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(54) Spray tube assembly of a rotary spray gun

(57) A spray tube assembly (1) includes a first bearing (14), a reinforcing tube (13), a second bearing (15) and a gasket ring (16) respectively sleeved onto a nozzle tube and then inserted with the nozzle tube into a spray

tube to constitute a modularized structure of spray tube assembly for quick connection to the barrel of a spray gun in a detachable manner. The modularized structure of spray tube (11) assembly facilitates installation and maintenance.

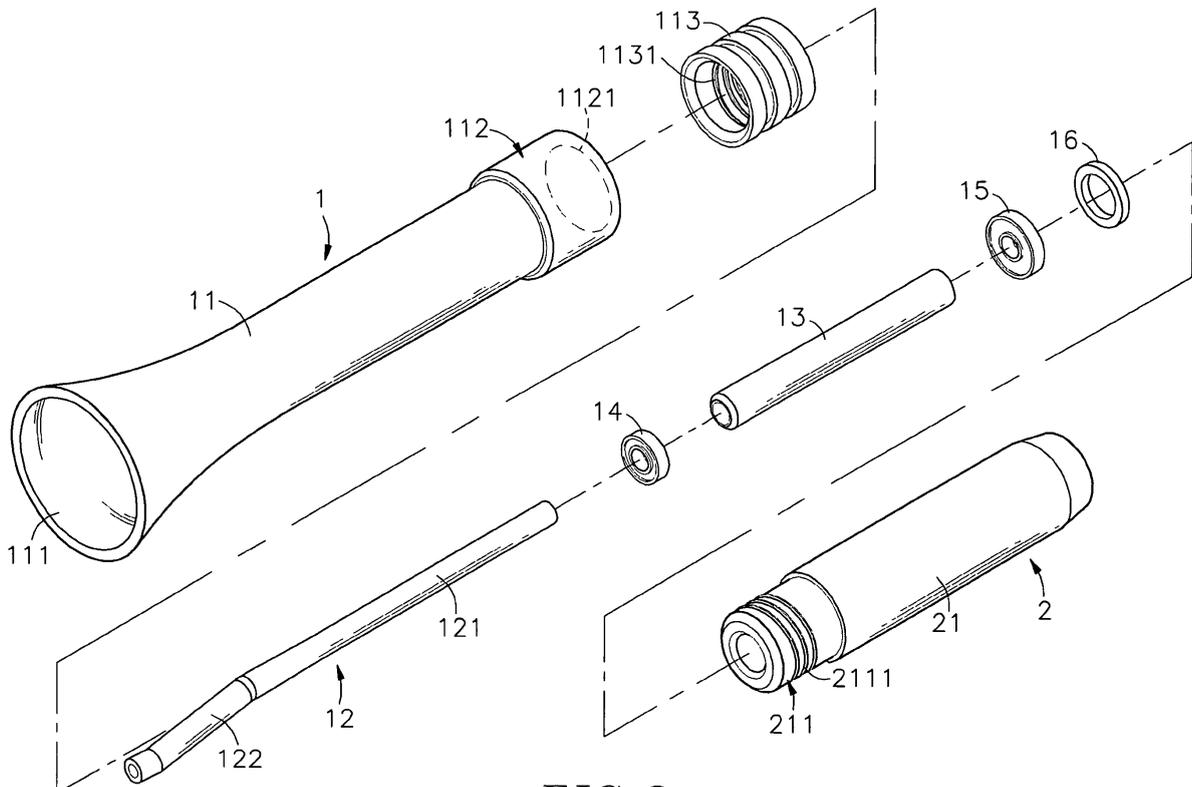


FIG. 2

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention:

[0001] The present invention relates to a rotary spray gun for cleaning purposes and more particularly, to a spray tube assembly of a rotary spray gun, which is formed by sleeving a first bearing, a reinforcing tube, a second bearing and a gasket ring onto a nozzle tube and then inserting with the nozzle tube into a spray tube to constitute a modularized structure that facilitates installation and maintenance.

2. Description of the Related Art:

[0002] Water spray gun or pistol nozzle is an implement controllable by a control lever to output a forced flow of water. When performing a cleaning work, brushes, wipes, cleaning cloth, and/or many other cleaning tools may be used with a water spray gun or pistol nozzle. Further, after washing with water, a piece of cloth is usually used to dry and clean the washed object. This cleaning method takes much time and labor and consumes a big amount of water. To avoid these problems, rotary spray guns are created.

[0003] FIG. 8 illustrates a known design of rotary spray gun. According to this design, the rotary spray gun **A** comprises a front barrel **A1**, a spray tube **A12** connected to the front connection end **A11** of the front barrel **A1**, a water tube **A13** connected to an external water container and suspending in the front barrel **A1**, and a nozzle assembly **B** mounted inside the spray tube **A12**. The nozzle assembly **B** comprises a delivery tube **B1** connected to the front connection end **A11** of the front barrel **A1** for input of water from the water tube **A13** and a flow of compressed air being guided from an external compressed air source into the front barrel **A1**, a cylindrical tube **B2** mounted in the spray tube **A12** around the delivery tube **B1**, a curved nozzle tip **B4**, a connector **B3** that connects the curved nozzle tip **B4** to the delivery tube **B1**, and bearings **B5** mounted in the cylindrical tube **B2** to support the delivery tube **B1** and the connector **B3**, allowing rotation of the curved nozzle tip **B4** with the cylindrical tube **B2** relative to the delivery tube **B1**. When a flow of water and compressed air mixture is being forced through the curved nozzle tip **B4**, the curved nozzle tip **B4** is forced to rotate with the cylindrical tube **B2** relative to the delivery tube **B1**.

[0004] The aforesaid rotary spray gun is functional, however it still has drawbacks as follows:

1. The assembly process of the rotary spray gun is complicated. During installation, the delivery tube **B1**, the cylindrical tube **B2**, the connector **B3** and the curved nozzle tip **B4** must be assembled at first so that the nozzle assembly **B** can be mounted inside

the spray tube **A12** to have the delivery tube **B1** be connected to the front connection end **A11** of the front barrel **A1**. After installation of the nozzle assembly **B**, the spray tube **A12** can then be fastened to the front barrel **A1**. This installation procedure wastes much time and labor.

