

(19)



(11)

EP 3 995 043 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
11.05.2022 Bulletin 2022/19

(51) International Patent Classification (IPC):
A46B 11/06 (2006.01)

(21) Application number: **20206073.7**

(52) Cooperative Patent Classification (CPC):
B05B 1/20; A46B 11/063

(22) Date of filing: **06.11.2020**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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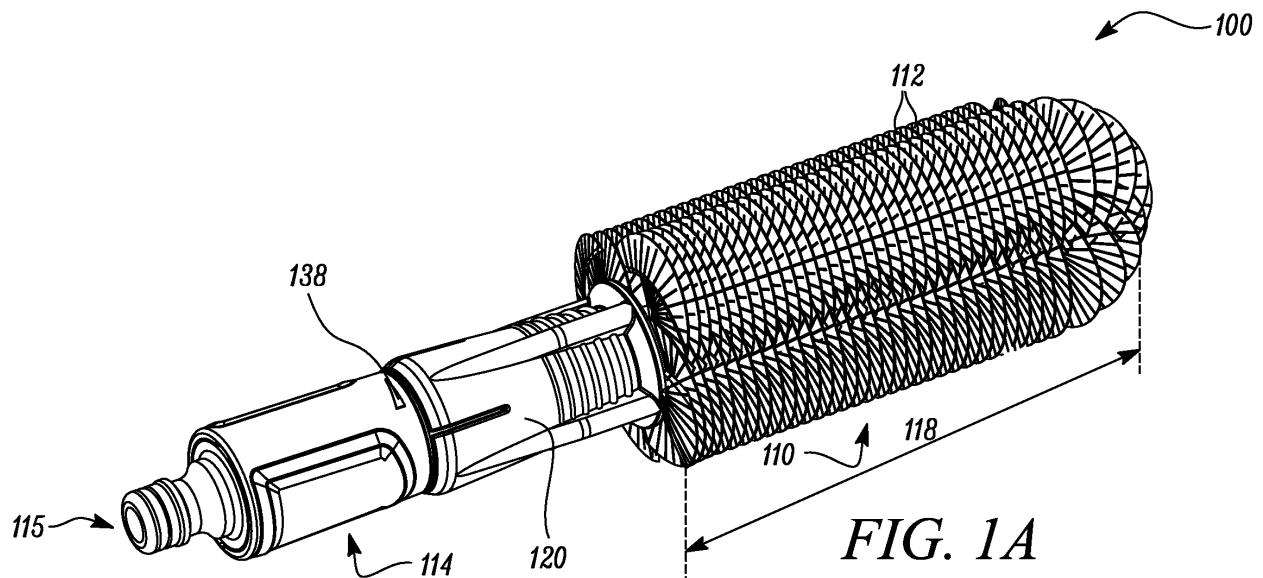
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(54) **CLEANING TOOL**

(57) A cleaning tool (100) includes a housing (102) having a first end (104) and a second end (106). The cleaning tool (100) includes a liquid channel (108) defined at the first end (104) of the housing (102). The liquid channel (108) further defines at least one opening (130). And, a plurality of cleaning elements (112) of the cleaning

tool (100) are disposed around and at least partially enclose the liquid channel (108) connected thereto. The cleaning tool (100) is characterized in that the cleaning tool (100) is further adopted to have a nozzle (114) coupled to the second end (106) of the housing (102).



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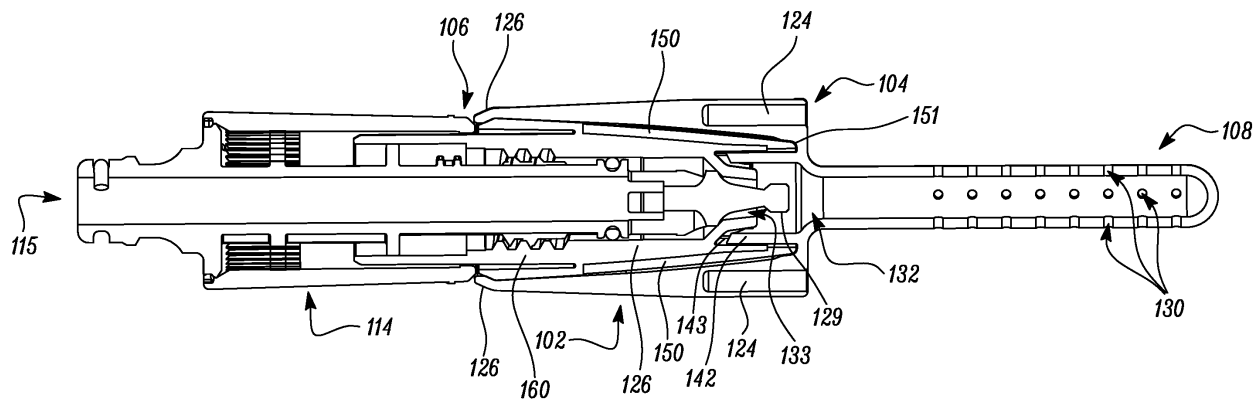


FIG. 2B

Description

TECHNICAL FIELD

[0001] The present disclosure relates to a cleaning tool. More specifically, the present disclosure relates to the cleaning tool which allows improved cleaning by easy and controlled delivery of a cleaning fluid.

BACKGROUND

[0002] A cleaning tool such as a cleaning gun uses high-pressure water spray to remove loose paint, mold, grime, dust, mud, chewing gum and dirt from surfaces and objects such as buildings, vehicles, and concrete surfaces. In this way, the cleaning tool may allow power washing by taking advantage of the high-pressure water spray along with other features available with the cleaning tool.

[0003] However, there may be instances where a cleaning brush of the cleaning tool may have an integrated "cleaning jet" to previously spray the object to be cleaned with water, followed by washing off with clear water and the like. Further, in addition to the cleaning brush, an additional cleaning syringe may be needed. A cumbersome change between the cleaning brush and the cleaning syringe may be necessary but undesirable for common users. Moreover, on wearing and tearing of a cleaning brush head (say oil-smeared or bent bristles), the entire cleaning brush, including handle and valve mechanism, may need to be discarded. This makes the use of the cleaning tool more cumbersome in addition to high costs involved in their maintenance.

[0004] An example of a cleaning tool is provided in US patent application US 1,118,774 A (hereinafter referred to as '774 reference). The '774 reference provides a fountain spray brush. The fountain spray brush includes a U-shaped wire frame and bristles distributed along the frame. The ends of the frame are secured in a handle. Further, a spraying device extends from the handle. The spraying device includes a tubular structure. The tubular structure is positioned axially between the arms of the U-shaped wire frame. The tubular structure includes perforations on the side wall suitable for delivering water to the bristles adjacent to it. The spraying device is appreciably shorter than the frame by which it is enclosed and is provided with an axial opening at the extreme end suitable for delivering water to the bristles relatively remote from the spraying device at the end portion of the brush. However, the '774 reference seems short of providing a simple, convenient cleaning tool which allows ease of water control along with other desired features.

[0005] Thus, there is a need of an improved cleaning tool with better cleaning efficiency and ease of watering control.

