United States Patent

[11] **3,570,483**

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[21] Appl. No. **678,952**
[22] Filed **Oct. 30, 1967**
[45] Patented **Mar. 16, 1971**
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[54] **DENTAL SYRINGE WITH RELEASABLE HOSE COUPLING**
2 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **128/173.1,** 128/229, 339/16, 339/89, 339/211
[51] **Int. Cl.** **A61c 17/02**
[50] **Field of Search** ..... 128/173.1, 224 (Inquired), 229, 353 (Inquired); 339/15, 16, 96, 211, 111, 89

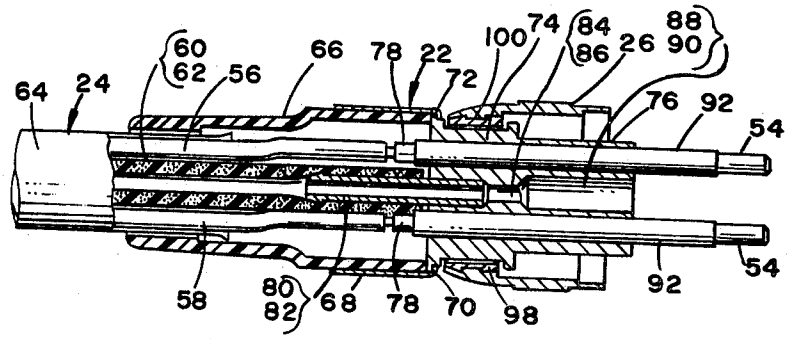
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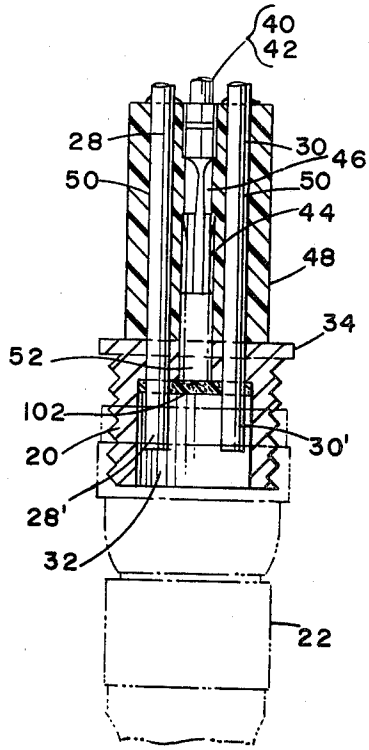
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ABSTRACT: A dental syringe provided with a handle having a coupling end and a discharge head for air, water and a spray mist and an electrical heater in the handle. A flexible hose having a coupling end connectable to the coupling end of the handle to supply air, water and electrical current thereto. Coupling means engages with the coupling ends of the handle and hose operable to quickly connect said hose to said handle and automatically connect the conduits and conductors of said hose correspondingly to those in said handle without any disassembly of the syringe. The male coupling body is made of metal and is attached to the flexible hose and has female passages for air and water and for two male electrical conductors, which are surrounded by electrical insulation which extends beyond the end of the coupling body. The female coupling body is made of an electrically insulative material and has male air and water passages and female passages having electrical conductors. When coupled, the insulation around the male electrical conductors extends into the female electrical passages in the female connector.