2. When a flow of water and compressed air mixture is being forced through the curved nozzle tip **B4**, the curved nozzle tip **B4** is forced to rotate with the cylindrical tube **B2** relative to the delivery tube **B1** at a high speed. During rotation of the curved nozzle tip **B4** with the cylindrical tube **B2**, the delivery tube **B1** is caused to vibrate. After a long use of the rotary spray gun, the weight of the cylindrical tube **B2**, the connector **B3** and the curved nozzle tip **B4** may cause the delivery tube **B1** to break during rotation of the curved nozzle tip **B4**, resulting in an accident.

[0005] Therefore, it is desirable to provide a measure that eliminates the drawbacks of the aforesaid rotary spray gun.

SUMMARY OF THE INVENTION

[0006] The present invention has been accomplished under the circumstances in view. It is one object of the present invention to provide a spray tube assembly for rotary spray gun, which has a modularized structural design, facilitating installation and maintenance.

[0007] To achieve this and other objects of the present invention, a spray tube assembly comprises a spray tube, a nozzle tube, a first bearing, a reinforcing tube, a second bearing and a gasket ring. The first bearing, the reinforcing tube, the second bearing and the gasket ring are respectively sleeved onto the nozzle tube in proper order and then inserted with the nozzle tube into the spray tube, thereby constituting a modularized structure of spray tube assembly for quick connection to the barrel of a spray gun in a detachable manner. The modularized structure of spray tube assembly facilitates installation and maintenance.

[0008] Further, the gasket ring is abutted against the outer side of the first bearing and kept in friction engagement with the inside wall of the connection portion of the spray tube tightly, securing the second bearing to an annular step in the connection portion of the spray tube firmly and avoiding water leakage..

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1 is an elevational assembly view of a spray tube assembly and a barrel for rotary spray gun in accordance with a first embodiment of the present invention.

FIG. 2 is an exploded view of the assembly shown in FIG. 1.

FIG. 3 is a sectional elevation of the spray tube assembly in accordance with the first embodiment of the present invention.

FIG. 4 is a schematic sectional view showing the spray tube assembly installed in a rotary spray gun according to the first embodiment of the present invention.

FIG. 5 corresponds to FIG. 4, showing the nozzle tube rotated in the spray tube during operation of the rotary spray gun.

FIG. 6 is a schematic sectional view, showing another application example of the spray tube assembly according to the first embodiment of the present invention.

FIG. 7 is an exploded view of a spray tube assembly in accordance with a second embodiment of the present invention.

FIG. 8 is a schematic sectional side view of a conventional rotary spray gun.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0010] Referring to FIGS. 1 and 2, a spray tube assembly 1 for rotary spray gun in accordance with a first embodiment of the present invention is shown comprising a spray tube 11, a nozzle tube 12, a reinforcing tube 13, a first bearing 14, a second bearing 15 and a gasket ring 16.

[0011] The spray tube 11 is a hollow cylindrical member having one end thereof terminating in an orifice 111 and the other end thereof terminating in a connection portion 112 that defines a circular mounting hole 1121 and an annular step 1122 at the inner end of the circular mounting hole 1121.

[0012] The nozzle tube 12 has an elongated tubular body portion 121 mounted in the spray tube 11 and a nozzle tip 122 obliquely extended from one end of the elongated tubular body portion 121 at an angle and suspending inside the spray tube 11 in proximity to the orifice 111.

[0013] The reinforcing tube 13 is mounted inside the spray tube 11 around the elongated tubular body portion 121 of the nozzle tube 12.

[0014] The first bearing 14 is attached to one end of the reinforcing tube 13 around one end of the elongated tubular body portion 121 of the nozzle tube 12 near the nozzle tip 122 and kept in contact with the inside wall of the spray tube 11.

[0015] The second bearing 15 is attached to the other end of the reinforcing tube 13 around the other end of the elongated tubular body portion 121 of the nozzle tube 12 near the connection portion 112 and kept in contact with the inside wall of the spray tube 11.

[0016] The gasket ring 16 is attached to one side of the second bearing 15 opposite to the reinforcing tube 13 and kept in contact with the inside wall of the spray tube 11 near the connection portion 112.

[0017] Further, a fitting 113 is fixedly mounted in the circular mounting hole 1121 of the connection portion 112 of the spray tube 11. The fitting 113 is a metal ring having an inner thread 1131.

5 [0018] Referring to FIGS. 3 and 4 and FIGS. 1 and 2 again, during installation of the spray tube assembly 1, sleeve the first bearing 14, the reinforcing tube 13, the second bearing 15 and the gasket ring 16 onto the elongated tubular body portion 121 of the nozzle tube 12 in proper order, and then aim the nozzle tip 122 of the nozzle tube 12 at the connection portion 112 of the spray tube 11 axially and insert the nozzle tube 12 into the spray tube 11 to force the first bearing 14, the second bearing 15 and the gasket ring 16 into friction engagement with the inside wall of the spray tube 11. At this time, the second bearing 15 which has an outer diameter relatively greater than the first bearing 14 is abutted against the annular step 1122 in the circular mounting hole 1121 of the connection portion 112 of the spray tube 11, and the gasket ring 16 is abutted against the outer side of the first bearing 14 and kept in friction engagement with the inside wall of the connection portion 112 of the spray tube 11 tightly. The gasket ring 16 can be a compressible ring made of cotton knit fabric or a ring cushion made of an elastic plastic material. Thus, the gasket ring 16 firmly secures the second bearing 15 to the annular step 1122 in the circular mounting hole 1121 of the connection portion 112 of the spray tube 11. Thereafter, the fitting 113 is fixedly mounted in the circular mounting hole 1121 of the connection portion 112 of the spray tube 11. Thus, the spray tube 11, the nozzle tube 12, the reinforcing tube 13, the first bearing 14, the second bearing 15, the gasket ring 16 and the fitting 113 are assembled, forming the desired spray tube assembly 1.

35 [0019] Referring to FIGS. 3 and 4 again, after the spray tube assembly 1 has been assembled, the spray tube assembly 1 is then fastened to the barrel 21 of a spray gun 2 by means of threading the inner thread 1131 of the fitting 113 onto an outer thread 2111 around the periphery of the front connection portion 211 of the barrel 21 of the spray gun 2.