SUMMARY

[0006] In view of the above, it is an objective of the present invention to solve or at least reduce the drawbacks discussed above. The objective is at least partially achieved by a cleaning tool. The cleaning tool includes a housing having a first end and a second end. The cleaning tool includes a liquid channel defined at the first end of the housing. The liquid channel further defines at least one opening. And, a plurality of cleaning elements of the cleaning tool are disposed around and at least partially enclose the liquid channel connected thereto. The cleaning tool is characterized in that the cleaning tool is further adopted to have a nozzle coupled to the second end of the housing. Thus, the present disclosure provides a simple, efficient, and convenient cleaning tool with the first rotational configuration and the second rotational configuration to help in controlling water flow rate for cleaning and other purposes.

[0007] According to an embodiment of the invention, rotation of the cleaning tool, when coupled to the nozzle, leads to rotation of the valve. Further, rotation of the cleaning tool includes rotation of the housing which leads to rotation of the valve of the nozzle. This may allow ease of rotation of the valve of the nozzle, which may allow change in water spray pattern from the nozzle. Further, the present disclosure may allow this rotation with a single-hand of users.

[0008] According to an embodiment of the invention, the nozzle is selectively fluidly coupled with the liquid channel and rotatable between a first rotational configuration and a second rotational configuration. The nozzle allows a first fluid flow through the liquid channel in the first rotational configuration and a second fluid flow through the liquid channel in the second rotational configuration. The first fluid flow and the second fluid flow may be one or more of a jet pattern, spray pattern, no flow, or any other fluid flow as per the application.

[0009] According to an embodiment of the invention, the liquid channel is defined as an elongated structure. The liquid channel allows a better reach of the plurality of bristles associated with the liquid channel.

[0010] According to an embodiment of the present invention, the housing is adapted to removably couple to the valve. This allows to switch between a hand brush and the liquid-based cleaning tool, by desired removal of the housing from the nozzle, as per the application.

[0011] According to an embodiment of the present invention, each of the plurality of cleaning elements are bristles. The cleaning elements may be bristles, foam brush, lips, and other cleaning elements as used or known in the art.

[0012] According to an embodiment of the present invention, each of the bristles has a bristle opening and the liquid channel defines a liquid channel opening. Further, a diameter of the bristle opening of the bristles is greater than a diameter of the liquid channel opening. This results in pressure drop causing the water to flow

almost without pressure and with improved control through the bristle openings.

[0013] According to an embodiment of the present invention, the housing includes attachment portions. The attachment portions allow removable coupling of the cleaning elements with the housing. The cleaning elements are provided on a brush. This allows easy and removable coupling of the brush having the cleaning elements with the housing.

[0014] Other features and aspects of this invention will be apparent from the following description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The invention will be described in more detail with reference to the enclosed drawings, wherein:

FIGS. 1A and 1B show perspective views of different parts of a cleaning tool, in accordance with an aspect of the present disclosure;

FIGS. 2A and 2B show partial cross-sectional and cross-sectional view of a nozzle fitted with the housing of the cleaning tool, in accordance with an aspect of the present disclosure;

FIG. 3 shows a perspective view of a plurality of bristles of the cleaning tool, in accordance with an aspect of the present disclosure;

FIGS. 4A and 4B show perspective views of the cleaning tool with one or more rotational configurations, in accordance with an aspect of the present disclosure;

FIG. 5 shows a partial cross-sectional view of the cleaning tool, in accordance with an aspect of the present disclosure;

FIG. 6 shows a partial cross-sectional view of a reservoir of a liquid channel of the cleaning tool, in accordance with an aspect of the present disclosure; and

FIG. 7 shows perspective views of the cleaning tool disassembled from the bristles, in accordance with an aspect of the present disclosure.

DESCRIPTION OF EMBODIMENTS

[0016] The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which example embodiments of the invention incorporating one or more aspects of the present invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein;

rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. For example, one or more aspects of the present invention may be utilized in other embodiments and even other types of structures and/or methods. In the drawings, like numbers refer to like elements.

[0017] Certain terminology is used herein for convenience only and is not to be taken as a limitation on the invention. For example, "upper", "lower", "front", "rear", "side", "longitudinal", "lateral", "transverse", "upwards", "downwards", "forward", "backward", "sideward", "left", "right", "horizontal", "vertical", "upward", "inner", "outer", "inward", "outward", "top", "bottom", "higher", "above", "below", "central", "middle", "intermediate", "between", "end", "adjacent", "proximate", "near", "distal", "remote", "radial", "circumferential", or the like, merely describe the configuration shown in the Figures. Indeed, the components may be oriented in any direction and the terminology, therefore, should be understood as encompassing such variations unless specified otherwise.

[0018] **FIG. 1A** illustrates a cleaning tool **100**. The cleaning tool **100** of the present disclosure is illustrated as a cleaning nozzle however the present disclosure may be readily applied with any cleaning tool such as a cleaning brush, a spray bottle, a cleaning gun and the like which helps in removing dirt, soil, loose paint, mold from surfaces of vehicles, buildings, furniture, and garden accessories. The cleaning tool **100** includes a housing **102** (shown in **FIG. 1B**). The cleaning tool **100** includes a brush **110**. The cleaning tool **100** includes a nozzle **114**. Further, the nozzle **114** includes a needle **129** (shown in **FIG. 2**). The nozzle **114** includes an inlet **115**. The inlet **115** is connected to a water source like tap, tank, and the like.

[0019] The brush **110** includes a brush head **118** and a brush body **120**. The brush head **118** is connected to the nozzle **114** through the brush body **120**. The brush body **120** is operatively coupled with the nozzle **114** constituting a handle extension **128**. The illustrated brush **110** includes four bundles which constitute plurality of bristles **112**. The plurality of bristles **112** is disposed around a liquid channel **108**. The plurality of bristles **112** at least partially encloses the liquid channel **108**. The liquid channel **108** allows a better reach of the plurality of bristles **112** associated with the liquid channel **108**.

[0020] In some embodiments, the brush **110** may be a bottle brush, a spout brush, a stove brush, a refrigerator brush, a dryer vent brush. The brush **110** may have one or more bundles having the plurality of bristles **112**. The plurality of bristles **112** may be hard, soft, long, short, round, square and the like depending on the requirements. The plurality of bristles **112** may be made up of wire, nylon, polyester and any other such material as per need of the brush **110**.

[0021] In some embodiments, the cleaning tool **100** includes the housing **102** having the first end **104** and the second end **106**. The cleaning tool **100** includes the

liquid channel **108** defined at the first end **104** of the housing **102**. The liquid channel **108** further defines at least one opening **130**. And, the plurality of cleaning elements **112** of the cleaning tool **100** are disposed around and at least partially enclose the liquid channel **108** connected thereto. The cleaning tool **100** is further adapted to have the nozzle **114** coupled to the second end **106** of the housing **102**.

[0022] As used herein, the "cleaning elements", or "bristles" may be any cleaning means which allow flow and transfer of liquids such as water. They may be made of any material such as elastomeric material, polymers, rubber, or any other material as used or known in the art. As will be evident, the cleaning elements **112** may be lips (say elastomeric lips), foam (say rubber foam), tubes and like elements in accordance with application of the present disclosure. Further, the cleaning elements **112** may be provided for different applications with different bristle hardness (say hard or soft), bristle lengths (short or long), bristle shape (round, square and the like), among other variations as known or used in the art.

