Description

BACKGROUND OF THE INVENTION

This invention relates to dental syringe tip assemblies, and more particularly to dental syringe tip assemblies having a disposable tip.

For the past twenty-five years, dentists have been using a three-way syringe. An air tube and a water tube join together at the handpiece. Two operating buttons are provided on the handpiece body to allow activation by the dentist of the air or water. By depressing the air button, air flows out of the tip into the appropriate area of the patient's mouth to dry the field of operation. By depressing the water button, a passive flow of water is emitted to clean and float away debris and congestion from the field of operation. By depressing both buttons simultaneously, a spray of air and water is emitted which flushes away debris which can then be vacuumed from the oral cavity. Typical of a three-way syringe assembly is that shown in U. S. Patent No. 3,874,083 to Buckley.

During these twenty-five years, there has only been one significant improvement made to this essential piece of dental equipment. In approximately 1979, the tip of the syringe was made removable to allow for sterilization. Before 1979, tips were disinfected and cleaned by simply wiping them with alcohol. With the development of the removable tip, sterilization of each tip could be accomplished through the use of steam or chemical heat procedures. However, if done with the appropriate frequency, the tip becomes clogged and unusable in several months. This is due to minerals and other impurities in the steam used in an autoclave which causes alkaline and calcium deposits to build up in the orifices of the tip which interrupt the flow of air and water from the tip. The air and water orifices in the tip are quite small, so that any irregularities occurring during fabrication will also decrease the life expectancy of the tip. Any plugging of the tip orifices results in both a loss of spray pressure as well as a loss of spray accuracy. Tips are conventionally made out of metal and it would be cost prohibitive to discard a metal tip after only a single use.

With the rising incidence of communicable diseases such as hepatitis and acquired immune deficiency syndrome, extreme care must be taken to prevent the transmission of germs (viral or bacteria) from one patient to the next. With the conventional metal tips, it is necessary to sterilize the tip after each patient use. This is due to a condition that occurs in the end of the tip during use known as water retraction (also called suck-back or draw-back), which is a negative pressure applied to the water line. In a syringe, water retraction is used to prevent siphoning or dripping from the water line. When water retraction occurs, water, saliva and blood from the patient's mouth can be drawn back into the end of the tip and then passed on to the next patient. This provides the opportunity for the transfer of infection from one patient to the next. Also, latent bacterial growth can be promoted in both the tip and the entire water system lines because of the existence of this potentially contaminating material. Both the Center for Disease Control and the American Dental Association recommend that water lines be non-retracting. To further mitigate this possibility of cross-contamination from one patient to the next, the routine sterilization of handpieces as well as air/water syringes is desirable. In case of handpieces and air/water syringes that cannot be sterilized, it is recommended that other complete cleaning and disinfection procedures be followed.

A disposable syringe tip according to the preamble of claim 1 is disclosed in U.S. patent No. 4,026,025 to Roderick S. Hunt. The plastic tip is disclosed as flexible and can be easily bent by hand without any special tools or heating. Such a flexible tip would suffer from the limitation that it would not function as a retractor. It is necessary when applying air, water or a spray to the patient's mouth to be able to use the syringe tip as a retractor to move the patient's tongue, cheeks or lips. If the syringe tip were flexible, it would fail to perform this important retraction function.

The syringe tip and mounting collet disclosed in the Hunt patent also have further design limitations. The chamfered surface on the end of the syringe tip effectively directs the air away from the water thereby impeding the formation of the water spray which is so important in a three-way syringe. The small circular air passages further limit the amount of air exiting the end of the tip and these air passages would be subject to being crimped closed when the flexible tip is bent. The syringe tip is press fit on the end of a small nipple on the collet in such a manner that the air and water pressure leaving the handpiece body and entering the syringe tip would lead to a loosening of the press fit thereby causing the syringe tip to dislodge from the nipple. This design is also not adaptable to most three-way piece syringe assemblies on the market.

It is an object of the present invention to provide a syringe tip in which the flow of air, water or spray from the syringe to the oral cavity will be improved and in which the above problems problems are removed in an effective way. For this purpose the syringe tip according to the invention has the features of the characterizing portion of claim 1. Preferred embodiments of the invention are defined in the dependent claims.

Other objects, features and advantages will become apparent when the detailed description and drawings of the present invention are considered.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows an exploded view of a dental syringe assembly incorporating the present invention.

Figure 2 shows a disposable syringe tip of the present invention.

Figure 3 shows a cross-section taken along line 3-3 of Figure 2 of the disposable syringe tip of the present invention.

Figure 4 shows an end view taken along line 4-4 of Figure 2 of the exit end of the disposable syringe tip of the present invention.

Figure 5 shows a cross-section of the exit end of the disposable syringe tip taken along line 5-5 of Figure 4.

Figure 6 shows an end view of the entrance end of the disposable syringe tip taken along line 6-6 of Figure 2.

Figure 7 shows in section the adaptor of the present invention.

Figure 8 shows the adaptor with a portion of the syringe tip mounted thereon.

Figure 9 shows in partial cross-section an alternate embodiment of the syringe tip and adaptor of the present invention.

Figure 10 shows in cross-section a coupling device used in an alternate embodiment of the present invention.

Figure 11 shows in partial cross-section the syringe tip - coupling device- adaptor assembly of an alternate embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A dental syringe assembly 10 includes a conventional handpiece body 12 on which is mounted a syringe tip 14. The tip 14 is an elongated cylindrical member preferably made of a rigid plastic material. The tip 14 is provided with a bend 17, at preferably an angle of approximately 30°, to provide easy access to any portion of the patient's mouth during use of the syringe assembly. An adaptor 20 screws into a threaded opening 13 in the handpiece body 12 and is sealed toward one end of the adaptor by a first rubber O-ring 16. A second rubber O-ring 22 provides a seal at the midpoint of the adaptor 20.