[0020] Referring to FIG. 5, when the user pressed the control lever 23 of the spray gun 2, a flow of compressed air or fluid is forced into the barrel 21 through an intake port 22. The intake flow of compressed air or fluid is then guided through the elongated tubular body portion 121 and nozzle tip 122 of the nozzle tube 12 to the outside of the inside wall of the spray tube 11. When the high speed flow of compressed air or fluid is flowing through the connection area between the elongated tubular body portion 121 and the nozzle tip 122 of the nozzle tube 12, an eccentric force is produced, causing rotation of the nozzle tube 12 relative to the spray tube 11, and therefore the output flow of compressed air or fluid is forced out of the orifice 111 of the spray tube 11, forming a mist of fine drops of fluid (in the case that compressed fluid is forced through the intake port 22 into the barrel 21) for cleaning things. Further, the spray tube 11 is a hard or rigid tube

(made of metal, for example, aluminum, or hard plastics), having high structural strength and toughness. Because the elongated tubular body portion **121** of the nozzle tube **12** is relatively longer than the nozzle tip **122** and supported in the first bearing **14**, the reinforcing tube **13** and the second bearing **15**, the nozzle tube **12** is forced to rotate at a high speed stably during flowing a high speed flow of compressed air or fluid therethrough. By means of the first bearing **14** and the second bearing **15** to support the two distal ends of the elongated tubular body portion **121** and the reinforcing tube **13** to surround the major part of the elongated tubular body portion **121**, the nozzle tube **12** does not break or deform during its high speed rotation, assuring high durability.

[0021] Referring to FIG. 6, in another application example of the first embodiment of the present invention, the barrel **21** of the spray gun **2** has a water inlet **212** cut through the peripheral wall thereof, and a water supply unit **3** is connected to the water inlet **212** for supplying water to the inside of the barrel **21**. The water supply unit **3** has a top cap **33**, a connection tube **31** perpendicularly extended from the top cap **33** and connected to the water inlet **212** of the barrel **21**, a control valve **32** mounted in the connection tube **31** for controlling the water passage defined in the connection tube **31** in communication with the water in the water supply unit **3**, and a handle **321** connected to the control valve **32** and biasable to open/close the control valve **32**. When the user pressed the control lever **23** of the spray gun **2**, a high speed flow of compressed air is forced into the barrel **21** through an intake port **22** and then guided through the elongated tubular body portion **121** and nozzle tip **122** of the nozzle tube **12** to the outside of the inside wall of the spray tube **11**. When the high speed flow of compressed air or fluid is flowing through the barrel **21**, a Venturi effect is produced, causing water to be sucked upwards from the water supply unit **3** into the barrel **21** and carried by the high speed flow of air through the nozzle tube **12** toward the outside of the spray tube assembly **1**. When the high speed flow of air and water mixture is flowing through the connection area between the elongated tubular body portion **121** and the nozzle tip **122** of the nozzle tube **12**, an eccentric force is produced, causing rotation of the nozzle tube **12** relative to the spray tube **11**, and therefore a very fine water mist is sprayed out of the orifice **111** of the spray tube **11** for application.

[0022] FIG. 7 is an exploded view of a spray tube assembly **1** for rotary spray gun in accordance with a second embodiment of the present invention. Similar to the aforesaid first embodiment, the spray tube assembly **1** according to this second embodiment is comprised of a spray tube **11**, a nozzle tube **12**, a reinforcing tube **13**, a first bearing **14**, a second bearing **15** and a gasket ring **16**. This second embodiment eliminates the fitting **113** of the aforesaid first embodiment (see FIG. 2) and has an inner thread **1123** formed in the connection portion **112** of the spray tube **12** for threading onto the outer thread **2111** around the periphery of the front connection

portion **211** of the barrel **21** of a spray gun **2**. Further, the spray tube **11** has two longitudinal locating ribs **114** protruded from the inside wall at two opposite sides, and an inside annular flange **115** protruded from the inside wall near the orifice **111**. The inside annular flange **115** defines a center hole **1151**. Further, the nozzle tube **12** has an outer thread **1211** extending around the periphery of one end of the elongated tubular body portion **121** remote from the nozzle tip **122**. Further, the reinforcing tube **13** has two longitudinal locating grooves **131** located on the periphery at two opposite sides and respectively coupled to the longitudinal locating ribs **114** of the spray tube **11**, and two annular locating grooves **132** respectively located on the inside of the front and rear ends thereof for accommodating the first bearing **14** and the second bearing **15** respectively. Further, the gasket ring **16** has a shank **161** perpendicularly extended from one side thereof for insertion into the second bearing **15** to hold the second bearing in place **15**, and an inner thread **1611** defined in the shank **161** for threading onto the outer thread **1211** of the nozzle tube **12**.

[0023] During installation of the spray tube assembly **1**, set the first bearing **14** and the second bearing **15** in the two annular locating grooves **132** of the reinforcing tube **13** and then sleeve the first bearing **14**, the reinforcing tube **13**, the second bearing **15** and the gasket ring **16** onto the elongated tubular body portion **121** of the nozzle tube **12** in proper order, and then thread the inner thread **1611** of the gasket ring **16** onto the outer thread **1211** of the nozzle tube **121**, and then aim the nozzle tip **122** of the nozzle tube **12** at the connection portion **112** of the spray tube **11** axially and insert the nozzle tube **12** into the spray tube **11** to insert the nozzle tip **122** of the nozzle tube **12** through the center hole **1151** of the inside annular flange **115** of the spray tube **11** and to force the two longitudinal locating grooves **131** of the reinforcing tube **13** into engagement with the two longitudinal locating ribs **114** of the spray tube **11** respectively. Thus, the spray tube **11**, the nozzle tube **12**, the reinforcing tube **13**, the first bearing **14**, the second bearing **15** and the gasket ring **16** are assembled, forming the desired spray tube assembly **1**.

[0024] After connection of the spray tube assembly **1** to the barrel of a spray gun (not shown), the user can operate the control lever of the spray gun to let a flow of compressed water go through the barrel into the nozzle tube **12**. When a high speed flow of compressed water is flowing through the connection area between the elongated tubular body portion **121** and the nozzle tip **122** of the nozzle tube **12**, an eccentric force is produced, causing rotation of the nozzle tube **12** relative to the spray tube **11**, and therefore the output flow of compressed water is forced out of the orifice **111** of the spray tube **11**, forming a fine water mist for application. Because the elongated tubular body portion **121** of the nozzle tube **12** is relatively longer than the nozzle tip **122** is supported in the first bearing **14**, the reinforcing tube **13** and the second bearing **15** and because the reinforcing tube **13**

has its two longitudinal locating grooves **131** located on the periphery at two opposite sides and respectively coupled to the longitudinal locating ribs **114** of the spray tube **11**, the first bearing **14**, the reinforcing tube **13** and the second bearing **15** give excellent support to the nozzle tube **12**, allowing smooth rotation of the nozzle tube **12** at a high speed relative to the spray tube **11**, and therefore the nozzle tube **12** does not break or deform during its high speed rotation, assuring high durability.