[0023] FIG. 1B illustrates the housing **102** of the cleaning tool **100**. The housing **102** includes a first end **104**. Further, the housing **102** includes a second end **106**. The first end **104** couples with the brush **110**. The second end **106** couples with the nozzle **114**. The liquid channel **108** is defined at the first end **104** of the housing **102**. The liquid channel **108** is operatively coupled with the brush **110**. The liquid channel **108** is defined as an elongated structure, however other shapes, profiles of the liquid channel **108** have been contemplated and are well within the scope. The liquid channel **108** includes the bristle openings **130** and a liquid channel opening **132**.

[0024] FIG. 2A illustrates the nozzle **114** fitted in the second end **106** of the housing **102**. The housing **102** removably couples to the nozzle **114**. This allows to convert the cleaning tool **100** into the hand brush. The cleaning tool **100** may be transferred into the hand brush by disassembly of the cleaning tool **100**. The disassembly of the brush **110** and the nozzle **114** may be done manually without using any tools. The connection and disassembly of the brush **110** and the nozzle **114** may be done by a click, sliding, and pressing a button (if provided). The hand brush without the nozzle **114** may be used for cleaning, finishing and the like. The compact, collapsible construction of the cleaning tool **100** allows storage in any box such as a balcony box, cleaning set and the like.

[0025] Referring to FIGS. 1B, 2A, the nozzle **114** includes a plurality of ribs **140**. The ribs **140** may be provided around a 2K-rubber component **150** of the nozzle **114**. The nozzle **114** includes a valve **160**. The valve **160** has generally a tapered profile and includes the 2K-rubber component **150** around a front part of the valve **160**. The housing **102** includes a plurality of engaging seats **142**.

[0026] FIG. 2B illustrates the housing **102** which includes attachment portions **124**. The attachment portions **124** may be construed as a bristle carrier. The attachment

portions **124** allow coupling with the brush **110** through one or more brush wires **122** (shown in FIG. 3). The housing **102** includes a snap connection **126**. The snap connection **126** allows for assembly or connection of the housing **102** with the nozzle **114**. The snap connection **126** may also provide a leak-proof and secure assembly between housing **102** and the nozzle **114**. In some embodiments, the snap connection **126** may be a snap-fit, or involve one or more of an annular snap-fit, a cantilever snap-fit, and a torsional snap-fit.

[0027] In some embodiments, the housing **102** includes attachment portions **124**. The attachment portions **124** allow removable coupling of the cleaning elements **112** with the housing **102**. The cleaning elements **112** are provided on the brush **110**. This allows easy and removable coupling of the brush **110** having the cleaning elements **112** with the housing **102**.

[0028] During implementation, the housing **102** and the nozzle **114** may be connected by one or more components like a rubber component, a plastic component, and the like. The component is the 2K-rubber component **150**, as illustrated in FIG. 2B. The 2K-rubber component **150** may provide a leak-free connection. In some embodiments, the housing **102** and the nozzle **114** provide a leak-free connection by an axial sealing **151**. The brush **110** may be connected to the housing **102** in a material or form-fitting manner. Alternatively, or additionally, the brush **110** may be tied, glued, screwed, bolted to the housing **102**.

[0029] In some embodiments, each of the plurality of cleaning elements **112** are bristles **112**. Further, each of the bristles **112** has the bristle opening **130** and the liquid channel **108** defines the liquid channel opening **132**. A diameter of the bristle opening **130** of the bristles **112** is greater than a diameter of the liquid channel opening **132**. This results in pressure drop causing the water to flow almost without pressure and with improved control through the bristle openings **132**.

[0030] FIG. 3 illustrates the brush head **118** which includes the one or more brush wires **122**. The brush body **120** includes some grooves (not shown). The brush head **118** fits into the brush body **120** through the one or more brush wires **122**. The brush body **120** and the one or more brush wires **122** help in fitting the brush **110** around the first end **104** of the housing **102**. The brush **110** may be a removable brush. The brush **110** may be substituted with a new brush when any deformation occurs with the brush **110**. The nozzle **114** may continue to be used. The brush **110** may be used as a hand brush whenever no water is required for cleaning. These features provide a cost-effective and eco-friendly cleaning tool **100**.

[0031] FIGS. 4A and 4B illustrate the configurational changes in the brush body **120**. The brush body **120** includes an internal regulation valve (not shown). A flow of fluid may be regulated by changing different configurations of the brush body **120**. The configurational changes in the brush body **120** actuates the regulation valve. Further, the brush body **120** may indirectly actuate the

nozzle **114**. The nozzle **114** is adapted to be rotated between a first rotational configuration **R1** and a second rotational configuration **R2**.

[0032] FIG. 4A illustrates the first rotational configuration **R1** of the brush body **120**. The first rotational configuration **R1** of the brush body **120** is a clockwise rotation. The nozzle **114** is selectively fluidly coupled with the liquid channel **108** such that the nozzle **114** allows the fluid flow through the liquid channel **108** in the first rotational configuration **R1** of the brush body **120**. On the first rotational configuration **R1**, the needle **129** emerges out to allow the fluid flow.

[0033] FIG. 4B illustrates the second rotational configuration **R2** of the brush body **120**. The second rotational configuration **R2** of the brush body **120** is an anticlockwise rotation. The nozzle **114** is selectively fluidly coupled with the liquid channel **108** such that the nozzle **114** stops the fluid flow through the liquid channel **108** in the second rotational configuration **R2** of the brush body **120**. On the second rotational configuration **R2**, the needle **129** retracts. The fluid flow is made to stop on retracting of the needle **129**.

[0034] In some embodiments, rotation of the cleaning tool **100**, when coupled to the nozzle **114**, leads to rotation of the valve **160**. More particularly, rotation of the cleaning tool **100** may include rotation of the housing **102** which leads to rotation of the valve **160**. The present disclosure thus allows rotation of the housing **102** with a single hand of users which lead to rotation of the valve **160**. The present disclosure mentions rotation of the nozzle **114**, which actually pertains to rotation of the valve **160** of the nozzle **114** for desired change in flow of the liquid from the nozzle **114**. This rotation of the valve **160** allows change in flow pattern (jet, sprinkler, and the like) through the nozzle **114**. Further, the nozzle **114** is selectively fluidly coupled with the liquid channel **108** and rotatable between a first rotational configuration **R1** and a second rotational configuration **R2**. The valve **160** allows a first fluid flow through the liquid channel **108** in the first rotational configuration **R1** and a second fluid flow through the liquid channel **108** in the second rotational configuration **R2**. The first fluid flow and the second fluid flow may be one or more of a jet pattern, spray pattern, no flow, or any other fluid flow as per the application.

[0035] During implementation, the fluid flow may be controlled by partial or complete rotation of the brush body **120** of the handle extension **128**. The partial or complete rotation of the brush body **120** may range from a certain angle to full revolution of 360 degrees. The convenient regulation of water volume may be done by one hand. An arrow **138** is marked on the nozzle **114**. The arrow **138** denotes that the flow of fluid may be increased on clockwise rotation and the flow of fluid may be decreased by anticlockwise rotation of the brush body **120**.

