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(54) **ACCESSORY TOOL FOR EXTRACTION CLEANER**

(57) An accessory tool (10T) usable with an extraction cleaner (12, 120, 220) for cleaning a surface (11) includes a tool body (10), fluid reservoir (54), and porous spray bar (55). The tool body (10) defines a fluid pathway (50), an airflow pathway (52), and a suction nozzle (20) connected to the airflow pathway (52), and connects to the extraction cleaner (12, 120, 220) via an accessory hose (13). The fluid reservoir (54) is in fluid communication with the fluid pathway (50) and carried by the tool body (10). The porous spray bar (55), which is coupled to the tool body (10) adjacent the fluid reservoir (54) and surrounded by the suction nozzle (20), directs cleaning fluid (34) from the fluid reservoir (54) onto the surface (11). The fluid pathway (50) connects via the accessory hose (13) to a fluid delivery system (30) aboard the extraction cleaner (12, 120, 220) to receive the cleaning fluid (34) and direct the cleaning fluid (34) to the fluid reservoir (54). The airflow pathway (52) connects the suction nozzle (20) via the accessory hose (13) to a fluid recovery system (18) aboard the extraction cleaner (12, 120, 220).

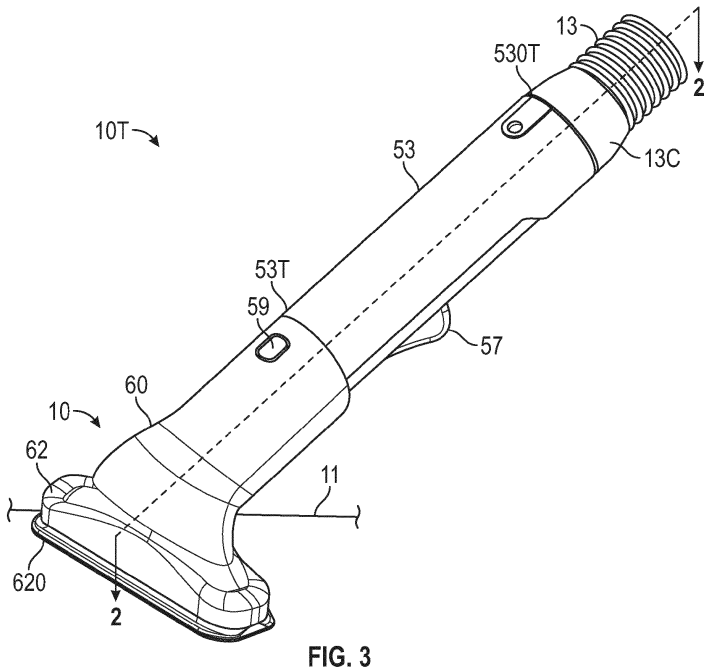


FIG. 3

EP 4 298 973 A2

Description

BACKGROUND

[0001] The subject disclosure pertains to extraction cleaners of a type commonly used to clean rugs, carpeting, drapes, and upholstered surfaces. In particular, the subject disclosure pertains to an extraction tool that connects to a housing of an extractor cleaner via a flexible accessory hose and an intervening conduit section, with the latter referred to herein and in the art as a wand. The extraction cleaners contemplated herein can be upright or portable, with the housing carrying separate fluid and recovery systems. The extraction tool in turn has a tool body and an accompanying suction nozzle through which cleaning fluid and entrained debris are extracted from the surface. As the extraction tool is intended to be selectively connectable to the housing of the extraction cleaner as an accessory, the extraction tool is also commonly referred to as an accessory tool.

[0002] As appreciated in the art, fluid-based or "wet" extraction cleaners include a supply tank containing a cleaning fluid having an application-suitable composition. For instance, common household extraction cleaning tasks can be performed using water or a liquid cleaning solution containing surfactants, stabilizers, fragrances, and other active or inactive ingredients, or simply using water. The cleaning fluid is dispensed from the supply tank onto a surface to be cleaned, for instance through one or more orifices of the accessory tool or via a spray nozzle. The dispensed cleaning fluid can be agitated to help capture embedded dirt, pet dander, and other debris. A suction source carried by the housing of the extraction cleaner generates suction forces, which are directed to the suction nozzle of the accessory tool to extract cleaning fluid and entrained debris from the surface. The extracted fluid and debris are then deposited into a removable recovery tank for disposal.