[0025] As stated above, a fitting **113** that defines therein an inner thread **1131** can be tightly press-fitted into the circular mounting hole **1121** of the connection portion **112** of the spray tube **11** for threading onto the outer thread **2111** of the barrel **21** of a spray gun **2**. Alternatively, an inner thread **1123** can be directly made in the connection portion **112** of the spray tube **11** for threading onto the outer thread **2111** of the barrel **21** of a spray gun **2**. It is to be understood that other detachable mounting techniques may be employed for detachable connection between the spray tube **11** and the barrel **21** of a spray gun **2**.

[0026] In either of the aforesaid two embodiments of the present invention, the first bearing **14**, the reinforcing tube **13**, the second bearing **15** and the gasket ring **16** are sleeved onto the nozzle tube **12** and then inserted with the nozzle tube **12** into the spray tube **11**, forming a modularized structure of spray tube assembly for quick connection to the barrel **21** of a spray gun **2** in a detachable manner. This design of modularized spray tube assembly **1** facilitates installation and maintenance. When a repair work is necessary, the connection portion **112** of the spray tube **11** can be directly disconnected from the barrel **21** of the spray gun **2**, allowing dismounting of the component parts for examination and further replacement or repair work.

[0027] In conclusion, the invention provides a spray tube assembly for rotary spray gun, which has advantages and features as follows:

1. The first bearing **14**, the reinforcing tube **13**, the second bearing **15** and the gasket ring **16** are sleeved onto the nozzle tube **12** and then inserted with the nozzle tube **12** into the spray tube **11**, forming a modularized structure of spray tube assembly **1** for quick connection to the barrel **21** of a spray gun **2** in a detachable manner. Thus, the invention facilitates installation and maintenance.
2. The invention uses the first bearing **14**, the reinforcing tube **13** and the second bearing **15** to give excellent support to the elongated tubular body portion **121** of the nozzle tube **12**, allowing smooth rotation of the nozzle tube **12** at a high speed relative to the spray tube **11**, and therefore the nozzle tube **12** does not break or deform during its high speed rotation, assuring high durability.
3. The gasket ring **16** is abutted against the outer side of the first bearing **14** and kept in friction engagement with the inside wall of the connection por-

tion **112** of the spray tube **11** tightly, securing the second bearing **15** to the annular step **1122** in the circular mounting hole **1121** of the connection portion **112** of the spray tube **11** firmly and avoiding water leakage and preventing accumulation of leaked water in the space within the spray tube **11** and outside the reinforcing tube **13**.

[0028] A prototype of spray tube assembly for rotary spray gun has been constructed with the features of FIGS. 1-8. The spray tube assembly for rotary spray gun functions smoothly to provide all of the features disclosed earlier.

[0029] Although particular embodiments of the invention have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.

Claims

1. A spray tube assembly connected to a barrel of a spray gun used in a rotary spray gun, comprising:

a spray tube, said spray tube having an orifice located on one end thereof and a connection portion located on an opposite end thereof, said connection portion defining therein a circular mounting hole for connection to the barrel of said spray gun;

a nozzle tube mounted in said spray tube, said nozzle tube having an elongated tubular body portion and a nozzle tip extended from a front end of said elongated tubular body portion an opposite end thereof terminating in at an angle and suspending inside said spray tube in proximity to said orifice;

a reinforcing tube mounted inside said spray tube around said elongated tubular body portion of said nozzle tube;

a first bearing attached to one end of said reinforcing tube around one end of said elongated tubular body portion of said nozzle tube near said nozzle tip to support rotation of said nozzle tube relative to said spray tube;

a second bearing attached to an opposite end of said reinforcing tube around an opposite end of said elongated tubular body portion of said nozzle tube near said connection portion to support rotation of said nozzle tube relative to said spray tube; and

a gasket ring attached to one side of said second bearing opposite to said reinforcing tube and kept in contact with the inside wall of said spray tube near said connection portion.

2. The spray tube assembly as claimed in claim 1, further comprising a fitting fixedly mounted in the circular mounting hole of said connection portion of said spray tube, said fitting having an inner thread for mounting. 5
3. The spray tube assembly as claimed in claim 1, wherein said spray tube is an aluminum tube.
4. The spray tube assembly as claimed in claim 1, wherein fitting is made of cotton knit fabric. 10
5. The spray tube assembly as claimed in claim 1, wherein said connection portion of said spray tube comprises an inner thread formed in said circular mounting hole. 15
6. The spray tube assembly as claimed in claim 1, wherein said spray tube comprises two longitudinal locating ribs protruded from the inside wall thereof at two opposite sides; said reinforcing tube comprises two longitudinal locating grooves located on the periphery thereof at two opposite sides and respectively coupled to the longitudinal locating ribs of said spray tube. 20
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7. The spray tube assembly as claimed in claim 1, wherein said spray tube comprises an inside annular flange protruded from the inside wall thereof near said orifice, said inside annular flange defining a center hole for the passing of said nozzle tip of said nozzle tube. 30
8. The spray tube assembly as claimed in claim 1, wherein said nozzle tube comprises an outer thread extending around the periphery of one end thereof remote from said nozzle tip; said gasket ring comprises a shank perpendicularly extended from one side thereof for insertion through said second bearing, and an inner thread defined in said shank for threading onto the outer thread of said nozzle tube. 35
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9. The spray tube assembly as claimed in claim 1, wherein said reinforcing tube comprises two annular locating grooves respectively located on the two distal ends thereof for accommodating said first bearing and said second bearing respectively. 45