[0036] In some embodiments, torque transmission between the brush **110** and the brush body **120** may be actuated by adherence, positive fitting or any other transmission technique as used or known in the art. The con-

figurational changes may be brought by rotation, sliding, or by switching on/ off a button if provided with the brush body **120**.

[0037] FIG. 5 illustrates the liquid channel **108** having the liquid channel opening **132**. The present disclosure illustrates the liquid channel **108** as substantially cylindrical shaped and the liquid channel opening **132** defines its diameter. Preferably, the sum of all bristle openings **130** have diameter greater than diameter of the liquid channel opening **132**. This results in pressure drop of the liquid entering the liquid channel **108** at its channel opening **132**, thus the force on the connection of housing **102** and the brush **110** is significantly reduced.

[0038] A positive connection is created by the engaging seats **142** and inner ribs **143**, as best illustrated with reference to FIGS. 2A, and 5. Further, this connection between the engaging seats **142** and inner ribs **143** allows desired coupling of the housing **102** and the nozzle **114**, respectively. Then, any rotation of the housing **102** allows rotation of the valve **160** of the nozzle **114**, which allows desired change in flow of the liquid from the nozzle **114**. Alternatively, rotation of the nozzle **114** may allow rotation of the housing **102**.

[0039] In some embodiments, the diameter of the liquid channel opening **132** is greater than a diameter of a water ring **133**. This arrangement provides that the diameter of the bristle opening **130** of the bristles **112** is greater than a diameter of the liquid channel opening **132**, which is greater than the diameter of the water ring **133**. This arrangement ensures that there is drop of pressure in flow of the water flowing from the nozzle **114** to the housing **102**. Moreover, this pressure drop from the water ring **133** to the liquid channel opening **132** and then to the bristle opening **130** of the bristles **112** allows to avoid any inadvertent disassembly of the nozzle **114** and the housing **102**.

[0040] In some embodiments, the bristle openings **130** and the liquid channel openings **132** may have different dimensions, different shapes to cause pressure drop. Additionally, or alternatively, the bristle openings **130** and the liquid channel openings **132** may have same dimensions which even provide pressure drop in one way or the other. Such as, the bristle openings **130** and the liquid channel openings **132** both are large enough to allow the best pace of the fluid to come out.

[0041] FIG. 6 illustrates the liquid channel **108**. The liquid channel **108** includes an integrated reservoir **134**. In some embodiments, the integrated reservoir **134** may be for chemical cleaning additives such as soaps, barnacles and the like. During implementation, a soap stick **136** may be kept. The soap stick **136** may be substituted by any detergent. The integrated reservoir **134** for the soap stick **136** provides the cleaning tool **100** with an additional benefit. The integrated reservoir **134** provides an optional use of the soap stick **136** as per the requirements. As bicycles, car rims, garden furniture and the like may be immaculately cleaned by the active actions of the soap stick **136**.

[0042] In some embodiments, an external holder may be provided with the cleaning tool **100**. The external holder may carry soap, detergent and any such chemical cleaning additive. The external holder may be provided near to the liquid channel openings **132**. This allows mixing of incoming water with the detergent before falling on the surface of the object to be cleaned. Additionally, or alternatively, the integrated reservoir **134** may have an external button, switch provided with the cleaning tool **100** which may allow mixing of water with the detergent on demand of the user.

[0043] The present disclosure also allows application of the brush **110** and the nozzle **114** individually and separately, as illustrated in **FIG. 7**. As illustrated, the nozzle **114** may be disassembled from the grimy, soiled brush **110** so as to clean the brush **110** by a water stream **W** of the nozzle **114**. Alternatively, detachable arrangement of the brush **110** and the nozzle **114** also allows ease of replacement, such as replacement of the nozzle **114** or the brush **110** after service life or for other applications considerations.

[0044] The present disclosure provides the cleaning tool **100**, which is simple, cost-effective, and multi-purpose. The cleaning tool **100** may be readily switched between a cleaning syringe (i.e. the nozzle **114**) and washing brush (with the brush **110**). Further, the application of the brush **110** may be easily performed with a simple click-action. Further, the cleaning tool **100** allows ease of rotation of the cleaning tool **100** (say the housing **102**) by a single hand of the users leading to desired change in liquid flow from the nozzle **116**.

[0045] In the drawings and specification, there have been disclosed preferred embodiments and examples of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for the purpose of limitation of the scope of the invention being set forth in the following claims.

LIST OF ELEMENTS

[0046]

100	Cleaning Tool
102	Housing
104	First End
106	Second End
108	Liquid Channel
110	Brush
112	Cleaning Elements/Bristles
114	Nozzle
115	Inlet
118	Brush Head
120	Brush body
122	Brush wires
124	Attachment Portions
126	Snap Connection
128	Handle Extension
129	Needle

130	Bristle Openings
132	Liquid Channel Opening
133	Water Ring
134	Reservoir
136	Soap Stick
138	Arrow
140	Ribs
143	Inner Ribs
142	Engaging Seats
150	2K-rubber component
151	Axial sealing
160	Valve
R1	First Rotational Configuration
R2	Second Rotational Configuration
W	Water Stream

Claims

1. A cleaning tool (**100**) comprising:
 - a housing (**102**) having a first end (**104**) and a second end (**106**);
 - a liquid channel (**108**) defined at the first end (**104**) of the housing (**102**), wherein the liquid channel (**108**) further defines at least one opening (**130**); and
 - a plurality of cleaning elements (**112**) of the cleaning tool (**100**) which are disposed around and at least partially enclosing the liquid channel (**108**) connected thereto;

characterized in that:
the cleaning tool (**100**) further adopted to have a nozzle (**114**) coupled to the second end (**106**) of the housing (**102**).
2. The cleaning tool (**100**) of claim 1, wherein rotation of the cleaning tool (**100**), when coupled to the nozzle (**114**), leads to rotation of the valve (**160**).
3. The cleaning tool (**100**) of claim 2, wherein rotation of the cleaning tool (**100**) includes rotation of the housing (**102**) which leads to rotation of the valve (**160**) of the nozzle (**114**).
4. The cleaning tool (**100**) of claim 1, wherein the nozzle (**114**) is selectively fluidly coupled with the liquid channel (**108**) and rotatable between a first rotational configuration (**R1**) and a second rotational configuration (**R2**), wherein the nozzle (**114**) allows a first fluid flow through the liquid channel (**108**) in the first rotational configuration (**R1**) and a second fluid flow through the liquid channel (**108**) in the second rotational configuration (**R2**).
5. The cleaning tool (**100**) of claim 1, wherein the liquid channel (**108**) is defined as an elongated structure.