BRIEF SUMMARY

[0003] An accessory tool is disclosed herein that is usable with an upright or portable extraction cleaner for cleaning a surface. The accessory tool as described in detail below is particularly beneficial when used to clean resilient surfaces such as upholstery and drapes. Due to the nature of such surfaces, it is desirable to avoid saturation of the surface with cleaning fluid to help shorten drying times. Likewise, it is desirable to evenly distribute dispensed cleaning fluid on the surface when using the accessory tool to optimize cleaning effectiveness. Structural features of the accessory tool as set forth in detail below are therefore intended to address challenges associated with shortening drying time while providing an acceptable and/or improved degree of cleaning effectiveness. However, the described accessory tool is not limited to use on any particular surface or surface type, and therefore upholstery and drapes are exemplary surfaces and non-limiting of the present teachings.

[0004] The accessory tool disclosed below is a hose-connectable, user-maneuverable attachment equipped for receiving an end of a flexible accessory hose, typically via an intervening fluid conduit or connection piece referred to hereinafter as a wand. An opposing end of the accessory hose is connected to a housing of the extraction cleaner. Exemplary embodiments of extraction cleaners usable with the accessory tool include an upright extraction cleaner having a wheel-mounted housing that is rolled on the surface, or a portable extraction cleaner whose housing is instead lifted via a handle and carried about the surface by the user. The extraction cleaner for its part is operable for delivering room temperature water, heated water, or a chemical cleaning solution to the surface being cleaned, and for extracting liquid and entrained debris from the surface for disposal. For illustrative simplicity, the various possible types of liquids suitable for cleaning the surface are referred to below for simplicity as cleaning fluids.

[0005] As noted above, it is advantageous to limit the volume of cleaning fluid contacting upholstery and drapes during an extraction cleaning process. However, traditional spray nozzles are geared toward thoroughly wetting a target surface for the purpose of removing stains, dirt, and other deeply engrained debris. Unlike carpeting and rugs, however, upholstered furniture is intended to be in direct sustained contact with a user's body during normal use. Therefore, use of traditional accessory tools when cleaning certain upholstered surfaces can result in extended drying times, which in turn would have the undesirable effect of delaying the user's use and enjoyment of the furniture. While this may not be a problem with infrequent cleaning, users wishing to clean on a daily or weekly basis could be inconvenienced by extended drying times, and thus potentially dissuaded from maintaining a desired cleaning frequency. Other resilient surfaces such as drapery would similarly benefit from reduced drying times.

[0006] To that end, an aspect of the subject disclosure includes the above-noted accessory tool for an extraction cleaner, with the accessory tool having a tool body, a fluid reservoir, and a porous spray bar. For illustrative clarity and consistency, the term "fluid" is used herein synonymously with the term "liquid" to distinguish the liquid cleaning solution dispensed by the fluid delivery system from the airflow imparted by suction forces from the fluid recovery system when extracting the spent cleaning fluid and suspended debris from the surface. The tool body in an illustrative embodiment defines a fluid pathway, an airflow pathway, and a suction nozzle connected to the airflow pathway. The tool body is connectable to the extraction cleaner via a flexible hose. The fluid reservoir in this embodiment is in fluid communication with the fluid pathway and porous spray bar, and is carried by the tool body.

[0007] In a representative construction, the porous spray bar is connected to the tool body adjacent the fluid

reservoir and surrounded by the suction nozzle. The porous spray bar directs the cleaning fluid from the fluid reservoir onto the surface. The fluid pathway within the tool body connects via the hose to a fluid delivery system carried by the extraction cleaner, i.e., by a housing thereof. This allows the fluid pathway to receive the cleaning fluid from the fluid delivery system and direct the received cleaning fluid to the fluid reservoir. The airflow pathway within the tool body connects the suction nozzle, again via the hose, to a fluid recovery system carried by the extraction cleaner.