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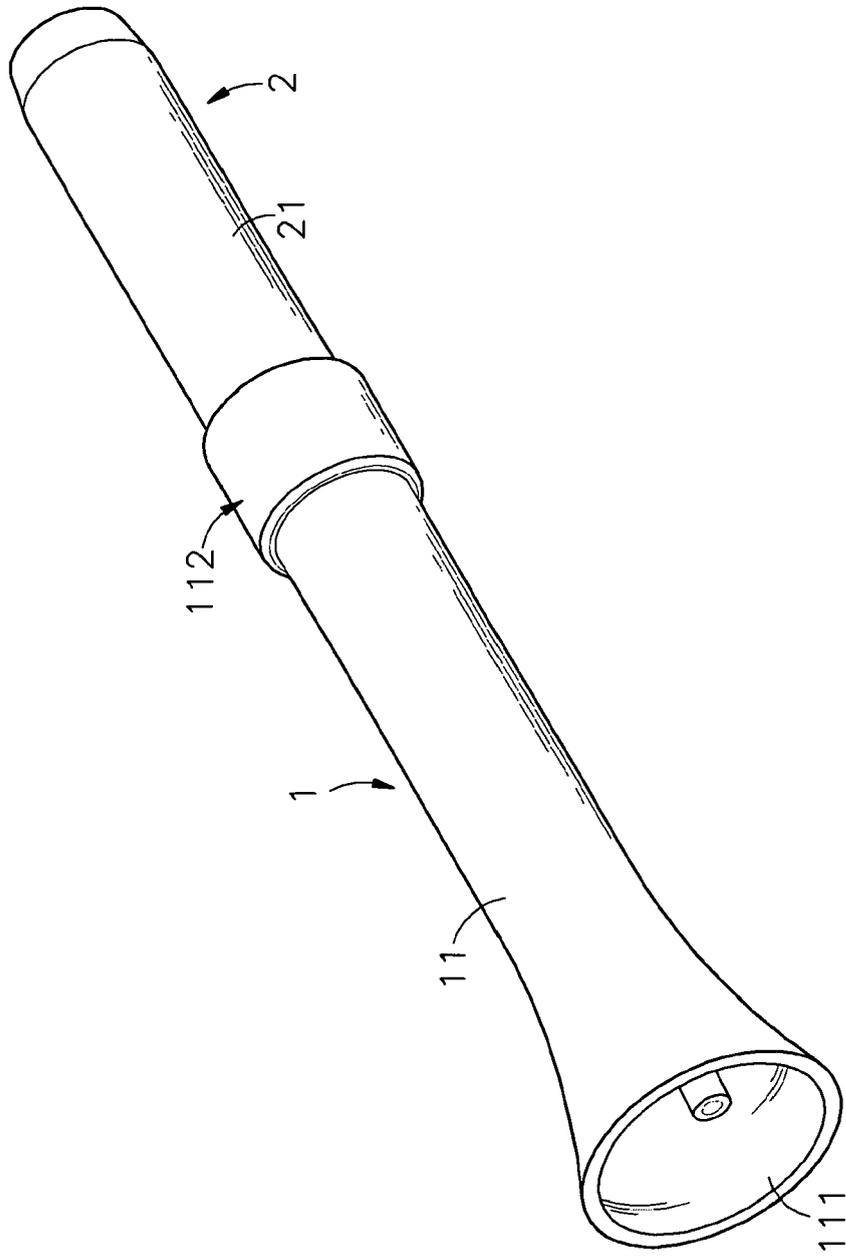