6. The cleaning tool **(100)** of any of the preceding claims, wherein the housing **(102)** is adapted to removably couple to the valve **(160)**.
7. The cleaning tool **(100)** of claim 1, wherein each of the plurality of cleaning elements **(112)** are bristles **(112)**. 5
8. The cleaning tool **(100)** of claim 7, wherein each of the bristles **(112)** has a bristle opening **(130)** and the liquid channel **(108)** defines a liquid channel opening **(132)**, wherein a diameter of the bristle opening **(130)** of the bristles **(112)** is greater than a diameter of the liquid channel opening **(132)**. 10
9. The cleaning tool **(100)** of any of the preceding claims, wherein the housing **(102)** includes attachment portions **(124)**, wherein the attachment portions **(124)** allow removable coupling of the cleaning elements **(112)** with the housing **(102)**. 15 20
10. The cleaning tool **(100)** of claim 4, wherein the cleaning elements **(112)** are provided on a brush **(110)**. 25

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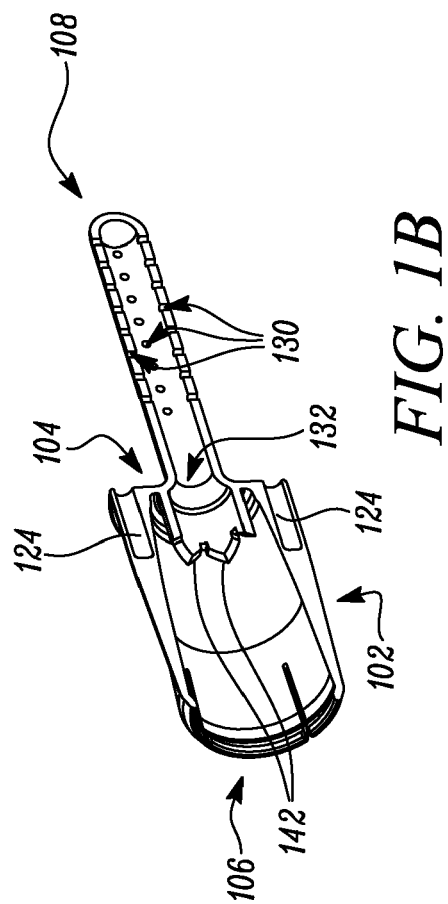
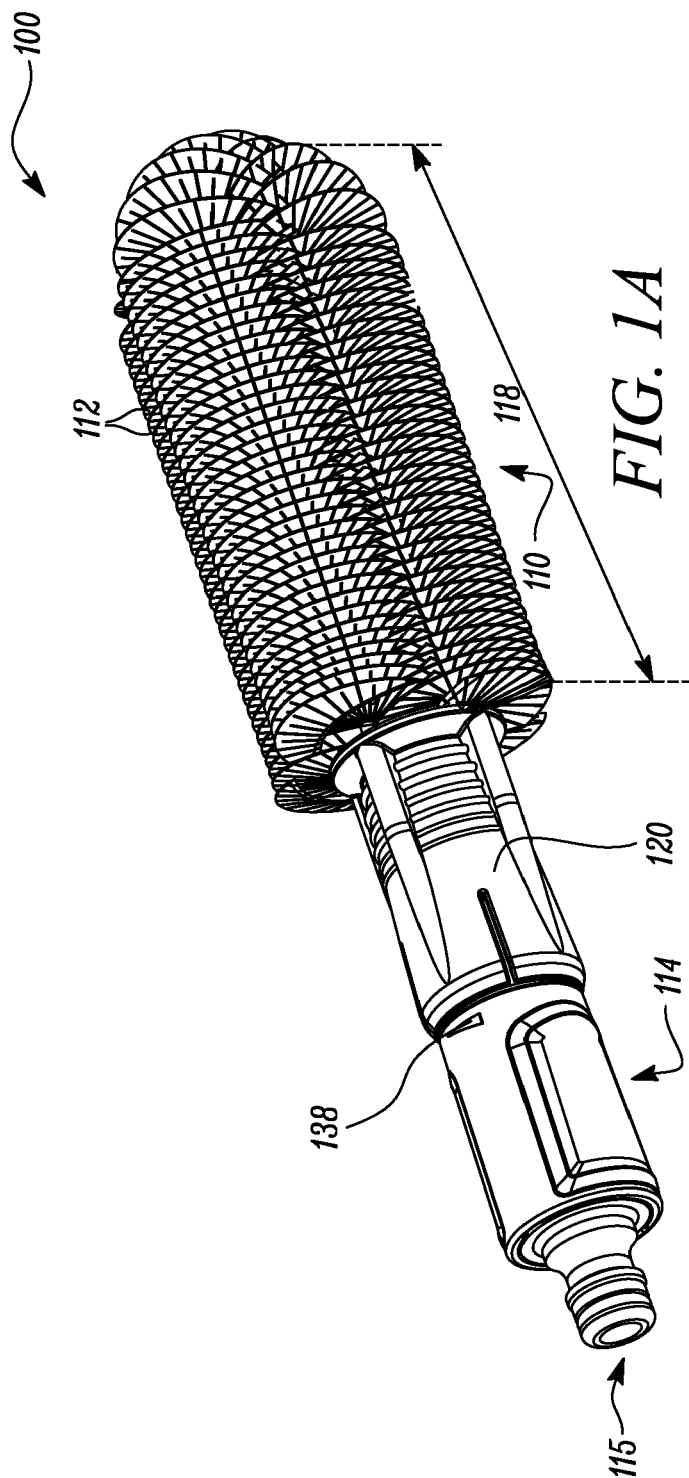
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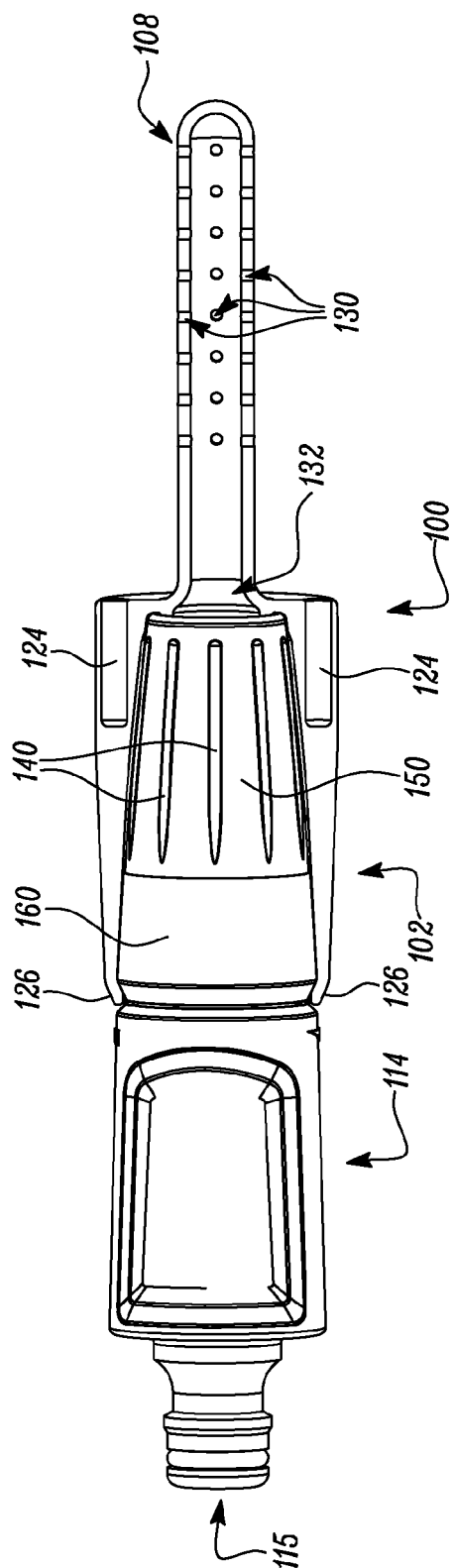