The tip 14 is press fit onto a tapered male connector 21 (see Figures 7 and 8) that is mounted axially in the interior of the adaptor 20. A collet 26 and a third O-ring 24 provide a seal for the tip 14 - male connector 21 assembly. A nut 28 comprises a locking assembly and screws onto the threads 44 on the outer surface of adaptor 20 to secure the tip 14, collet 26 and third O-ring 24 in place. Each of these parts, other than the specific tip 14 and the specific adaptor 20, are the conventional assembly for a three-way syringe tip assembly such as Model No. 23-0090-00 or Model No. 90-0125-00 sold by the Adec Corporation of Newberg, Oregon or the DCI 3-way syringe sold by Air-Con Inc. of Portland, Oregon.

The tip 14 is shown in detail in Figures 2 through 6. The tip 14 is designed to be disposable after a single use. The tip material is fabricated in a single-step extrusion process, and is made from any rigid transparent plastic. A rigid plastic is preferred to fulfill the need to use the tip for continued retraction of the check and tongue by the dental operator. In a preferred embodiment, the tip 14 is made from a polycarbonate plastic or other rigid plastic materials. Suitable rigid plastic transparent material is that sold by General Electric Co. under the trademark Ultem 1000 or that sold by Victrex Corp. under the trademark Peek.

As shown in Figures 2 through 6, a central water passageway 32 runs the entire length of the tip 14 and is used to deliver water from the handpiece body 12 to the patient's mouth. Three air passageways 34 also run the entire length of the tip 14, are disposed circumferentially about the central passageway 32 and are used to deliver air from the handpiece body 12 to the patient's mouth. If both air and water are delivered through the tip 14 simultaneously, a spray results at the exit end 15 of the tip 14.

In a preferred embodiment, the elongated cylindrical member comprising tip 14 has a diameter in a range generally of .140" - .150" most preferably has a diameter of approximately .145". The most passageway 32 has a diameter in a range of generally .035" - .039", and most preferably has a diameter of approximately .036". Each air passageway 34 comprises in cross-section an arcuate section (see Figure 3) approximately one-third of the circumference of the tip 14. Each arcuate section has a width in a range of generally .016" - .20", and preferably has a width of approximately .017". The arcuate sections are separated from one another by thin support segments 38, each having a thickness of approximately .018".

The support segments 38 are also shown in Figure 3 as being symmetrically oriented about the circumference of the tip 14 approximately 120° ± 4° apart. It is also possible to asymmetrically orient the support segments 38 about the circumference of the tip which would result in some of the air passages 34 being longer in cross-section than others. Also, while three support segments 38 are shown, as few as two or as many as four or more

support segments can also be used.

As shown in Figures 4 and 5, at the exit end 15 of the tip 14, the air passages 34 combine to form a continuous 360° annulus 35 around the water passage 32. This can be achieved during the fabrication of the tip 14 by die-cutting to the desire depth each support segment 38 inward from the exit end 15 of the tip 14. While die-cutting is the preferred way of forming the continuous annulus 35, other methods can be used to remove the support segments 38 to the desired depth. In the preferred embodiment, the depth of the continuous annulus 35 from the exit end 15 of the tip 14 inward is approximately .125".

The continuous annulus 35 achieves a quite effective mixing of the air and water which results in a uniform spray which is easily directed by the dental operator at the needed locations in the patient's mouth.

Figures 7 and 8 show the adaptor 20 that is used to connect the tip 14 to the handpiece body 12. The adaptor 20, preferably made of metal, comprises a generally cylindrical body having a hollow interior. The exterior wall 40 of the adaptor 20 has a first set of threads 42 for attaching the adaptor 20 to the threaded opening 13 in the handpiece body 12. A baffle 46 extends across the hollow interior of the cylindrical adaptor 20. Formed integrally with the baffle 46 is a male connector 21 formed as a cylindrical member and having an axial opening 48 therethrough. The male connector 21 is tapered to receive the entrance end 53 of the tip 14. The male connector 21 is also formed of metal and has an outer diameter at its forward end 54 of approximately .032" and tapers out at its bottom end 55 to a diameter of approximately .038". The male connector 21 is press fit into the water passageway 32 of the end 53 of the tip 14. A rounded shoulder 56, which surrounds the bottom of the male connector 21 at the location where the male connector 21 joins the baffle 46, cooperates with a resilient O-ring coating 60 on the entrance end 53 of the tip 14 (see Figure 6) to form a seal to prevent water from leaking. The baffle 46 communicates at 59 through axial opening 48 with a water line by way of a valve (not shown) in the handpiece body 12.

A plurality of circumferentially arranged channels 62 in the cylindrical body provide openings to allow the air from the handpiece body 12 to pass to the hollow interior of the adaptor 20 and then into the air passageway 34.

A second set of threads 44 is provided on the exterior wall 40 of the adaptor 20. These threads 44 cooperate with the threads in nut 28 to seal the tip 14 to the adaptor 20.

The forward interior portion of the adaptor 20 is provided with an hexagonal cross-section 58 which allows the use of an allen wrench to screw the adaptor 20 into the opening 13 in the handpiece body 12.

The present invention yields significant advantages over the syringe tip-adaptor assemblies used previously. By using a disposable syringe tip, a source of infection and cross-contamination of micro-organisms from one patient to the next is eliminated. When a three-way syringe is used, back pressure is created at the end 15 of the syringe tip 14 whenever the air and water flow is abruptly cut off. This back pressure can cause contaminated water, saliva or blood to be drawn back into the tip openings. If the tip 14 were to be used on a second patient, any micro-organisms to the contaminated water, saliva or blood from the first patient could infect the second patient. A disposable tip 14 used for each patient eliminates this problem.