FIG. 1

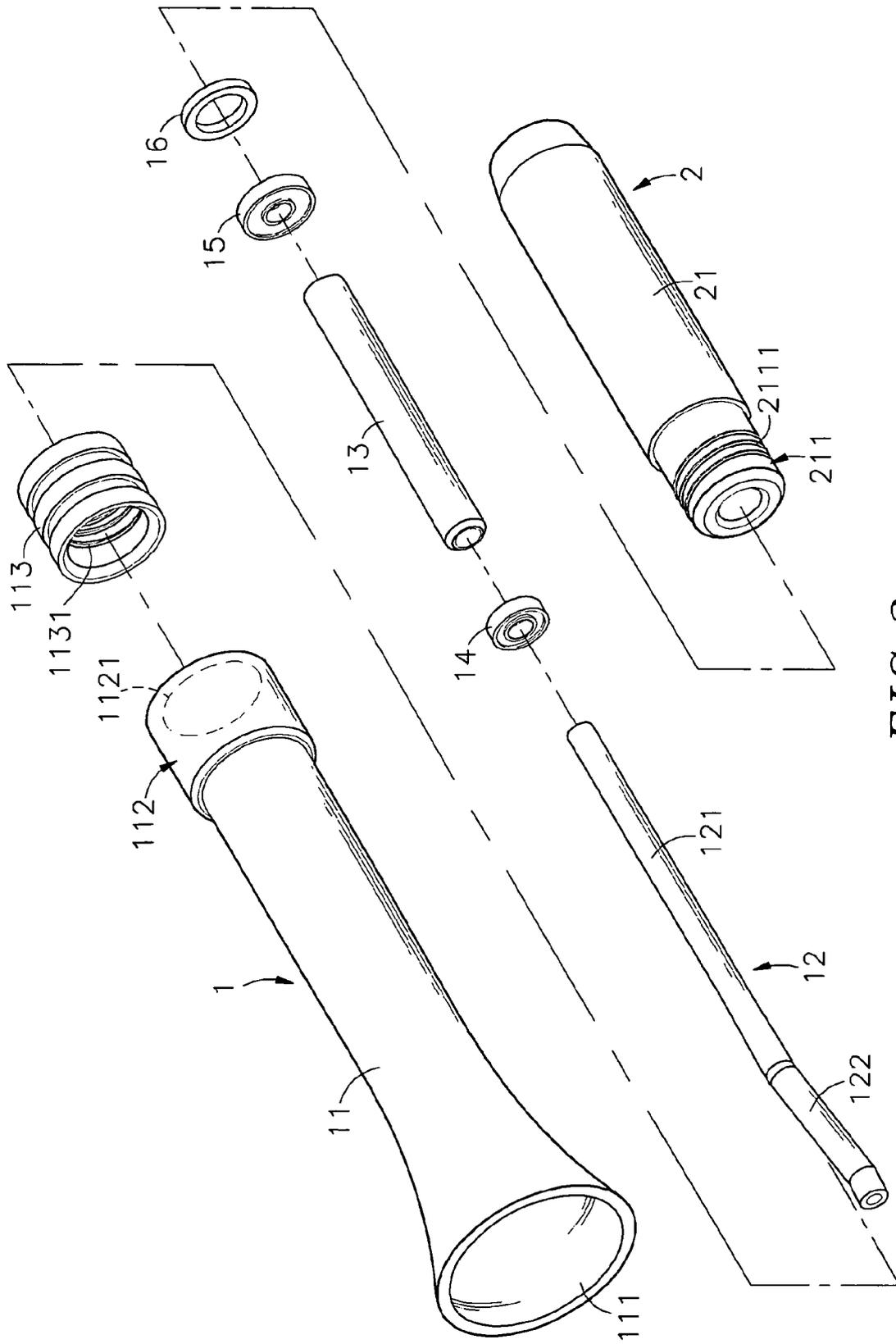


FIG. 2

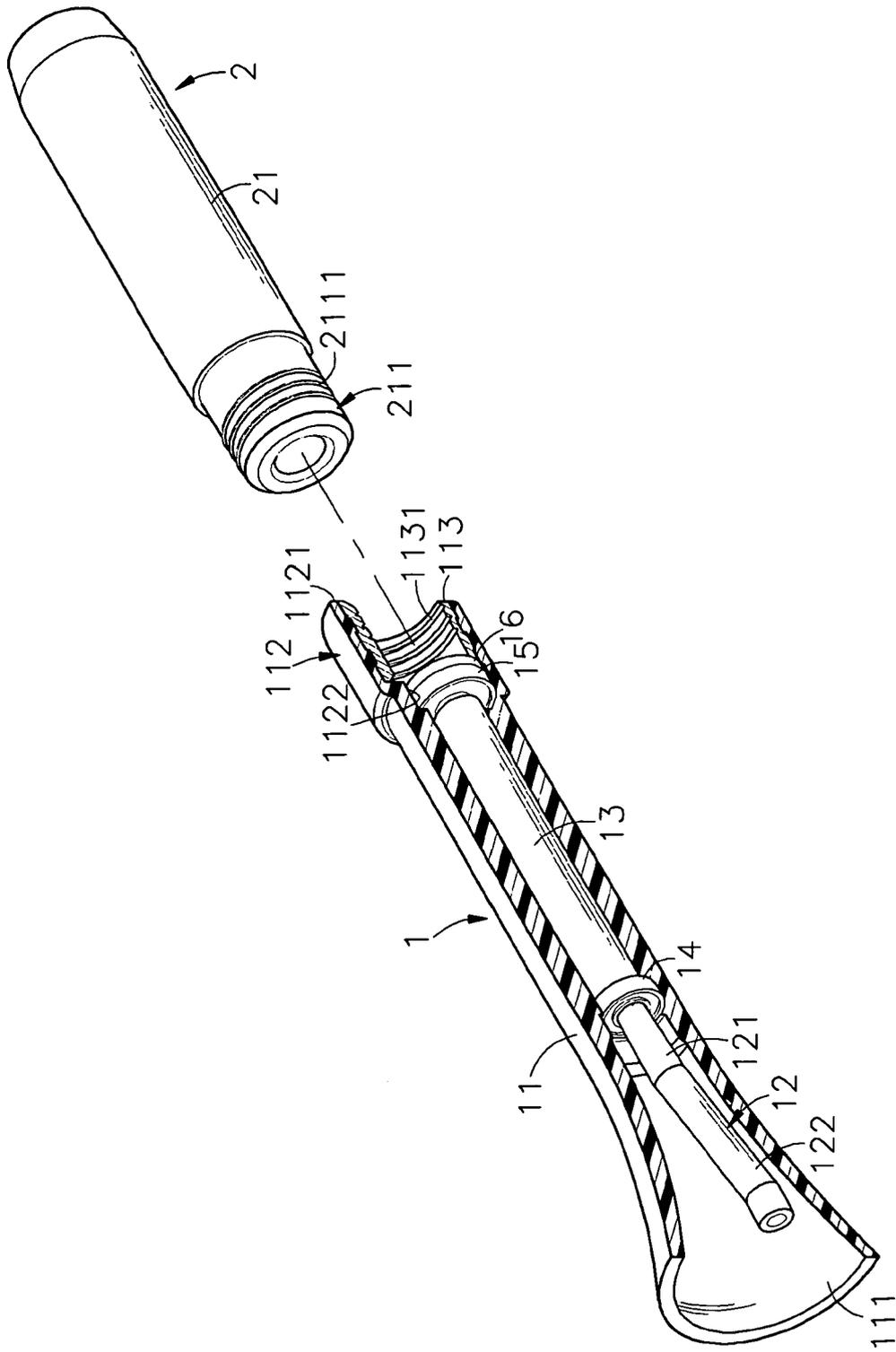


FIG.3

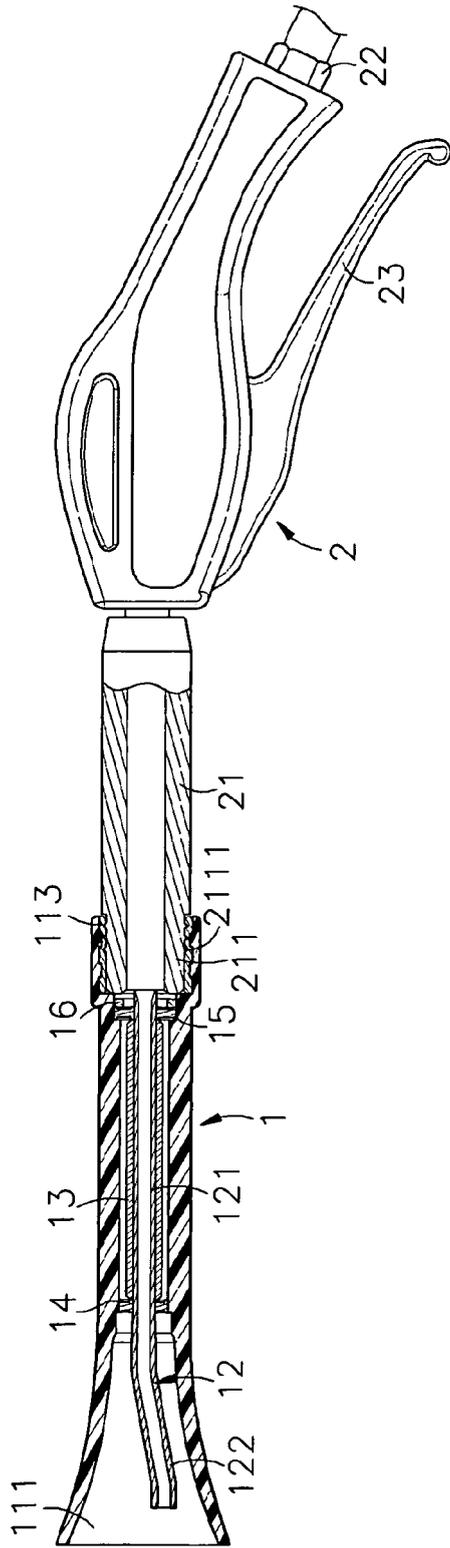


FIG. 4

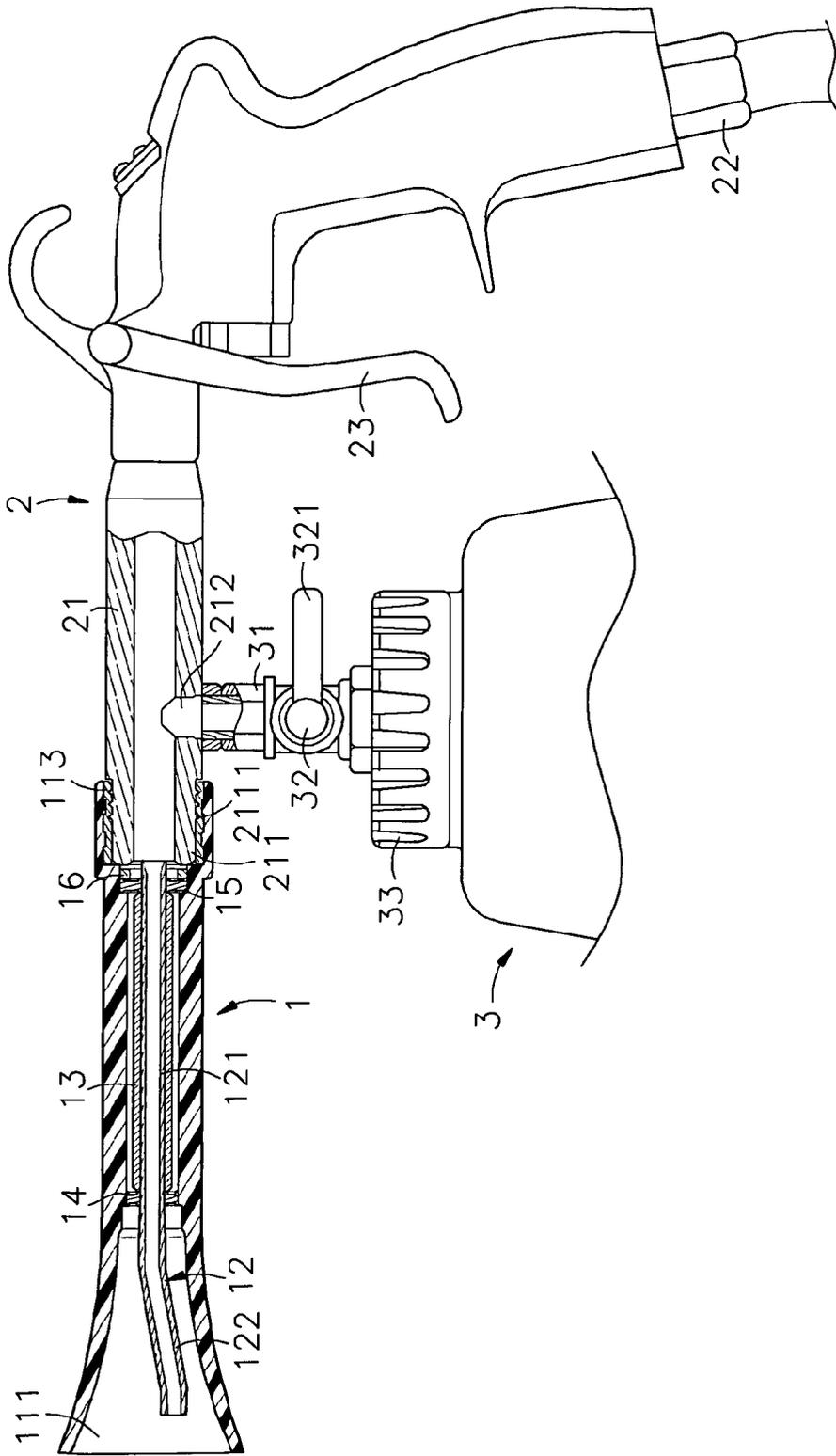


FIG. 6

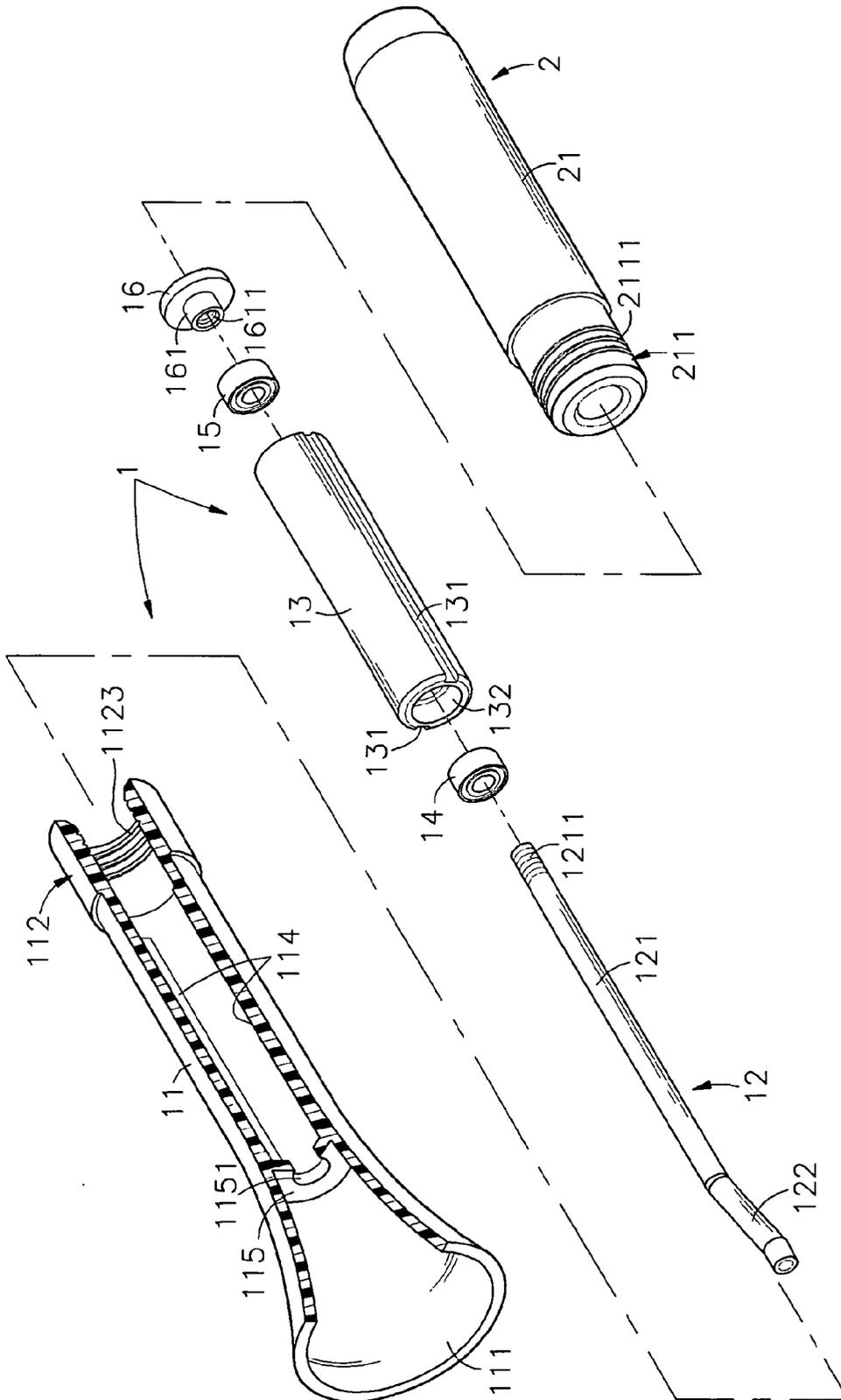