[0008] An aspect of the disclosure includes the tool body having a foot plate forming a working surface, e.g., a planar or substantially flat working surface. The suction nozzle in this embodiment includes a continuous suction channel that opens to the working surface of the foot plate. One or more agitators can be connected to or formed integrally with the tool body on the working surface in an optional construction of the tool body. The tool body can be optionally constructed at least partially from a transparent or translucent material, e.g., in whole or in the form of a sight glass, so as to facilitate a user's view of the ongoing fluid extraction process as well as a cleanliness level of the interior of the tool body.

[0009] The porous spray bar is constructed of a sintered material in one or more embodiments. For instance, the sintered material can include a sintered plastic material such as polypropylene or polyethylene, or the sintered material could be embodied as a corrosion-proof sintered metal, metal alloy, or ceramic material. In other embodiments, the porous spray bar can be a flat/planar bar or plate defining a plurality of orifices extending therethrough. The porous spray bar could be constructed to allow the porous spray barto be removably connected to the tool body, e.g., as a replaceable insert, which in turn would allow the user to select a porous spray bar having a suitable flow rate for a given cleaning task or to replace the porous spray bar due to damage or wear.

[0010] In a possible implementation, a flow rate of the cleaning fluid through the porous spray bar can be at least about 50 milliliters per minute (ml/min). The flow rate of the cleaning fluid through the porous spray bar can be less than about 300 ml/min in the same embodiment or other possible constructions.

[0011] Another aspect of the disclosure includes the tool body having or being connected to at least one suction relief device, with the suction relief device(s) being configured to selectively reduce suction at the suction nozzle. The suction relief device(s) can include a plurality of vent channels intersecting the suction nozzle such that the suction nozzle is in fluid communication with an outer perimeter surface of the accessory tool. Alternatively, the suction relief device(s) can include a plurality of vent holes formed in the accessory tool and a moveable member configured to selectively cover and uncover one or more of the vent holes.

[0012] Also disclosed herein is an extraction cleaner having a housing, a fluid delivery system carried by the housing and operable for dispensing a cleaning fluid, and a fluid recovery system carried by the body and operable for recovering the cleaning fluid and debris entrained therein. The extraction cleaner includes an accessory hose connectable to the extraction cleaner, and an accessory tool connectable to the accessory hose. The accessory tool in this particular embodiment includes a tool body having a foot plate forming a working surface and defining a fluid pathway, an airflow pathway, and a suction nozzle, with the latter being in fluid communication with the airflow pathway. The tool body connects to the accessory hose to fluidly connect the fluid pathway to a fluid delivery system, as well as to fluidly connect the airflow pathway to the fluid recovery system.

[0013] A fluid reservoir carried by the tool body is in fluid communication with the fluid pathway such that the fluid reservoir is supplied with the cleaning fluid from the fluid delivery system. The porous spray bar is surrounded by the suction nozzle and is connected to the tool body adjacent to the fluid reservoir. The fluid pathway connects via the accessory hose to the fluid delivery system aboard the extraction cleaner to receive the cleaning fluid therefrom, with the airflow pathway connecting via the accessory hose to the fluid recovery system.

[0014] The extraction cleaner in different exemplary embodiments can be an upright extraction cleaner having a housing carried by a set of wheels, or the extraction cleaner can be a portable extraction cleaner having a housing connected to or formed integrally with a handle, by means of which a user carries the housing.

[0015] Also disclosed herein is an accessory tool for use with an extraction cleaner and an accessory hose connectable thereto. The accessory tool in accordance with an aspect of the disclosure includes a tool body defining a fluid pathway, an airflow pathway, and a suction nozzle connected to the airflow pathway. The tool body, which is configured to connect to the extraction cleaner via the accessory hose, includes a foot plate forming or defining a working surface. The suction nozzle in this particular embodiment includes a continuous suction channel that opens to the working surface of the foot plate. The fluid pathway connects via the hose to a fluid delivery system aboard the extraction cleaner. The airflow pathway is configured to connect to a fluid recovery system via the accessory hose.