Existing metal tips should be sterilized prior to use using an autoclave sterilization system. The disposable tip eliminates the need for this autoclave sterilization equipment. Each tip 14 is sanitary during the manufacturing process and is then packaged. A dentist selects a packaged tip, removes the tip from its package or visually inspects the tip if it is already installed. The clear rigid plastic material from which the tip is made allows visual verification of the tip's sanitary state. If sterilization is required, such can be achieved during the manufacturing process by using any suitable sterilization process, such as gamma ray sterilization.

The prior art metal tip comprised two concentric tubes - - an inner water tube surrounded by an outer air tube. In practice, the orifice at the end of the prior art metal tip can be quite irregular causing uneven spray when the air and water flows are effected simultaneously. Uneven flows results in an unpredictable spray pattern.

The extruded tip 14 of the present invention yields very uniform orifices for both air and water at the end 15 of the tip 14. This results in a uniform distribution of air, water or spray. A continuous, uninterrupted air supply through parallel air passageways 34 mitigates air turbulence and therefore produces a more accurate and controlled spray.

The adaptor 20 is different from the prior art adaptors. The tapered male connector 21 with the axial opening 48 provides a mounting location for the tip 14 and keeps the water supply separate from the air supply until they are mixed together at the end 15 of the tip 14 to form the spray. When the air and water are activated simultaneously by the dental operator, the continuous 360° air annulus 35 around the central water passage 32 combines to produce a fine spray.

An alternate embodiment of the present invention is shown in Figure 9. The adaptor 120 is a conventional adaptor used in a conventional all-metal dental syringe assembly. The adaptor 120 has a first set of threads 142 for attaching the adaptor 120 to the threaded opening 13 in the handpiece body 12 (Figure 1). The adaptor 120 has a second set of threads 144 which cooperate with the threads in nut 28 (Figure 1) to seal the tip 114 to the adaptor 120. A plurality of circumferentially-disposed channels 162 (only one shown) are provided in the body of the adaptor 120 to allow air from the handpiece body 12 to pass to the hollow interior of the tip 114.

The syringe tip 114 is similar to the tip 14 shown in Figures 2-4. The tip is fabricated from rigid plastic material and has the same internal cross-section configuration shown in Figures 3 and 4. The tip 114 has a tip extension 113 formed integrally with the tip 114 at the entrance end of the tip 114. The tip extension 113 extends through an axial opening 148 in a baffle 146 that extends across the interior of the adaptor 120. The adaptor 120 at its end 157 has an insert portion to accommodate an annular rubber sealing ring that surrounds that tip extension 113.

In the preferred embodiment, the outer diameter of the tip extension 113 is in the range generally of .062" - .066", and most preferably is approximately .064". The length of the tip extension 113 is in the range generally of .012" - .032", and most preferably has a length of approximately .022".

The tip extension 113 has a hollow central channel 117 that allows water from the handpiece body 12 to pass into the central passageway 32 of the tip 114.

Figure 10 shows in cross-section a coupling device 180 used in connection with an alternate embodiment of the present invention. The coupling device 180 comprises a mounting stem 184 having an expanded shoulder 186 and an interior hollow member 182.

The coupling device 180 in use is shown in Figure 11. A conventional adaptor 120 (having the same elements as described with reference to Figure 9) has a coupling device 180 mounted therein. The mounting stem 184 of the coupling device 180 is positioned in the axial opening 148 of the baffle 146 and is held in place by an annular rubber sealing ring 125. The expanded shoulder 186 of the coupling device 180 fits against the interior wall of the baffle 146. A plastic syringe tip 214 is press fit onto the interior hollow member 182 of the coupling device 180. Water from a handpiece body 12 is directed down the hollow passageway 187 in the coupling device 180 to the central passageway 232 of the tip 214. The expanded shoulder 186 does not block the air passageway 162 that provides air to the air passageways 234 in the tip 214.

In the preferred embodiment, the overall length of the coupling device 180 is in the range of generally .815" - .835", and most preferably has a length of approximately .825". The coupling device 180 has a mounting stem 184 that has a length in the range of generally .165" - .185", the expanded shoulder 186 has a length in the range generally of .020" - .030" and the hollow tip member 182 has a length in the range generally of .615" - .635". In the most preferred embodiment, the mounting stem has a length of approximately .025" and the hollow tip member has a length of approximately .625".

Other advantages inure from the use of plastic as the material from which the tip 14 is fabricated. A plastic tip will transmit less heat and cold to sensitive tissues in the oral cavity. Plastic tips are not electrically conductive and will not transmit a spark which can occur during modern dental treatments using electro- surgical devices. Also plastic tips are not harmed by the presence of ultrasonic devices.

The tip 14 is fabricated from a good quality, rigid plastic. The bend in the tip 14 is provided during a heat forming step and once the plastic has cooled, the bend is a permanent part of the rigid tip 14. The entire tip fabrication process including extruding the plastic with the central water passage 32 and the arcuate section air passages 34, cutting the passage extrusion to length, heat forming the bend, die-cutting the continuous 360° air annulus 35 and forming the resilient O-ring seal 60 is performed in a special multiple operation machine.

While the invention has been illustrated with respect to several specific embodiments thereof, these embodiments should be considered as illustrative rather than limiting. Various modifications and additions may be made and will be apparent to those skilled in the art. Accordingly, the invention should not be limited by the foregoing description, but rather should be defined only by the following claims.