FIG. 2A

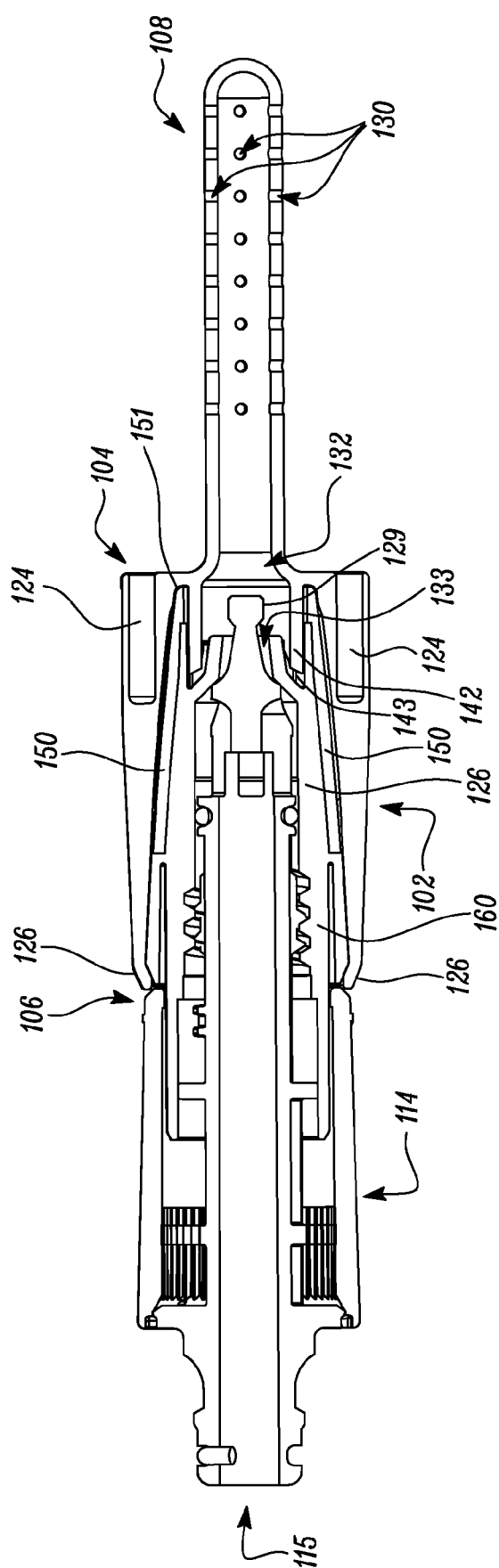


FIG. 2B

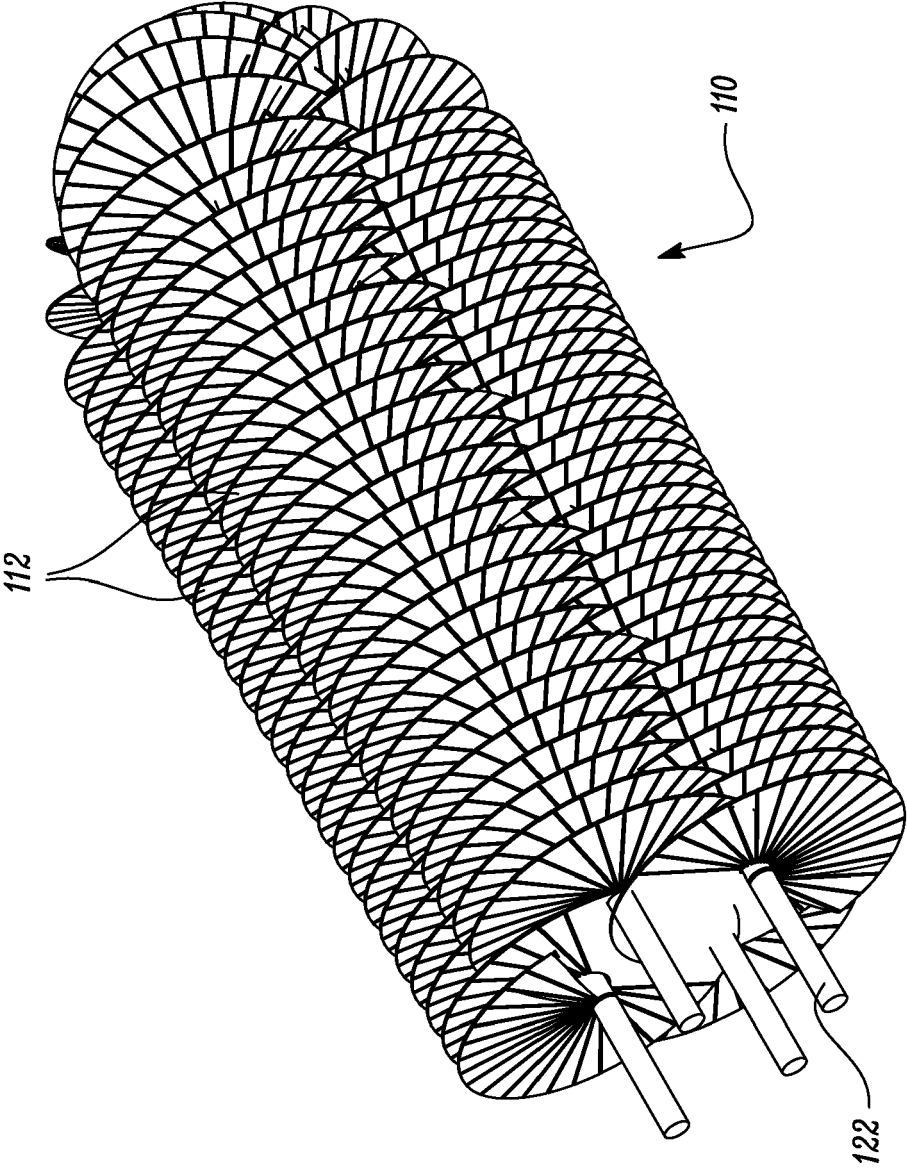


FIG. 3

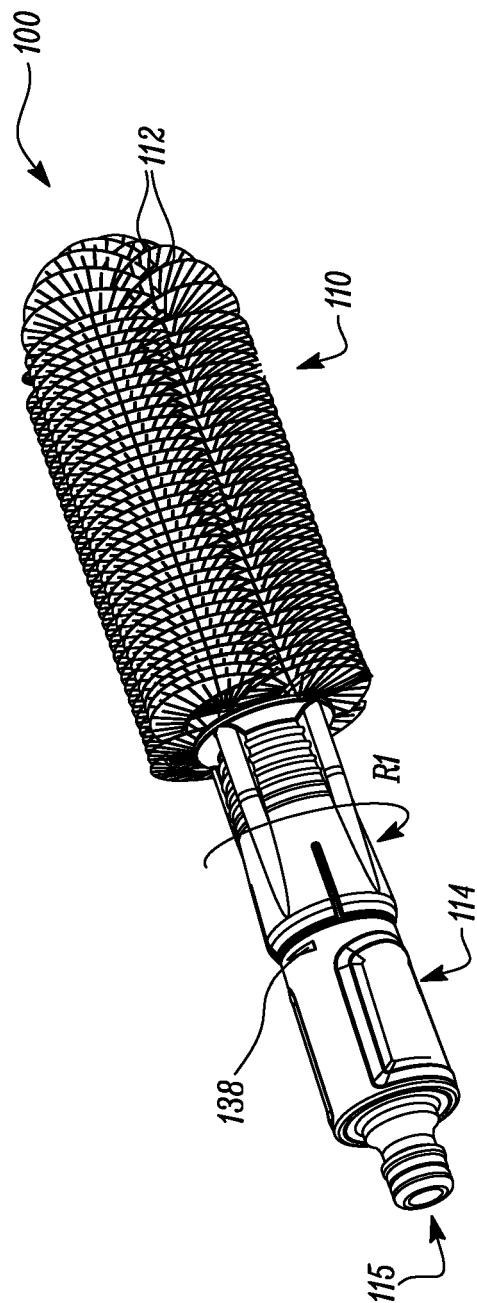


FIG. 4A

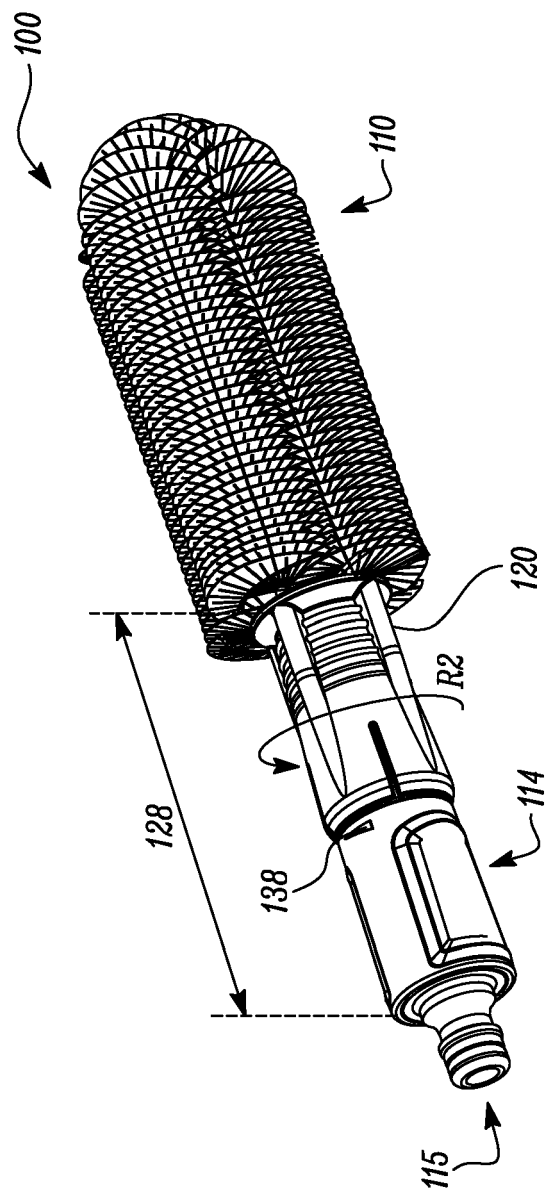


FIG. 4B

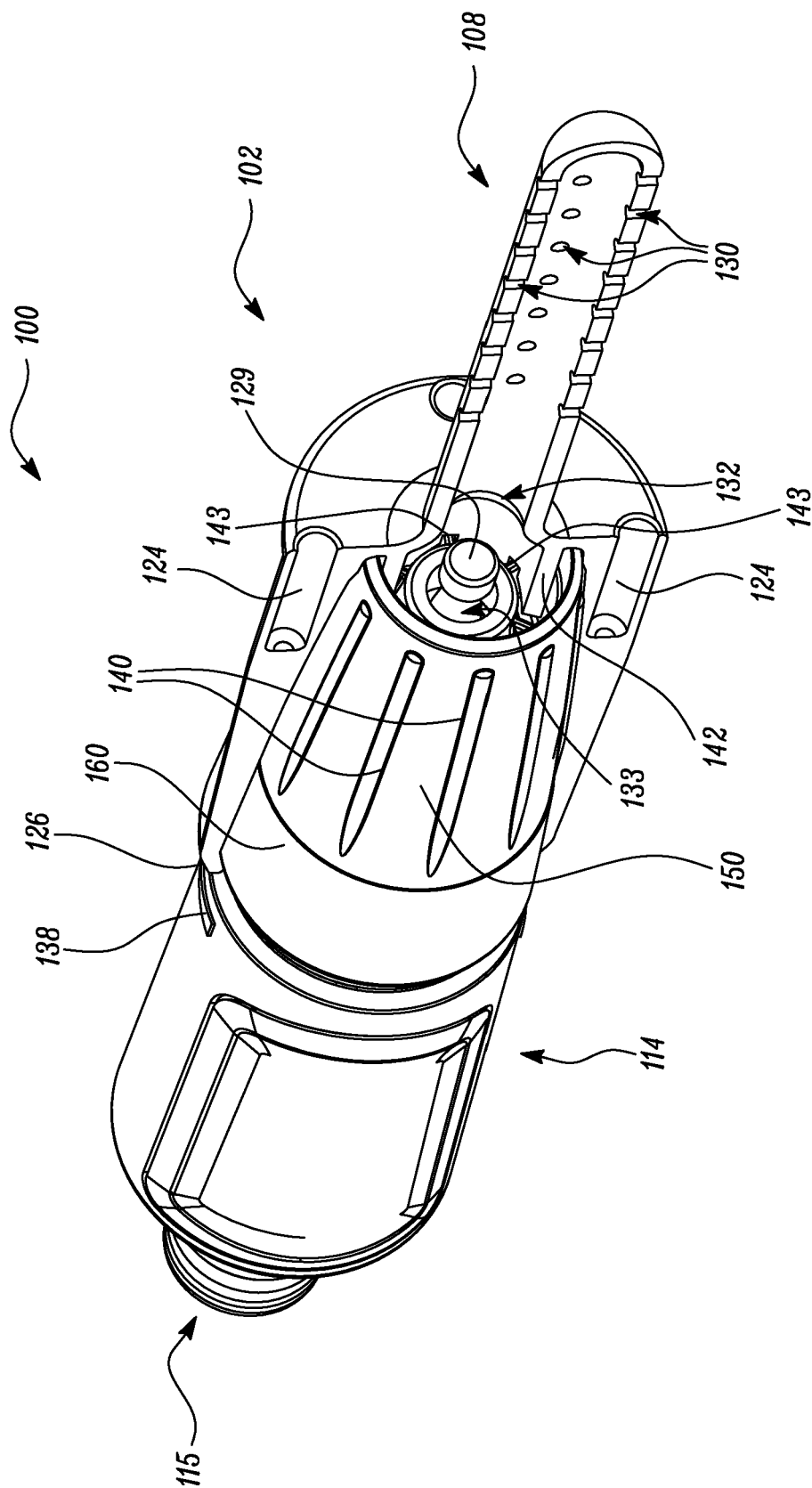