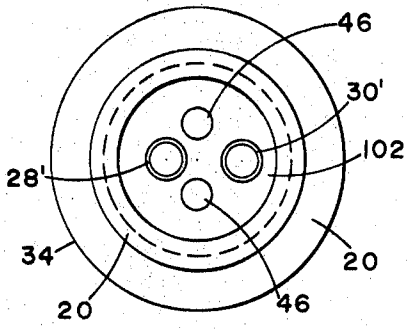


FIG. 3

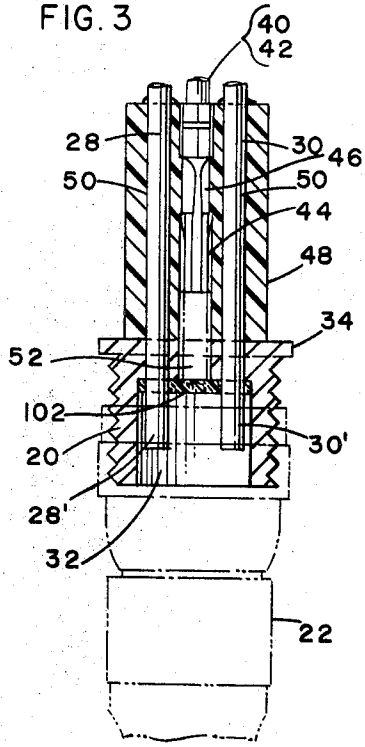


FIG. 4

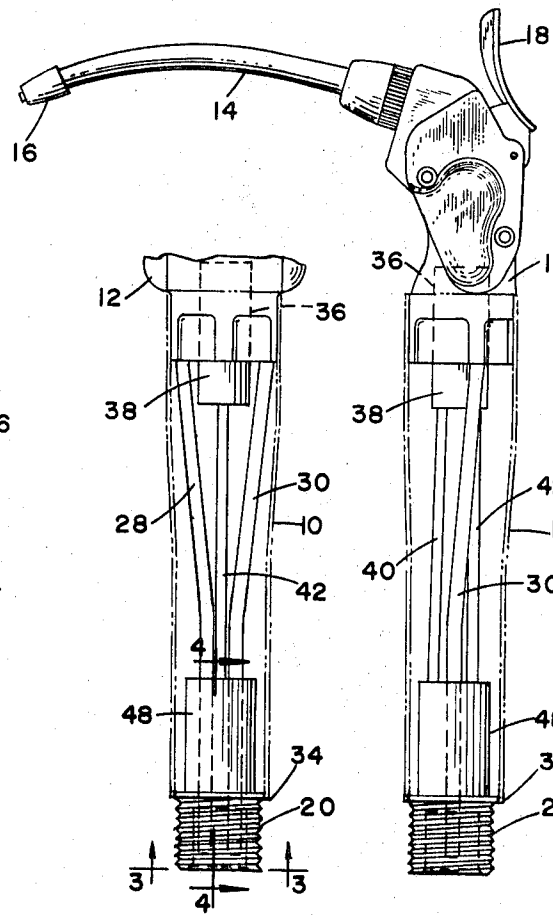


FIG. 2 FIG. 1

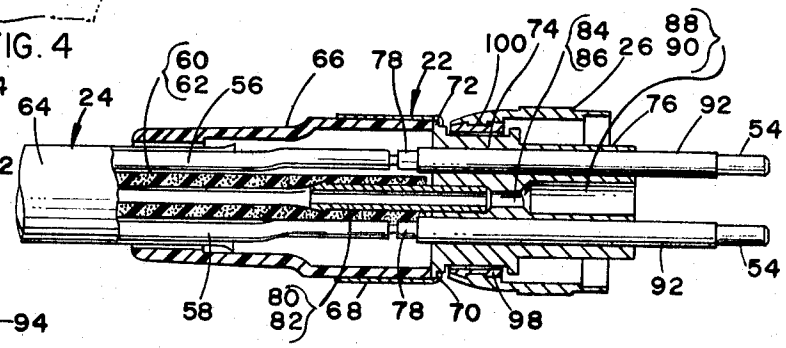


FIG. 5

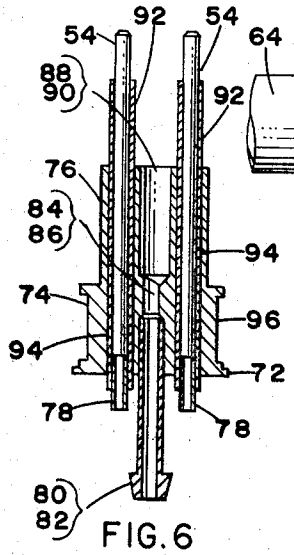


FIG. 6

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DENTAL SYRINGE WITH RELEASABLE HOSE COUPLING

CROSS-REFERENCE TO RELATED APPLICATION

The present invention pertains to coupling means by which the coupling end of a dental syringe is connectable to and disconnectable from the coupling end of a hose containing air and water conduits and electrical conductors to furnish such dental utilities to the syringe for the discharge of air and water, or mixtures thereof in the form of a spray, said nozzle being carried by a discharge head at the opposite end of the handle of the syringe from the coupling end thereof. The discharge of either air, water, or a spray from said discharge head is controlled by valve means and actuating members thereon comprising the subject matter of copending application Ser. No. 658,795, filed Aug. 7, 1967, in the name of the present inventor.

BACKGROUND OF THE INVENTION

For a substantial period of time, dental syringes have been available which individually discharge jets of air or water from nozzle means at one end thereof. These syringes have been provided with simple coupling means respectively to connect either an air-conducting or water-conducting hose to coupling means on the syringe.

In relatively recent years, dental syringes have been available which are of a compound nature and selectively may be operated to discharge either air, water, or a mixture of the two in the form of a spray mist or the like, depending upon the requirements of any particular intra-oral requirement while treating or operating upon an individual patient. In order that such discharged streams might not cause any discomfort or shock to the patient, heater means also have been provided in the dental stands to which such syringe devices have been connected for the supply of such air and water thereto as well as for physical support thereby when the syringe is not in use.

A very limited number of such syringes have also included electrical heating means directly within the body of the syringe and the hose or cord members which are connected to the syringes similarly are provided with flexible electrical conductors which are arranged in circuit with the electrical heating means to furnish current thereto. The positioning of air and water conduits and electrical conducting means within such flexible cords or hoses has presented substantial problems and difficulty, particularly in regard to interconnecting the conduits and conductors in such cords and hoses to the corresponding passageways, conductors and electrical circuit means in the handles of such syringes.