[0016] Additionally, a fluid reservoir carried by the tool body is in fluid communication with the fluid pathway. As part of this representative construction, a porous spray bar constructed of a sintered plastic material, e.g., polypropylene or polyethylene, is connected to the tool body adjacent to the fluid reservoir and surrounded by the suction nozzle. A flow rate of cleaning fluid passing through pores of the porous spray bar is at least about 50 ml/min and less than about 300 ml/min in this non-limiting construction, with various sub-ranges being possible within this defined range as set forth in detail below.

[0017] The above summary is not intended to represent every possible construction or aspect of the subject

disclosure. Rather, the foregoing summary is intended to exemplify some of the novel aspects and features disclosed herein. The above-summarized features and other features and advantages of the subject disclosure will be readily apparent from the following detailed description of representative embodiments and modes for carrying out the subject disclosure when taken in connection with the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The drawings described herein are for illustrative purposes only, are schematic in nature, and are intended to be exemplary rather than to limit the scope of the disclosure.

FIG. 1 is a schematic fluid circuit diagram illustrating an extraction cleaner having a hose-connectable accessory tool constructed as described herein.

FIG. 2 is a side cross-sectional view of the accessory tool of the present disclosure, taken along line 2-2 of FIG. 3.

FIG. 3 is a top perspective view of the accessory tool of FIG. 2.

FIG. 4 is a bottom plan view of the accessory tool shown in FIG. 3.

FIG. 5 is a fragmentary bottom perspective view of an alternative embodiment of the accessory tool of the present disclosure.

FIGS. 5A and 5B illustrate a porous surface of a porous spray bar of the accessory tool shown in FIGS. 1-5.

FIG. 6 is a fragmentary bottom perspective view of an accessory tool having an optional suction relief feature in accordance with an aspect of the disclosure.

FIGS. 7A and 7B illustrate a suction relief feature that can be used as an alternative to the suction relief feature shown in FIG. 6.

FIGS. 8A, 8B, and 8C together illustrate an optional adjustable nozzle orientation feature usable with the accessory tool described herein.

[0019] The appended drawings are not necessarily to scale, and may present a somewhat simplified representation of various preferred features of the present disclosure as disclosed herein, including, for example, specific dimensions, orientations, locations, and shapes. Details associated with such features will be determined in part by the particular intended application and use environment.

DETAILED DESCRIPTION

[0020] The subject disclosure may be embodied in many different forms. Representative examples are shown in the various drawings and described in detail below, with the understanding that the descriptions are exemplifications of the disclosed principles and not limitations of the broad aspects of the disclosure. To that end, elements and limitations described below, but not explicitly set forth in the claims, should not be incorporated into the claims, singly or collectively, by implication, inference, or otherwise. Moreover, the drawings discussed herein may not be to scale, and are provided purely for instructional purposes. Thus, the specific and relative dimensions shown in the Figures are not to be construed as limiting.

[0021] Additionally, unless specifically disclaimed: the singular includes the plural and vice versa; the words "and" and "or" shall be both conjunctive and disjunctive; the words "any" and "all" shall both mean "any and all"; and the words "including," "containing," "comprising," "having," along with permutations thereof and similar terms, shall each mean "including without limitation." Further, the words "example" or "exemplary" are used herein to mean serving as an example, instance, or illustration. Any aspect or design described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other aspects or designs. Rather, use of the word exemplary is intended to present concepts in a concrete fashion. Moreover, words of approximation, such as "about," "almost," "substantially," "generally," "approximately," and the like, may each be used herein in the sense of "at, near, or nearly at," or "within 0-5% of," or "within acceptable manufacturing tolerances," or any logical combination thereof, for example.