Claims

1. A syringe tip comprising an elongated cylindrical plastic member (14) having a first central passageway (32) throughout the entire length of the cylindrical member (14), said first central passageway (32) being generally circular in cross-section, and a plurality of second passageways (34) disposed circumferentially about the first central passageway (32) and extending substantially the entire length of the tip, **characterized** in that the plastic member (14) of the syringe tip is rigid, and said second passageways (34) being generally arcuate in

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An alternate embodiment of the present invention is shown in Figure 9. The adaptor 120 is a conventional adaptor used in a conventional all-metal dental syringe assembly. The adaptor 120 has a first set of threads 142 for attaching the adaptor 120 to the threaded opening 13 in the handpiece body 12 (Figure 1). The adaptor 120 has a second set of threads 144 which cooperate with the threads in nut 28 (Figure 1) to seal the tip 114 to the adaptor 120. A plurality of circumferentially-disposed channels 162 (only one shown) are provided in the body of the adaptor 120 to allow air from the handpiece body 12 to pass to the hollow interior of the tip 114.

The syringe tip 114 is similar to the tip 14 shown in Figures 2-4. The tip is fabricated from rigid plastic material and has the same internal cross-section configuration shown in Figures 3 and 4. The tip 114 has a tip extension 113 formed integrally with the tip 114 at the entrance end of the tip 114. The tip extension 113 extends through an axial opening 148 in a baffle 146 that extends across the interior of the adaptor 120. The adaptor 120 at its end 157 has an insert portion to accommodate an annular rubber sealing ring that surrounds that tip extension 113.

In the preferred embodiment, the outer diameter of the tip extension 113 is in the range generally of .062" - .066", and most preferably is approximately .064". The length of the tip extension 113 is in the range generally of .012" - .032", and most preferably has a length of approximately .022".

The tip extension 113 has a hollow central channel 117 that allows water from the handpiece body 12 to pass into the central passageway 32 of the tip 114.

Figure 10 shows in cross-section a coupling device 180 used in connection with an alternate embodiment of the present invention. The coupling device 180 comprises a mounting stem 184 having an expanded shoulder 186 and an interior hollow member 182.

The coupling device 180 in use is shown in Figure 11. A conventional adaptor 120 (having the same elements as described with reference to Figure 9) has a coupling device 180 mounted therein. The mounting stem 184 of the coupling device 180 is positioned in the axial opening 148 of the baffle 146 and is held in place by an annular rubber sealing ring 125. The expanded shoulder 186 of the coupling device 180 fits against the interior wall of the baffle 146. A plastic syringe tip 214 is press fit onto the interior hollow member 182 of the coupling device 180. Water from a handpiece body 12 is directed down the hollow passageway 187 in the coupling device 180 to the central passageway 232 of the tip 214. The expanded shoulder 186 does not block the air passageway 162 that provides air to the air passageways 234 in the tip 214.

In the preferred embodiment, the overall length of the coupling device 180 is in the range of generally .815" - .835", and most preferably has a length of approximately .825". The coupling device 180 has a mounting stem 184 that has a length in the range of generally .165" - .185", the expanded shoulder 186 has a length in the range generally of .020" - .030" and the hollow tip member 182 has a length in the range generally of .615" - .635". In the most preferred embodiment, the mounting stem has a length of approximately .025" and the hollow tip member has a length of approximately .625".

Other advantages inure from the use of plastic as the material from which the tip 14 is fabricated. A plastic tip will transmit less heat and cold to sensitive tissues in the oral cavity. Plastic tips are not electrically conductive and will not transmit a spark which can occur during modern dental treatments using electro- surgical devices. Also plastic tips are not harmed by the presence of ultrasonic devices.

The tip 14 is fabricated from a good quality, rigid plastic. The bend in the tip 14 is provided during a heat forming step and once the plastic has cooled, the bend is a permanent part of the rigid tip 14. The entire tip fabrication process including extruding the plastic with the central water passage 32 and the arcuate section air passages 34, cutting the passage extrusion to length, heat forming the bend, die-cutting the continuous 360° air annulus 35 and forming the resilient O-ring seal 60 is performed in a special multiple operation machine.

While the invention has been illustrated with respect to several specific embodiments thereof, these embodiments should be considered as illustrative rather than limiting. Various modifications and additions may be made and will be apparent to those skilled in the art. Accordingly, the invention should not be limited by the foregoing description, but rather should be defined only by the following claims.

Claims

1. A syringe tip comprising an elongated cylindrical plastic member (14) having a first central passageway (32) throughout the entire length of the cylindrical member (14), said first central passageway (32) being generally circular in cross-section, and a plurality of second passageways (34) disposed circumferentially about the first central passageway (32) and extending substantially the entire length of the tip, **characterized** in that the plastic member (14) of the syringe tip is rigid, and said second passageways (34) being generally arcuate in

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cross-section.

2. The syringe tip of claim 1 wherein the elongated cylindrical member (14) has a diameter in the range generally of 3.56 mm (.140") - 3.81 mm (.150").

3. The syringe tip of claim 2 wherein the elongated cylindrical member (14) has a diameter of approximately 3.68 mm (.145").

4. The syringe tip of claim 1 wherein the first central passageway (32) has a diameter in a range of generally 0.89 mm (.035") - 0.99 mm (.039").

5. The syringe tip of claim 4 wherein the first central passageway (32) has a diameter of approximately 0.91 mm (.036").

6. The syringe tip of claim 1 wherein each second passageway (34) has a width in a range of generally 0.41 mm (.016") - 0.51 mm (.020").

7. The syringe tip of claim 6 wherein each second passageway (34) has a width of approximately 0.43 mm (.017").

8. The syringe tip of claim 1 wherein a thin support segment (38) separates each second passageway (34) from one another.

9. The syringe tip of claim 8 wherein the thin support segment (38) has a thickness of approximately 0.46 mm (.018").

10. The syringe tip of claim 1 wherein the plurality of second passageways (34) combine to form a continuous annulus (35) around the first central passageway (32) at the exit end of the syringe tip.