In view of the foregoing situation, it has been substantially universal practice to interconnect the conductors and conduits in the cords and hoses to the corresponding means in the handles of the syringes by various types of arrangements which, in general, require partial and even extensive disassembly of at least the handle of the handpiece, for example, such as by utilizing various means for removing the outer shell which usually comprises the actual gripping member of the handle of the syringe so as to permit access to the various types of connecting means enclosed within such shell. Effecting such disconnection, as well as reconnection of such elements usually requires various types of tools, such as screw drivers, pliers or wrenches or special tools to accomplish the same.

The foregoing problems have also been compounded by the requirement that the electrical circuit for electrical heaters within the handle of the syringe, when provided, must be suitably insulated particularly from the metallic portions and members of the syringe in general. Thus far, rather awkward and complex mechanisms have been resorted to in regard to connecting the flexible hoses with the body or handle portions of existing syringes and, in general, this has resulted largely in manufacturers requiring the connected syringe and flexible hose being returned, intact, to the equipment supplier or factory for servicing when any type of repair of the syringe is required.

SUMMARY OF THE INVENTION

The principal object of the present invention is to provide a dental syringe assembly comprising a syringe having a handle which is provided at one end with a discharge head and the opposite end is the coupling end, said handle also containing an electric heater arranged to heat the air and water conduit means within the handle. The coupling end of the handle is provided with terminal means of the air and water conduit means as well as the electric circuit associated with the electric heater within the handle. A flexible conduit hose having a coupling end contains a plurality of flexible conduit means and electrical conductors arranged in compact relationship and terminal ends thereof and associated with the coupling end of the hose. The coupling ends of said syringe and hose means are interconnected or disconnected quickly and without the aid of tools by means of a preferably threaded and rotatable coupling thimble carried by one of the coupling ends and engageable with threaded means on the other coupling end. When the coupling ends of the syringe and hose are connected by said coupling thimble, the air and water conduit means and also the electrical conductor means respectively therein are automatically connected in air and watertight relationship, and the electric circuit for the heater is completed.