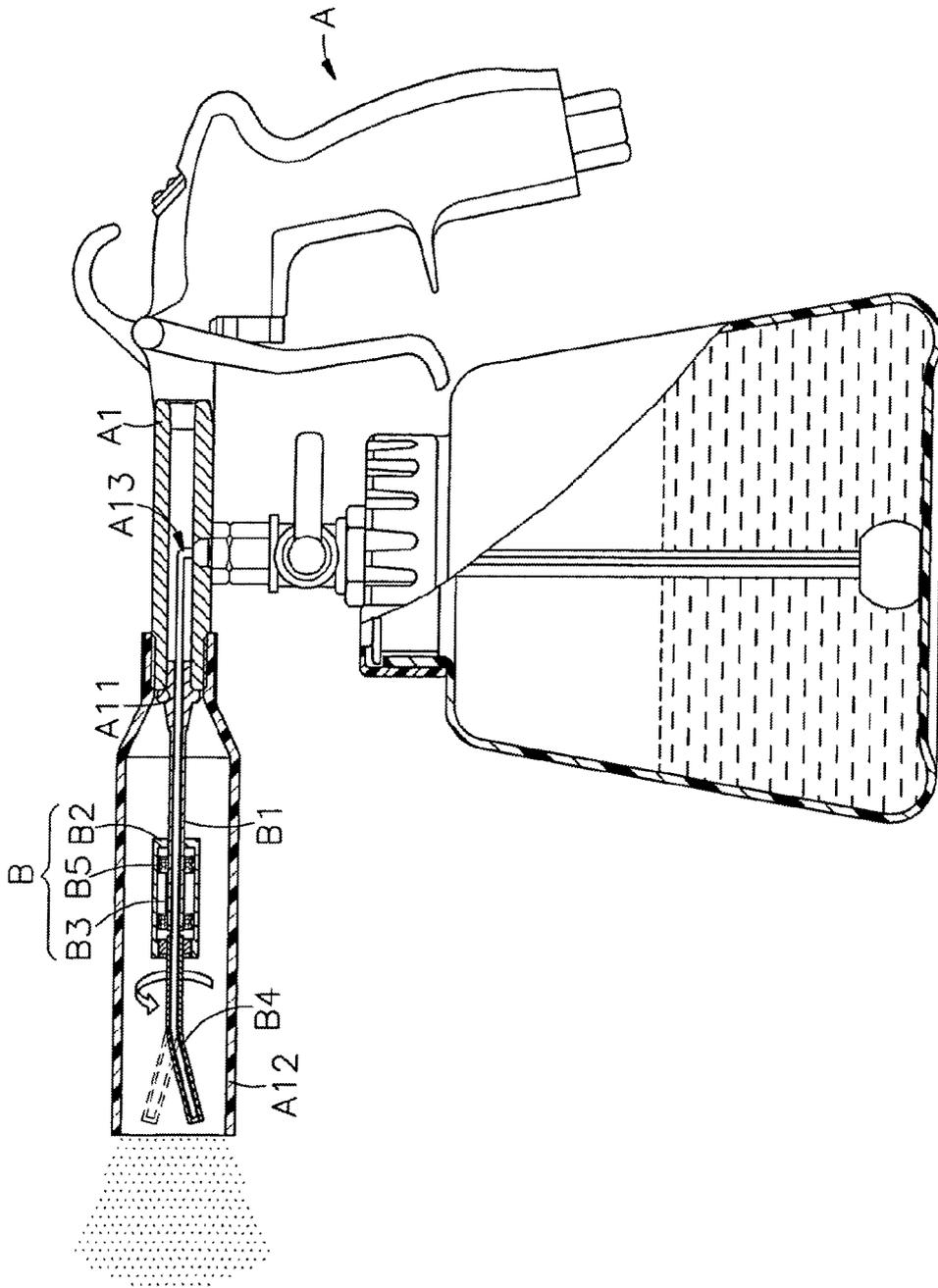


FIG. 7



PRIOR ART
FIG. 8



EUROPEAN SEARCH REPORT

Application Number
EP 10 00 5290

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Place of search		Date of completion of the search	Examiner
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CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons	
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ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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