11. The syringe tip of claim 10 wherein the depth of the continuous annulus (35) is approximately 3.18 mm (.125").

12. The syringe tip of claim 1 wherein the elongated cylindrical member (14) has a bend along the length thereof.

13. The syringe tip of claim 12 wherein the bend has an angle of approximately 30°.

14. The syringe tip of claim 1 further comprising a syringe tip extension (113) having an interior passageway (117) for joining the syringe tip to an adaptor (120).

15. The syringe tip of claim 14 wherein the syringe tip extension (113) is formed integrally with the elongated cylindrical member (114) at the entrance end of the tip.

16. The syringe tip of claim 14 wherein the outer diameter of the syringe tip extension (113) is less than the outer diameter of the elongated cylindrical member (114).

17. The syringe tip of claim 14 wherein the outer diameter of the syringe tip extension (113) is in the range generally of 1.57 mm (.062") - 1.68 mm (.066").

18. The syringe tip of claim 17 wherein the outer diameter of the syringe tip extension (113) is approximately 1.63 mm (.064").

19. The syringe tip of claim 14 wherein the length of the syringe tip extension (113) is in a range of generally 0.30 mm (.012") - 0.81 mm (.032").

20. The syringe tip of claim 19 wherein the length of the syringe tip extension (113) is approximately 0.56 mm (.022").

21. The syringe tip of claim 1 wherein the elongated cylindrical member (14) is made of a polycarbonate plastic.

22. The syringe tip of claim 21 wherein the elongated cylindrical member (14) is transparent.

23. The syringe tip of claim 1 wherein the elongated cylindrical member (14) is transparent.

24. The syringe tip of claim 1 wherein the first central passageway (32) is a water passageway.

25. The syringe tip of claim 24 wherein the second passageway (34) is an air passageway.

26. The syringe tip of claim 1 wherein the second passageway (34) is an air passageway.

27. The syringe tip of claim 1 further comprising: means (120) for mounting the syringe tip (114) and syringe tip extension (113) to a handpiece body.

28. The syringe tip assembly of claim 27 wherein the means (120) for mounting the syringe tip (114) and syringe tip extension (113) to a handpiece body comprises a syringe tip adaptor (120) comprising

a) a generally cylindrical body (120) having a hollow interior,
b) means (142) for connecting the cylindrical body (120) to the handpiece body (12),
c) a baffle (146) mounted within the hollow interior of the cylindrical body (120), and
d) an axial opening (148) in the baffle for receiving the syringe tip extension (113).

29. The syringe tip assembly of claim 1 further comprising:
a syringe tip coupling device (180) comprising a mounting stem (184) having an internal passageway for mounting the syringe tip coupling device (180) to the adaptor means (120), an expanded shoulder (186) on one end of the mounting stem (184) and a hollow tip member (182) having an internal passageway mounted to the expanded shoulder (186) for mounting the syringe tip (14) on the coupling device (180).

30. The syringe tip coupling device of claim 29 wherein the mounting stem (184) has a length in a range generally of 4.19 mm (.165") - 4.70 mm (.185"), the expanded shoulder (186) has a length in a range generally of 0.51 mm (.020") - 0.76 mm (.030") inches and the hollow tip member (182) has a length in a range generally of 15.62 mm (.615") - 16.13 mm (.635").

31. The syringe tip coupling device of claim 30 wherein the mounting stem (184) has a length of approximately 4.45 mm (.175"), the expanded shoulder (186) has a length of approximately 0.64 mm (.025") and the hollow tip member (182) has a length of approximately 15.88 mm (.625").

32. The syringe tip of claim 1 further comprising:
means (20) for mounting the syringe tip (14) to a handpiece body (12).

33. The syringe tip assembly of claim 32 wherein the means (20) for mounting the syringe tip (14) to a handpiece body (12) comprises a syringe tip adaptor (20) comprising
a) a generally cylindrical body (20) having a hollow interior,
b) first means (42) for connecting the cylindrical body (20) to the handpiece body (12).
c) a baffle (46) mounted within the hollow interior of the cylindrical body (20),
d) a tapered male connector (21) formed integrally with the baffle (46) and having an axial opening (48) therethrough whereby when a syringe tip (14) is mounted on the tapered male connector (21), the syringe tip (14) will be tightly held on the tapered male connector (21) to ensure that the air and water passageways do not leak into each other, and
e) a rounded shoulder (56) surrounding the tapered male connector (21) at the location where the male connector (21) meets the baffle (46) to provide a sealing surface when the syringe tip (14) is mounted on the male connector (21) and to provide access for air to enter into air passageways (34) in the syringe tip (14) while at the same time preventing water from leaking out of a water passageway (32) in the syringe tip (14).

Patentansprüche

1. Endstück für eine Spritzdüse, bestehend aus einem langgestreckten zylindrischen Kunststoffrohr (14) mit einen sich über die gesamte Länge des zylindrischen Kunststoffrohrs (14) erstreckenden ersten Zentralen Durchflußkanal (32), der einen im wesentlichen kreisförmigen Querschnitt aufweist, und mit einer Vielzahl von zweiten Durchflußkanälen (34), die kreisförmig um den ersten Zentralen Durchflußkanal (32) angeordnet sind und sich im wesentlichen über die gesamte Länge des Endstückes erstrecken, **dadurch gekennzeichnet**, daß das Kunststoffrohr (14) der Spritzdüse steif ist, und daß die Zweiten Durchflußkanäle (34) einen im wesentlichen bogenförmigen Querschnitt aufweisen.

2. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß das langgestreckte zylindrische Kunststoffrohr (14) einen Durchmesser hat, der im wesentlichen im Bereich Zwischen 3.56 mm (.140 ") bis 3.81 mm (.150 ") liegt.