Another object of the invention is to provide complementary and interfitting plug means in association with the coupling ends of the handle of the syringe and the flexible hose to facilitate the interconnection of the complementary terminal ends portions of the fluid conduit means and electrical conductor means in said handle and flexible hose.

It is a further object of the invention to provide simple, inexpensive electrical connector elements which are effectively insulated in a foolproof manner so as to permit the same to extend through appropriate passages in the coupling members of the handle of the syringe and the flexible hose without being short circuited and also being of such nature so as to permit the use of fluid conduits in the handle of the syringe and flexible hose.

Details of the foregoing objects and other objects of the invention, as well as details of the invention, are set forth in the following specification and illustrated in the accompanying drawing comprising a part thereof.

DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevation of an exemplary syringe embodying the principles of the present invention, the handle casing being illustrated in phantom to facilitate the illustration of other details of the syringe.

FIG. 2 is a fragmentary illustration of the midportion and lower portion of the syringe illustrated in FIG. 1 as viewed within a plane positioned at 90° to the axis of the syringe as shown in FIG. 1.

FIG. 3 is an enlarged bottom plan view of the handle portion of the syringe shown in FIG. 2, as seen on the line 3–3 of said FIG.

FIG. 4 is an enlarged fragmentary longitudinal sectional view of the coupling end portion of the syringe shown in FIG. 2, as seen on the line 4–4 of said FIG., and the coupling end of the flexible hose being illustrated in phantom in association therewith.

FIG. 5 is a fragmentary, partially longitudinally sectioned view of the coupling end of a flexible hose arranged to be interconnected to the coupling end of the syringe shown in FIGS. 1, 2 and 4.

FIG. 6 is a longitudinally sectioned view of the coupling element per se of the coupling apparatus of the flexible hose shown in FIG. 5 and illustrating the electrical connectors carried by said coupling element in insulated relationship thereto.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2, the syringe of the present invention comprises a handle 10 which preferably is tubular and appropriately shaped for comfortable accommodation within the

hand of the user. The same may be formed from any suitable material such as metal tubing, molded from appropriate synthetic resin, or otherwise. Connected to one end of the handle **10** is a discharge head **12** which may be cast or otherwise molded from any appropriate material such as metal, synthetic resin or the like. Appropriate screws or pins, complementary screw threads, or otherwise, may be employed to connect the upper end of handle **10** to the lower portion of the discharge head **12**. For practical purposes, the head **12** may be considered part of the handle **10** in that at least portions of the head are normally engaged by the forefinger and thumb of the user during operation thereof.

Extending laterally from one end of discharge head **12** is a nozzle **14** which is arranged to discharge either a stream of air, a stream of water, or a spray comprising a mixture of air and water, all of which exit through the tip **16** and details of which head and nozzle are illustrated in said aforementioned copending application Ser. No. 658,795. Similarly, details of valve means contained within the discharge head **12** are fully described in said copending application, as well as the manner in which the finger-engageable members **18** function to operate said valve means.

The end of the handle **10** opposite that which supports the discharge head **12** is referred to as the coupling end and the same supports an externally threaded coupling member **20** by which the syringe assembly shown in FIG. **1** is connected to corresponding coupling ends **22** of a flexible tube or hose **24** which is fragmentarily illustrated in FIG. **5**.

The coupling member **20** preferably is formed from metal, though, if desired, the same may be molded or otherwise formed from synthetic resin or the like. The preferred method for effecting coupling between the coupling ends of the syringe and the flexible hose is by a coupling member comprising a rotatable internally threaded coupling thimble **26**. Hence, for durability, metal is highly suitable for purposes of forming the coupling member **20** of the syringe, particularly in view of the preferably external threads formed thereon in accordance with the preferred construction.