[0022] As summarized above, it is desirable to limit saturation of certain resilient surfaces such as upholstery or drapes when performing a fluid-based extraction cleaning process. Efforts toward avoiding surface saturation using traditional cleaning tools include reducing the flow rate of an associated spray nozzle, typically mounted beneath a wand or a hose-connected accessory tool. However, reducing an output flow of a typical spray nozzle tend to result in an uneven distribution of the dispensed fluid and suboptimal cleaning. The present accessory tool-based solutions therefore seek to reduce drying time of fabric or textile upholstered surfaces, drapery, and the like while still providing an acceptable degree of cleaning effectiveness. These and other attendant benefits of the present disclosure will be apparent to those skilled in the art in view of the following disclosure.

[0023] Referring to the drawings, wherein like reference numbers refer to the same or like components in the several Figures, and beginning with FIG. 1, an accessory tool 10T as described in detail below is usable with a variety of extraction cleaners 12, with the extraction cleaner 12 exemplified as an upright extraction cleaner 120 and a portable extraction cleaner 220. The extraction cleaner 12 as contemplated herein includes a fluid recovery system 18 having a suction source (V) 22 for cleaning a surface 11, e.g., carpeting, rugs, upholstery, drapes, etc., and a fluid delivery system 30 for supplying an application-suitable cleaning fluid 34 to the surface

11. The accessory tool 10T within the scope of the present disclosure is selectively connectable to the extraction cleaner 12 via an accessory hose 13 to enable a user of the extraction cleaner 12 to more easily position and maneuver the accessory tool 10T relative to the surface 11 during an extraction cleaning process. As part of this process, a diverter valve 31 of the fluid recovery system 18 can fluidly connect the suction source 22 to either a suction nozzle 200 of the extraction cleaner 12, e.g., the upright extraction cleaner 120, or to a suction nozzle 20 of the accessory tool 10T. In the case of the portable extraction cleaner 220, the cleaner does not include a floor suction nozzle 200 and thus the diverter valve 31 is not necessary.

[0024] The extraction cleaner 12 in its various embodiments includes a housing 15 and a handle 16 coupled or formed integrally therewith. A handle 16 of the portable extraction cleaner 220 in particular facilitates unit portability by allowing a user to lift and carry the portable extraction cleaner 220. The upright extraction cleaner 120 for its part, of which the housing 15 acts as a lower housing that is pivotably connected to an upper housing 150, may be connected to a set of wheels 17 or another suitable surface drive mechanism to enable a user to roll the upright extraction cleaner 120 along the surface 11. The fluid recovery system 18 carried by the housing 15 is in fluid communication with the suction nozzles 20 and 200, with the suction nozzle 20 being an integral component of the accessory tool 10T as described in greater detail below with reference to FIGS. 2-8C.

[0025] The fluid recovery system 18 shown schematically in FIG. 1 includes the aforementioned suction source 22, e.g., a motorized fan assembly, which in turn is in fluid communication with the suction nozzles 20 and 200 and operable for generating a working airstream or airflow. Additionally, the fluid recovery system 18 can include a separator 24, e.g., a single-stage or multi-stage cyclonic separator device as appreciated in the art, with the separator 24 being operable for separating fluid and entrained debris from a working airstream and temporarily collecting the same in a recovery container 240. Other approaches could be used to implementing debris separation functions aboard the extraction cleaner 12, including but not limited to a centrifugal separator, a bulk separator, a filter bag, or a water-bath separator.

[0026] The suction source 22 for its part can be electrically coupled to a power source 26 (schematically represented as a power plug connectable thereto for simplicity), such as a battery or by a power cord plugged into a household electrical outlet. A power switch 28 disposed between the suction source 22 and the power source 26 can be selectively closed by a user, e.g., upon pressing a vacuum power button (not shown), thereby activating the suction source 22 as needed. Optionally, an agitator 29 can be provided adjacent to the suction nozzle 20 of the accessory tool 10T or, as an agitator 290 adjacent to the suction nozzle 200 of the extraction cleaner 12 for agitating fluid and debris when cleaning the surface 11. Non-limiting examples of the agitators 29 and 290 include polymeric bristles, bristle strips, tufts, brushes, needles, or other projections, or possibly a rubber squeegee surface or nub protrusions to help remove pet hair from upholstery during cleaning.