3. Endstück nach Anspruch 2, dadurch gekennzeichnet, daß das langgestreckte zylindrische Kunststoffrohr (14) einen Durchmesser von angenähert 3.68 mm (.145 ") hat.

4. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß der erste zentrale Durchflußkanal (32) einen Durchmesser hat, der im wesentlichen im Bereich zwischen 0.89 mm (.035 ") bis 0.99 mm (.039 ") liegt.

5. Endstück nach Anspruch 4, dadurch gekennzeichnet, daß der erste zentrale Durchflußkanal (32) einen Durchmesser von angenähert 0.91 mm (.036 ") hat.

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6. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß jeder zweite Durchflußkanal (34) eine Durchflußbreite hat, die im wesentlichen im Bereich zwischen 0.41 mm (.016 ") bis 0.51 mm (.020 ") liegt.

7. Endstück nach Anspruch 6, dadurch gekennzeichnet, daß jeder zweite Durchflußkanal (34) eine Durchflußbreite von angenähert 0.43 mm (.017 ") hat.

8. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß die zweiten Durchflußkanäle (34) voneinander jeweils durch einen dünnen Stützsteg (38) getrennt sind.

9. Endstück nach Anspruch 8, dadurch gekennzeichnet, daß der dünne Stützsteg (38) eine Dicke von angenähert 0.46 mm (.018 ") hat.

10. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß die Vielzahl der zweiten Durchflußkanäle (34) in Kombination einen durchlaufenden Ring (35) um den ersten Durchflußkanal (32) am Austrittsende der Spritzdüse formen.

11. Endstück nach Anspruch 10, dadurch gekennzeichnet, daß die Tiefe des durchlaufenden Rings (35) angenähert 3.18 mm (.125 ") beträgt.

12. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß das langgestreckte zylindrische Kunststoffrohr (14) eine Biegung in Längserstreckung aufweist.

13. Endstück nach Anspruch 12, dadurch gekennzeichnet, daß die Biegung einen Winkel von angenähert 30° beschreibt.

14. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß das Endstück eine Endstückverlängerung (113) mit einem internen Durchflußkanal (117) zur Verbindung des Endstückes mit einem Adapter (120) aufweist.

15. Endstück nach Anspruch 14, dadurch gekennzeichnet, daß die Endstückverlängerung (113) zusammen mit dem langgestreckten zylindrischen Kunststoffrohr (114) am eingangsseitigen Ende des Endstückes geformt ist.

16. Endstück nach Anspruch 14, dadurch gekennzeichnet, daß der Außendurchmesser der Endstückverlängerung (113) kleiner als der Außendurchmesser des langgestreckten zylindrischen Kunststoffrohrs (114) ist.

17. Endstück nach Anspruch 14, dadurch gekennzeichnet, daß der Außendurchmesser der Endstückverlängerung (113) im allgemeinen im Bereich zwischen 1.57 mm (.062 ") bis 1.68 mm (.066 ") liegt.

18. Endstück nach Anspruch 17, dadurch gekennzeichnet, daß der Außendurchmesser der Endstückverlängerung (113) angenähert 1.63 mm (.064 ") beträgt.

19. Endstück nach Anspruch 14, dadurch gekennzeichnet, daß die Länge der Endstückverlängerung (113) im allgemeinen im Bereich zwischen 0.30 mm (.012 ") bis 0.81 mm (.032 ") liegt.

20. Endstück nach Anspruch 19, dadurch gekennzeichnet, daß die Länge der Endstückverlängerung (113) angenähert 0.56 mm (.022 ") beträgt.

21. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß das langgestreckte zylindrische Kunststoffrohr (14) aus Polycarbonat hergestellt ist.

22. Endstück nach Anspruch 21, dadurch gekennzeichnet, daß das langgestreckte zylindrische Kunststoffrohr (14) transparent ist.

23. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß das langgestreckte zylindrische Kunststoffrohr (14) transparent ist.

24. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß der erste zentrale Durchflußkanal (32) ein Wasserdurchflußkanal ist.

25. Endstück nach Anspruch 24, dadurch gekennzeichnet, daß der zweite Durchflußkanal (34) ein Luftdurchflußkanal ist.

26. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß der zweite Durchflußkanal (34) ein Luftdurchflußkanal ist.

27. Endstück nach Anspruch 1, dadurch gekennzeichnet, daß Mittel (120) zur Montage des Endstückes (114) und der Endstückverlängerung (113) an einem Handstück (12) vorgesehen sind.

28. Bausatz für das Endstück einer Spritzdüse nach Anspruch 27, wobei die Mittel (120) zur Montage des Endstückes (114) und der Endstückverlängerung (113) an einem Handstück (12) aus einem Adapter bestehen mit

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a) einem im wesentlichen zylindrischen Hohlkörper (120),
b) Mitteln (142) zur Verbindung des zylindrischen Hohlkörpers (120) mit dem Handstück (12),
c) einem im innenseitigen Hohlraum des zylindrischen Hohlkörpers (120) angebrachten Zwischenstück (146) und
d) einer axialen Öffnung (148) im Zwischenstück (146) zur Aufnahme der Endstückverlängerung (113).

29. Bausatz für das Endstück einer Spritzdüse nach Anspruch 1, gekennzeichnet durch eine Endstückkupplungsvorrichtung (180) mit einem Montageschaft (184), der einen internen Durchflußkanal zur Montage der Endstückkupplungsvorrichtung (180) am Adapter (120) aufweist, und durch eine vorstehende Schulter (186) an einem Ende des Montageschaftes (184) und ein Hohldüsenteil (182) mit einem internen an der vorstehenden Schulter (186) montierten Durchflußkanal, um das Endstück (14) mit der Endstückkupplungsvorrichtung (180) zu verbinden.