The coupling member **20** is connected rigidly, such as by solder, to the lower end of the sleeve comprising handle **10** for separative movement relative to the discharge head **12** and a pair of rigid and preferably metallic conduit tubes **28** and **30**. Said tubes respectively are fixed at their upper ends to head **12** and are arranged to conduct air and water between the valves therefor, not shown, within the discharge head **12** and the terminal end of the syringe. The tubes **28** and **30** respectively have terminal ends **28'** and **30'** which extend through suitable holes in member **20** and into an inwardly directed cylindrical cavity **32** formed in the outer end of coupling member **20** of the syringe, as best illustrated in FIG. **4**. Therefore, the coupling member **20** preferably is cup-shaped and said holes for tube ends **28'** and **30'** are formed in the upper end of the coupling member **20**, as viewed in FIGS. **1**, **2** and **4**, for purposes of permitting separative movement of member **20** from said terminal end portions of the conduit tubes **28** and **30** when, for example, the aforementioned screws or pins which detachably secure handle **10** to head **12** are removed. Such removal frees the connected handle **10** and member **20** for axial movement from the head **12**, tubes **28** and **30**, and other components normally within handle **10**.

The discharge head **12** also is provided with an axially extending recess **36** within which a heater element **38** is positioned. In the preferred construction, the heater **38** is of the electrical resistance type and may comprise a metallic resistance coil disposed within an appropriate ceramic enclosure, for example. Circuit members comprising insulated electrical conductors **40** and **42** are connected in series with the electrical resistance member, not shown, within the heater element **38**. The lower ends of said conductors, as viewed in FIGS. **1** and **2**, respectively are electrically connected to socket-type, female connectors **44**, which are securely anchored within axially extending openings **46** formed within a preferably cylindrical, insulating block **48**. The latter may be formed from appropriate synthetic resin or the like and the lower end thereof, as viewed in FIGS. **1**, **2** and **4**, preferably firmly abuts the inner end of coupling member **20** from which the flange **34** extends.

Insulating block **48** also is provided with additional, parallel, longitudinally extending openings **50** through which the conduit tubes **28** and **30** extend and within which they preferably are closely fitted so as to assist in operatively positioning the insulating block **48** within the interior of the tubular handle **10** when the same is mounted in operative position and is connected to the discharge head **12** and extends axially therefrom. Appropriate cement may be used to position the block **48** in fixed position upon conduit tubes **28** and **30**.

From FIG. **4** in particular, it will be seen from the foregoing description that the terminal end of the syringe, and particularly the coupling member **20** thereon, is arranged so that the projecting, terminal end portions **28'** and **30'** of the air and water conduit tubes **28** and **30** extend a limited distance away from the innermost end of cylindrical cavity **32** within the coupling member **20**. Also, particularly as will be appreciated from FIG. **3**, which is an enlarged illustration of the terminal end of the syringe, the outer ends of the openings **46** within the insulating block **48** also are coextensive and axially aligned with corresponding openings **52** in the coupling member **20** and are freely exposed for the reception of male terminals **54** projecting from the coupling end **22** of the flexible hose **24**. Details of said male terminals and the coupling end **22** of said tube are as follows.

Referring to FIGS. **5** and **6**, it will be seen that the flexible hose **24** is of a composite nature and comprises a pair of flexible, water and air conduit tubes **60** and **62** which, as viewed in FIG. **5**, are superimposed upon each other and only one of the same actually is shown, in partially longitudinally sectioned manner. A pair of flexible electrical conductors **56** and **58** are provided beside said air and water conduit tubes. All of said aforementioned electrical conductors and water and air conduit tubes are arranged in compact parallel relationship with each other and are covered either with a continuous, flexible rubberlike or synthetic resin sheath or a braided textile type sheath or covering **64**. Such arrangement is similar to many types of composite or compound supply tubes or hoses used in various kinds of mechanisms, instruments, and the like.