[0027] Also shown in FIG. 1 is the fluid delivery system 30, which can include one or more fluid supply tanks 32 for storing a volume of cleaning fluid 34, e.g., a suitable treating agents including but not necessarily limited to a fragrance, surfactants, water, odor eliminator, sanitizer, cleaning composition, surface conditioner, and/or various other treatments and mixtures thereof. An optional heater 40 can be provided for heating the cleaning fluid 34 prior to delivering the cleaning fluid 34 to the surface 11. For instance, an in-line heater variant of the heater 40 could be located downstream of the fluid supply tank(s) 32 and upstream of the pump 44 as shown. Other types of heaters 40 can be used within the scope of the disclosure, such as heating via exhaust from the suction source 22.

[0028] The fluid delivery system 30 depicted schematically in FIG. 1 also includes a fluid dispenser 36 for dispensing the cleaning fluid 34 onto the surface 11 as part of the normal floor cleaning operation of the extraction cleaner 12, in this instance the upright extraction cleaner 120. Although only one supply tank 32 is shown for illustrative simplicity and clarity, those skilled in the art will appreciate that additional supply tanks 32 could be used in other embodiments. For instance, one of the supply tanks 32 could store clean water and one or more additional supply tanks 32 could store a detergent-based cleaning solution. Outlet flow from the different supply tanks 32 in such a construction could be mixed using a mixing valve or other suitable approaches to control a composition of the fluid ultimately dispensed to the surface 11.

[0029] The fluid delivery system 30 of FIG. 1 can also include a flow control system 33. In a possible construction, the flow control system 33 includes a fluid pump 44, e.g., a centrifugal or solenoid pump, which pressurizes the fluid delivery system 30 and thereby forces the cleaning fluid 34 through a liquid supply conduit 38, and ultimately out of the dispenser 36 of the extraction cleaner 12, e.g., through one or more spray tips 360. A flow control valve 41 and actuator 141 may be used to control this process. For instance, the flow control valve 41 could be actuated via the actuator 141 via an electrical switch 42 disposed between the flow control valve 41 and the power source 26 noted above. Such an electrical switch 42 can be selectively closed when the actuator 141 is activated, thereby powering the flow control valve 41 to an open position and thus allowing the cleaning fluid 34 to be dispensed. The accessory hose 13 is likewise connected to the flow control valve 41 when the accessory hose 13 is connected to the extraction cleaner 12, such that the fluid delivery process described above temporarily diverts the cleaning fluid 34 to the surface 11 through the accessory tool 10T, as will now be described

with reference to the remaining Figures.

[0030] Referring to FIG. 2, the accessory tool 10T of the present disclosure is usable with the extraction cleaner 12 of FIG. 1 as described above for the purpose of cleaning the surface 11. The accessory tool 10T, which is a cross-sectional view taken along cut line 2-2 of FIG. 3, includes a tool body 10 defining a fluid pathway 50, an airflow pathway 52, and the above-noted suction nozzle 20, with the suction nozzle 20 being fluidly connected to the airflow pathway 52. As best shown in FIG. 1, the tool body 10 is connectable to the extraction cleaner 12 via the accessory hose 13, such as via an intervening conduit piece referred to hereinafter as a wand 53. A fluid reservoir 54 is in fluid communication with the fluid pathway 50 and carried by the tool body 10, such that the cleaning fluid 34 shown in FIG. 1 is delivered to the fluid reservoir 54 through the fluid pathway 50 within the tool body 10 as indicated by arrows FF. During the cleaning process, applied suction forces from the suction source 22 of FIG. 1 are applied to the suction nozzle 20 via the airflow pathway 52 to thereby extract spent fluid and entrained debris as indicated by arrows AA.