30. Kupplungsvorrichtung für das Endstück einer Spritzdüse nach Anspruch 29, dadurch gekennzeichnet, daß der Montageschaft (184) eine Länge hat, die im wesentlichen zwischen 4.19 mm (.165 ") bis 4.70 mm (.185 ") liegt, daß die vorstehende Schulter (186) eine Länge hat, die im wesentlichen im Bereich zwischen 0.51 mm (.020 ") bis 0.76 mm (.030 ") liegt, und daß das Hohldüsenteil (182) eine Länge hat, die im wesentlichen 15.62 mm (.615 ") bis 16.13 mm (.635 ") beträgt.

31. Kupplungsvorrichtung nach Anspruch 30, dadurch gekennzeichnet, daß der Montageschaft (184) eine Länge von angenähert 4.45 mm (.175 ") hat, daß die vorstehende Schulter (186) eine Länge von angenähert 0.64 mm (.025 ") hat, und daß das Hohldüsenteil (182) eine Länge von angenähert 15.88 mm (.625 ") hat.

32. Endstück nach Anspruch 1, gekennzeichnet durch Mittel (20) zur Montage des Endstückes (14) an einem Handstück (12).

33. Bausatz für das Endstück einer Spritzdüse nach Anspruch 32, wobei die Mittel (20) zur Montage des Endstückes (14) am Handstück (12) einen Endstückadapter aufweisen mit
a) einem im wesentlichen zylindrischen Hohlkörper (20),
b) ersten Mitteln (42) zum Verbinden des zylindrischen Hohlkörpers (20) mit dem Handstück (12),
c) einem im innenseitigen Hohlraum des zylindrischen Hohlkörpers (20) montierten Zwischenstück (46).
d) einem an das Zwischenstück (46) angeformten kegelförmigen Verbindungsstift (21) mit einer durchgehenden axialen Öffnung (48), wobei das Endstück (14) auf dem Verbindungsstift (21) befestigt ist, und das Endstück (14) dicht bzw. eng auf dem Verbindungsstift (21) gehalten wird, um eine gegenseitige Leckage des Luftdurchflußkanals (34) und Wasserdurchflußkanals (32) zu verhindern und
e) einer abgerundeten Schulter (56), die den kegelförmigen Verbindungsstift (21) an der Stelle umschließt, an welcher der Verbindungsstift (21) in das Zwischenstück (46) übergeht, um eine abdichtende Oberfläche zu erhalten, sobald das Endstück (14) auf dem Verbindungsstift (21) montiert ist und um Luftzufuhr in den Luftdurchflußkanal (34) in dem Endstück (14) sicherzustellen, während zur gleichen Zeit eine Wasserleckage vom Wasserdurchflußkanal (32) in das Endstück (14) verhindert wird.

Revendications

1. Embout pour seringue comportant un élément (14) cylindrique allongé en matière plastique ayant un premier passage central (32) s'étendant à travers toute la longueur de l'élément cylindrique (14), ledit premier passage central (32) ayant en coupe une forme générale circulaire, et plusieurs seconds passages (34) disposés circonférentiellement autour du premier passage central (32) et s'étendant à peu près sur toute la longueur de l'embout, caractérisé en ce que l'élément (14) en matière plastique de l'embout pour seringue est rigide, et lesdits seconds passages (34) ont en coupe une forme générale d'arc de cercle.

2. Embout pour seringue selon la revendication 1, dans lequel l'élément (14) cylindrique allongé a un diamètre situé dans la plage allant de manière générale de 3,56 mm à 3,81 mm (0,140 pouce à 0,150 pouce).

3. Embout pour seringue selon la revendication 2, dans lequel l'élément (14) cylindrique allongé a un diamètre d'approximativement 3,68 mm (0,145 pouce).

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4. Embout pour seringue selon la revendication 1, dans lequel le premier passage central (32) a un diamètre situé dans une plage allant de manière générale de 0,89 mm à 0,99 mm (0,035 pouce à 0,039 pouce).

5. Embout pour seringue selon la revendication 4, dans lequel le premier passage central (32) a un diamètre d'approximativement 0,91 mm (0,036 pouce).

6. Embout pour seringue selon la revendication 1, dans lequel chaque second passage (34) a une largeur située dans une plage allant de manière générale de 0,41 mm à 0,51 mm (0,016 pouce à 0,020 pouce).

7. Embout pour seringue selon la revendication 6, dans lequel chaque second passage (34) a une largeur d'approximativement 0,43 mm (0,017 pouce).

8. Embout pour seringue selon la revendication 1, dans lequel un mince segment (38) formant support sépare chaque second passage (34) d'un autre second passage.

9. Embout pour seringue selon la revendication 8, dans lequel le mince segment (38) formant support a une épaisseur d'approximativement 0,46 mm (0,018 pouce).

10. Embout pour seringue selon la revendication 1, dans lequel les plusieurs seconds passages (34) se combinent pour former un espace de forme (35) continu autour du premier passage central (32) au niveau de l'extrémité de sortie de l'embout pour seringue.

11. Embout pour seringue selon la revendication 10, dans lequel la profondeur de l'annulaire (35) continu est approximativement de 3,18 mm (0,125 pouce).

12. Embout pour seringue selon la revendication 1, dans lequel l'élément (14) allongé cylindrique est courbé sur sa longueur.

13. Embout pour seringue selon la revendication 12, dans lequel la courbure présente un angle d'environ 30°.

14. Embout pour seringue selon la revendication 1, comportant en outre un prolongement (113) d'embout pour seringue ayant un passage intérieur (117) pour relier l'embout pour seringue à un adaptateur (120).

15. Embout pour seringue selon la revendication 14, dans lequel le prolongement (113) d'embout pour seringue est formé en étant venu de matière avec l'élément (114) allongé cylindrique en étant situé à l'extrémité d'entrée de l'embout.

