate said conduits and said tubes through the passage, resilient means in said handle biasing said plug toward the smaller end of the bore to prevent leakage, and means for stopping the plug in two extreme positions each communicating the tube with another conduit.

3. A dental mirror comprising a handle, a mirror mounted on said handle adjacent one end thereof, said handle having a liquid supply conduit and a gas supply conduit, a tube in said handle and having an open end adjacent and directed toward said mirror, valve means in said handle and movable to selectively communicate said liquid and gas supply conduits with said tube, whereby mirror cleaning may be accomplished by washing it with a liquid and then removing the liquid with a gas, a bore formed in the handle and interposed between the tube and conduits, said valve means including a fluid control means in communication with each conduit having an actuating rod projecting into said bore, a control cylinder rotatably mounted in said bore having a chamber formed in one wall the bottom of which defines a cam surface, an actuating rod in the vicinity of each end of the cam surface and closely adjacent thereto so that a small rotation of the control cylinder in one direction actuates one fluid control means through its actu-

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ating rod, while a small rotation of said cylinder in the opposite direction actuates the other fluid control means through its actuating rod, and a passage formed through said control cylinder and communicating said chamber with said tube whereby gas and fluid from said conduits may be selectively conveyed to said tube with but a slight movement of said cylinder.

4. The device of claim 3 wherein each fluid control means includes a compartment in said handle communicating with a conduit, a cylindrical passageway in communication with said compartment and said bore, a valve body in said compartment, means biasing said valve body against said passageway to prevent flow therethrough, said actuating rod having a cross section only partially filling the passageway through which it projects from the valve body so that movement of said valve body against the biasing means communicates the compartment with the chamber through the space between the walls of the control rod and the passageway.

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