It will be understood that the outer end of the flexible hose **24** which is not illustrated in the drawing is suitably arranged to be connected to sources of dental utilities such as supplies of air under pressure, water under pressure such as is available from municipal supplies, and an electric circuit of appropriate capacity to supply current to the heater element **38**. The opposite or coupling end of the flexible hose **24** is provided with an appropriate terminal collar **66** which, for example, preferably is molded from suitable insulating material such as synthetic resin, either of a pliable or rigid nature.

Surrounding the outermost end of said collar **66** is a ferrule **68** of metal, for example, which is firmly secured to the collar **66** by any appropriate means. The outermost end of ferrule **68** has an inwardly turned flange **70** thereon which engages with a mating, companion flange **72** of a unitary coupling element **74** which, especially for durability, preferably is formed from metal such as brass. This element is shown in FIG. **6** as being unattached to the hose **24** in order that the details thereof may be more readily appreciated than in the illustration of FIG. **5** wherein the element is shown connected to the terminal end of hose **24**.

The outermost end of coupling element **74**, as viewed in FIG. **5**, comprises a plug portion **76** which is closely complementary to and is received within the cylindrical cavity **32** in coupling member **20** of the syringe. Accordingly, the interfitting relation between the plug portion **76** and cavity **32** constitute plug means to facilitate the interconnection of these elements and the various interfitting conduit and electrical conductor means respectively carried thereby.

When the flange **70** of the ferrule **68** is interfitted with the flange **2** of coupling element **74**, said coupling element is fix-

edly secured with respect to the terminal collar 66, whereby the element 74 is nonrotatable with respect to the flexible hose 24. Prior to so affixing the coupling element 74 with respect to terminal collar 66, however, the projecting ends 78 of the male terminals 54 are suitably connected electrically to the terminal ends of the electrical conductors 56 and 58 within the flexible hose 24 by any conventional means.

A pair of attaching sleeves 80 and 82 are fixedly connected at one end to a pair of transversely spaced ports 84 and 86 which communicate with correspondingly spaced enlarged terminal sockets 88 and 90 which respectively closely receive the terminal ends 28' and 30' of conduit tubes 28 and 30 which project into the cylindrical cavity 32 of coupling member 20 of the syringe when the coupling end of flexible tube 24 is connected thereto. The opposite ends of the attaching sleeves 80 and 82 are inserted within the terminal ends of the water and air conduit tubes 60 and 62 within the flexible hose 24, as illustrated in exemplary manner in FIG. 5. The preferably inherent elasticity of the tubes 60 and 62 readily effects a tight union between the terminal ends of said tubes and the attaching sleeves 80 and 82.

It is preferably to index the coupling ends of the syringe and flexible hose 24, especially to insure the desired connections between the water and air tubes 60 and 62 of flexible hose 24 and the air and water tubes 28 and 30 of the syringe. To accomplish this, by reference to FIG. 3, it will be seen that the terminal ends 28' and 30' of the air and water conduit tubes 28 and 30 of the syringe are spaced unequal distances from the central axis of the coupling end of the syringe. Correspondingly, the the terminal sockets 88 and 90 in coupling element 74 on the coupling end of the flexible hose 24 are arranged in complementary manner with respect to the central axis of the preferably cylindrical plug portion 76 of coupling element 74.

One of the very important features of the present invention which has made it possible to utilize very simple coupling means and corresponding interengageable elements to effect connection between the fluid conduits and electrical conductors respectively in the flexible hose 24 and the coupling end of the handle 10 of the syringe comprises the particular arrangement of the male terminals 54, which are carried by the coupling element 74, and the female connectors 44, which are fixedly supported within the insulating block 48 adjacent the coupling end of the handle of the syringe. The male terminals 54 are sufficiently long that they not only provide the projecting ends 78 for connection with the electrical conductors 56 and 58, but especially so as to project an appreciable distance beyond the outer end of the plug portion 76 of coupling element 74.