16. Embout pour seringue selon la revendication 14, dans lequel le diamètre extérieur du prolongement (113) de l'embout pour seringue est plus petit que le diamètre extérieur de l'élément (114) allongé cylindrique.

17. Embout pour seringue selon la revendication 14, dans lequel le diamètre extérieur du prolongement (113) d'embout pour seringue est situé dans la plage allant de manière générale de 1,57 mm à 1,68 mm (0,062 pouce à 0,066 pouce).

18. Embout pour seringue selon la revendication 17, dans lequel le diamètre extérieur du prolongement (113) d'embout pour seringue est approximativement de 1,63 mm (0,064 pouce).

19. Embout pour seringue selon la revendication 14, dans lequel la longueur du prolongement (113) d'embout pour seringue est situé dans une plage allant de manière générale de 0,30 mm à 0,81 mm (0,012 pouce à 0,032 pouce).

20. Embout pour seringue selon la revendication 19, dans lequel la longueur du prolongement (113) d'embout pour seringue est approximativement de 0,56 mm (0,022 pouce).

21. Embout pour seringue selon la revendication 1, dans lequel l'élément (14) allongé cylindrique est constitué d'une matière plastique en polycarbonate.

22. Embout pour seringue selon la revendication 21, dans lequel l'élément (14) allongé cylindrique est transparent.

23. Embout pour seringue selon la revendication 1, dans lequel l'élément (14) allongé cylindrique est transparent.

24. Embout pour seringue selon la revendication 1, dans lequel le premier passage central (32) est un passage d'eau.

25. Embout pour seringue selon la revendication 24, dans lequel le second passage (34) est un passage d'air.

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26. Embout pour seringue selon la revendication 1, dans lequel le second passage (34) est un passage d'air.

27. Embout pour seringue selon la revendication 1, comportant en outre des moyens (120) de montage de l'embout (114) pour seringue et du prolongement (113) d'embout pour seringue sur un corps formant porte-outil.

28. Ensemble formant embout pour seringue selon la revendication 27, dans lequel les moyens (120) de montage de l'embout (114) pour seringue et du prolongement (113) d'embout pour seringue sur un corps formant porte-outil comportent un adaptateur (120) d'embout pour seringue comportant
a) un corps (120) de manière générale cylindrique ayant une partie intérieure creuse,
b) des moyens (142) pour relier le corps (120) cylindrique au corps (12) formant porte-outil,
c) une cloison (146) montée à l'intérieur de la partie intérieure creuse du corps (120) cylindrique, et
d) une ouverture axiale (148) située dans la cloison pour recevoir le prolongement (113) de l'embout pour seringue.

29. Ensemble formant embout pour seringue selon la revendication 1, comportant en outre :
un dispositif (180) de raccordement d'embout pour seringue comportant une queue de montage (184) ayant un passage intérieur pour monter le dispositif (180) de raccordement d'embout pour seringue sur les moyens (120) formant adaptateur, un épaulement (186) évasé sur une extrémité de la queue de montage (184) et un élément (182) formant embout creux ayant un passage interne monté sur l'épaulement évasé (186) pour monter l'embout (14) pour seringue sur le dispositif (180) de raccordement.

30. Dispositif de raccordement d'embout pour seringue selon la revendication 29, dans lequel la queue de montage (184) a une longueur située dans une plage générale allant de 4,19 mm à 4,70 mm (0,165 pouce à 0,185 pouce) l'épaulement évasé (186) ayant une longueur située dans une plage générale allant de 0,51 mm à 0,76 mm (0,020 pouce à 0,030 pouce) et l'élément (182) formant embout creux a une longueur situé dans une plage générale allant de 15,62 mm à 16,13 mm (0,615 pouce à 0,635 pouce).

31. Dispositif de raccordement d'embout pour seringue selon la revendication 30, dans lequel la queue de montage (184) a une longueur d'approximativement 4,45 mm (0,175 pouce), l'épaulement évasé (186) a une longueur d'approximativement 0,64 mm (0,025 pouce) et l'élément (182) formant embout creux a une longueur d'approximativement 15,88 mm (0,625 pouce).

32. Embout pour seringue selon la revendication 1, comportant en outre des moyens (20) de montage de l'embout (14) pour seringue sur un corps (12) formant porte-outil.

33. Ensemble formant embout pour seringue selon la revendication 32, dans lequel les moyens (20) de montage de l'embout (14) pour seringue sur un corps (12) formant porte-outil comportent un adaptateur (20) d'embout pour seringue comportant :
a) un corps (20) de manière générale cylindrique ayant une partie intérieure creuse,
b) des premiers moyens (42) pour relier le corps cylindrique (20) au corps (12) formant porte-outil,
c) une cloison (46) montée à l'intérieur de la partie intérieure creuse du corps (20) cylindrique,
d) un raccord (20) conique mâle formé étant venu de matière avec la cloison (46) et ayant une ouverture axiale (48) traversante de telle sorte que lorsqu'un embout (14) pour seringue est monté sur le raccord (21) conique mâle l'embout (14) pour seringue sera maintenu serré sur le raccord (21) conique mâle pour assurer que les passages d'air et d'eau ne fuient pas l'un dans l'autre, et
e) un épaulement arrondi (56) entourant le raccord (21) conique mâle à l'endroit où le raccord mâle (21) rejoint la cloison (46) pour fournir une surface d'étanchéité lorsque l'embout (14) pour seringue est monté sur le raccord mâle (21) et pour fournir un accès pour que l'air puisse entrer dans les passages d'air (34) situés dans l'embout (14) pour seringue tout en empêchant en même temps l'eau de fuir à l'extérieur d'un passage d'eau (32) situé dans l'embout (14) formant seringue.