FIG. 5

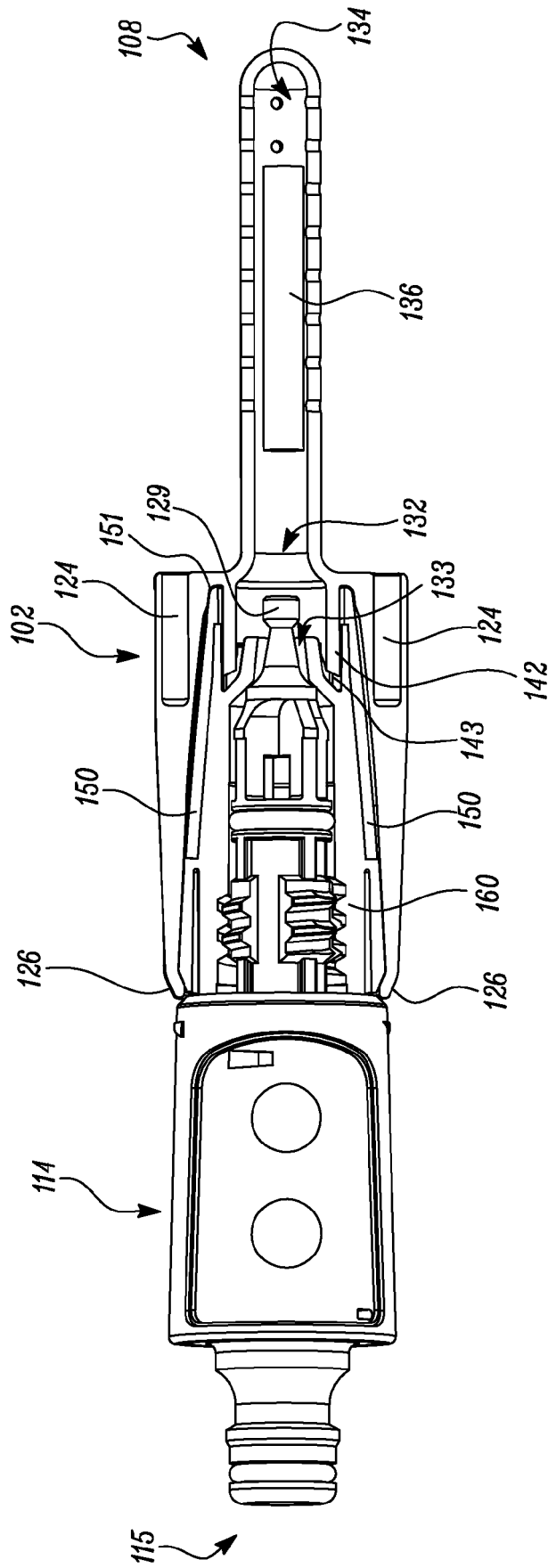


FIG. 6

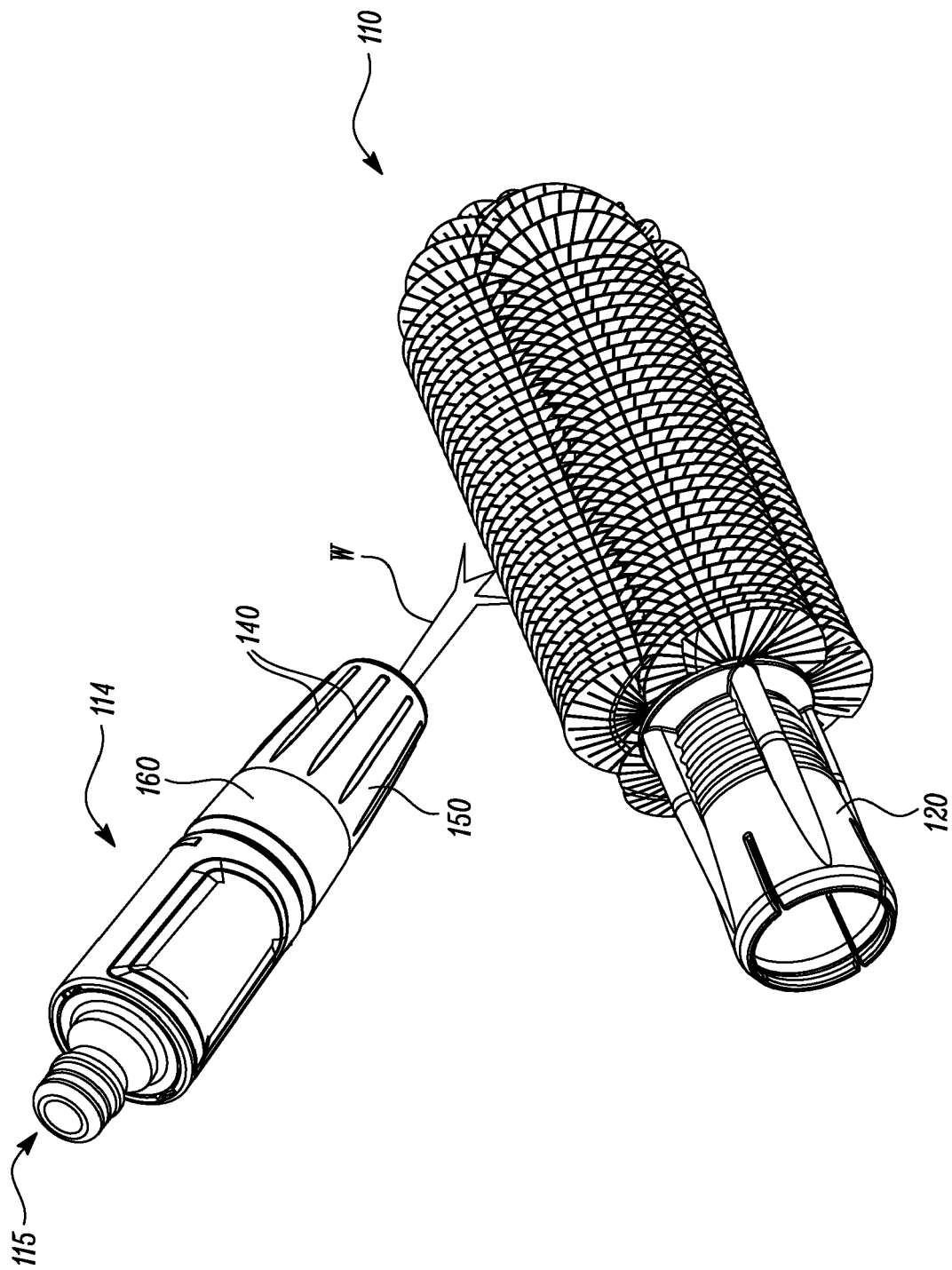


FIG. 7



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 20 6073

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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document 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 & : member of the same patent family, corresponding document			

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