Especially since the coupling element 74 preferably is formed from metal, it is necessary that the male terminals 54 be electrically insulated therefrom and from each other and this is accomplished quite simply by the utilization of tubular insulating sleeves 92 which are preferably tightly complementary to parallel elongated openings 94 which extend in an axial direction through coupling element 74 for the entire length thereof. More importantly, as readily can be seen from FIGS. 5 and 6, the insulating sleeves 92 extend a substantial distance along the projecting terminals 54, beyond the outer end of plug portion 76 of coupling element 74. Said projecting end portions of the insulating sleeves 92 are adequate to extend through the full length of the openings 52 in coupling member 20 in order that the male terminals 54 will not contact said terminal member which preferably is indicated as being made of metal.

As a safety precaution, the length of the projecting end portions of the insulating sleeves 92 is adequate to extend beyond the outer ends of the openings 52 in said coupling member 20 and even extend a limited distance into openings 46 in the insulating block 48. The outer diameter of the insulating sleeves 92 also is preferably only very slightly less than the inner diameter of the openings 52 in coupling member 20 and openings 46 in insulating block 48.

The slidable projection of the projecting end portions of insulating sleeves 92 successively through the openings 52 and 46 serves to guide the reception of the terminal end portions of the male terminals 54, which extend beyond the outer ends of insulating sleeves 92 frictionally within the female connectors 44 so as to be electrically connected thereto. Such connection serves, therefore, to electrically connect the conductors 56 and 58 within the flexible hose 24 with the electrical conductors 40 and 42 within the handle 10, thereby completing a circuit between the heater element 38 and the conductors 56 and 58 of the hose 24.

At its opposite end, hose 24 is connected to an electric circuit which, incidentally, preferably includes appropriate switch means, not shown, to control the supply of current to and from the heater element 38. By way of example, an appropriate master switch of suitable type may be employed for such purposes, the same being disposed in ON position during the time, for example, the dental stand or other supporting means to which the syringe is attached is disposed in operative position, such as during the normal office hours of a dentist.

By such an arrangement, the heater 38 is constantly maintained ON during such regular business hours in heating condition and in view of the immediate proximity of the heater 38 to the air and water conduit tubes 28 and 30 within handle 10, not only the position of the heater with respect thereto but also the capacity of the heater 38 results in the air and water delivered to the nozzle 14 being heated to a comfortable degree for discharge into the oral cavity without shock or discomfort to the patient. In the event any residual air or water within the nozzle 14 has cooled from the last use thereof, it is customary technique for a dentist to normally discharge such residual portions into a cuspidor or the like before directing the nozzle 14 into the oral cavity of a patient.

Connection and disconnection of the coupling ends of the syringe and flexible hose 24 is accomplished by means of the clamping thimble 26 which is rotatably supported upon the coupling element 74 on the coupling end of hose 24. The intermediate interior portion between the ends of thimble 26 is threaded complementarily to the external threads on coupling member 20 of the syringe and the preferred fit between the threads is such as to readily permit connection and disconnection simply by rotation of the thimble 26 manually by an operator. For that purpose, at least a portion of the exterior surface of thimble 26 is suitably knurled in accordance with conventional practice.

From FIGS. 5 and 6, it will be seen that the coupling element 74 is provided with a shallow, flat annular groove 96 which rotatably receives a band 98 which is loosely complementary to the groove 96. The inner surface of one end portion of the thimble 26 is provided with an inwardly projecting, annular rib 100 which is received within a complementary groove in the outer surface of band 98 so as to permit the thimble 26 to be interlocked therewith and thus become rotatably connected to the coupling element 74 but the opposed annular shoulders defining the opposite sides of the groove 96 provide restricting means which permit only limited longitudinal movement between thimble 26 and coupling element 74.

When it is desired to connect the coupling end of flexible hose 24 to the coupling end of the handle 10 of the syringe, it is only necessary, by use of the means described above, to orient the terminals 54 of the flexible hose 24 with respect to the openings 46 in coupling member 20 of the syringe and simultaneously index the terminal ends 28' and 30' of the air and water conduit tubes with respect to the terminal sockets 88 and 90, which correspond thereto in the coupling element 74 of the hose 24. Upon achieving the desired indexed relationship between the coupling ends of the syringe and hose, it then is only necessary to rotate the coupling thimble 26 sufficiently to move the plug portion 76 of coupling element 74 into plugged relationship with the cylindrical cavity 32 of coupling member 20.

When such plugged relationship has been accomplished, the exposed outer ends of the terminals **54** will be in firm electrical engagement with the mating connectors **44** within the handle of the syringe and the terminal ends **28'** and **30'** of the air and water conduit tubes **28** and **30** will be snugly received within the terminal sockets **88** and **90** of coupling element **74**. To prevent leakage of air and water between such latter connections, however, there is provided a compressible sealing gasket **102** of suitable thickness disposed within the inner end portion of the cavity **32** in coupling member **28**. Said gasket is compressed sufficiently upon the completion of the plugging relationship of plug portion **76** with complementary plugging cavity **32** that the gasket **102** is also firmly compressed around the exterior surfaces of the terminal end portions **28'** and **30'** of conduit tubes **28** and **30** that no leakage of either air or water will occur with respect to the interengaged terminal ends **28'**, **30'** and sockets **88**, **90**.

Although the structure illustrated in detail and described above preferably contemplates that the male terminals **54** be mounted upon the coupling end of the hose **24** and the female connectors **44** be within the coupling end of the handle of the syringe, it is to be understood that these connectable electrical members may be reversed without departing from the spirit of the invention. Similarly, though the coupling thimble **26** is illustrated as being rotatably connected to the coupling end of hose **24** for engagement with the threads of coupling member **20** on the syringe, it also is to be understood that a reversal of such elements also is possible within the purview of the invention, whereby the thimble **26** may be rotatably connected to the coupling end of the handle **10** of the syringe, for example.

While the invention has been illustrated and described in its several preferred embodiments, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways falling within the scope of the invention as claimed.

I claim:

1. A dental syringe assembly comprising in combination an elongated handle means having two ends, a discharge head at one end, an electric heater in said handle means, air and water conduit means in said handle means extending from said discharge head to the other end of said handle means and terminating thereat, and electrical conductors extending from said heater and terminating at said other end; a flexible conduit hose means having an end, electric conductors and air and water conduit means extending through said hose means and terminating at said conduit end, each of said electrical conductors, air and water conduit means being connected respectively to a source of electricity, air and water; a first coupling end comprising a body, said body being made of metal, air and water passageways extending through said first coupling end body, additional passageways in said coupling end body, electrical connectors in said additional passageways and extending therethrough beyond the opposite ends of said first coupling end body; a second coupling end comprising a body, said second coupling end body being formed from insulation material, air and water passageways in said second coupling end body, electrical connector passageways in said second coupling end body terminating in electrical connectors complementary to the electrical connectors in said first coupling end body; coupling means engageable with the first and second coupling end bodies and operable to detachably connect the same and automatically interconnect the corresponding air and water passageways and the complementary electrical connectors in respectively fluidtight and electric current-establishing manner when said coupling end bodies are connected, said electrical connectors in said first coupling end body terminating in terminals provided with insulation arranged and adapted to extend into said electrical connector passageways in said second coupling end body and prevent contact of said terminals with the body of said second coupling end; the air and water passageways and electrical connectors of one of said coupling end bodies being connected respectively to the terminal ends of the air and water conduit means and electrical conductors of said flexible conduit hose, and the air and water passageways and electrical connectors of the other of said coupling end body being connected respectively to the terminal ends of said air and water conduit means and electrical conductors in said handle means.

2. The dental syringe assembly according to claim **1** in which said second coupling end body has a cavity in the outer end means closely fitting within said cavity when said coupling end bodies are connected for purposes of aligning and stabilizing said connection therebetween.