[0031] Within the scope of the present disclosure, the accessory tool 10T of FIG. 2 also includes a porous spray bar 55 that is coupled to the tool body 10 adjacent the fluid reservoir 54. The porous spray bar 55, which is surrounded by the suction nozzle 20 as described in greater detail below with reference to FIGS. 4 and 5, is configured to direct the cleaning fluid 34 of FIG. 1 contained in the fluid reservoir 54 onto the surface 11 to be cleaned. To that end, the fluid pathway 50 is configured to connect via the accessory hose 13 of FIG. 1 to the fluid delivery system 30 carried aboard the extraction cleaner 12. This connection allows the fluid pathway 50 of FIG. 2 to receive cleaning fluid 34 from the fluid delivery system 30 and direct the cleaning fluid 34 into the fluid reservoir 54 under pressure from the fluid pump 44 of FIG. 1. The airflow pathway 52 in turn is configured to connect the suction nozzle 20 of the accessory tool 10T to the fluid recovery system 18 via the accessory hose 13 as is likewise illustrated in FIG. 1.

[0032] In a typical arrangement, the tool body 10 depicted in FIG. 2 is connectable to the accessory hose 13 of FIG. 1 via the wand 53. The wand 53 in this particular configuration includes a tool end 53T that can be releasably connected to the tool body 10, e.g., via a push button connector 59, and a hose end 530T that can be connected to the accessory hose 13, such as via a mating collar (not shown). Thus, the accessory tool 10T is shown in FIG. 2 with the wand 53 connected to the accessory hose 13 and to the tool body 10, such that the accessory tool 10T is ready for use in cleaning the surface 11.

[0033] In order for the user of the accessory tool 10T to dispense the cleaning fluid 34 to the fluid reservoir 54, the user can close an inlet valve 56 via an actuator 57, e.g., a trigger mechanism in the exemplary configuration of FIG. 2. Closing the inlet valve 56 in this manner allows some of the cleaning fluid 34 to pass through the inlet valve 56 via an upstream fitting 49 and a connected hose or tubing (not shown) into a downstream spray valve 58. As indicated by arrows FF, the cleaning fluid 34 thus passes from the spray valve 58 into the fluid reservoir 54 where the cleaning fluid 34 eventually flows under pressure through the porous spray bar 55.

[0034] In accordance with the present disclosure, the porous spray bar 55 disposed at the end of the tool body 10 is configured to evenly distribute the cleaning fluid 34 of FIG. 1 on the surface 11. Fluid distribution occurs at a constant flow rate that is considered herein to be low relative to flow rates of traditional extraction cleaners. More specifically, the flow rates contemplated herein according to some aspects of the present disclosure should be low enough that the surface 11 is left substantially dry to the touch. As appreciated in the art, a traditional extraction cleaner such as the respective upright and portable extraction cleaners 120 and 220 of FIG. 1 have a flow rate of approximately 500 milliliters per minute (ml/min), with flow rates exceeding 1000 ml/min being possible for larger extraction cleaners 12. Such flow rates are generally needed for thoroughly saturating and penetrating deeply embedded stains and entrained dirt from carpeting and other high-traffic floor coverings. In contrast, while the accessory tool 10T described herein could be used to clean such floor surfaces, the accessory tool 10T is specially configured for use with relatively thin fabrics such as upholstery, drapes, and other resilient surfaces, for instance coverings of couches or chairs that the user may wish to use soon after cleaning. For such cleaning tasks, use of the porous spray bar 55 as part of the accessory tool 10T enables an even low-flow distribution of the cleaning fluid 34 with expedited drying, while also enabling acceptable cleaning effectiveness of the accessory tool 10T, with various "low-flow" implementations set forth below.

[0035] Referring briefly to FIGS. 3 and 4, with FIG. 3 showing the cut line 2-2 noted above, the accessory tool 10T is shown in an assembled state in FIG. 3 with the tool body 10 having a neck 60 that is securely connected to the tool end 53T of the wand 53. The hose end 530T of the wand 53 in turn is securely connected to the accessory hose 13, in this instance via a collar 13C or another suitable hose attachment piece. An embodiment of the tool housing 10 includes a foot plate 62 forming a working surface 620, with the suction nozzle 20 opening to and thus defined at least partially by the working surface 620 as detailed below. While an outer perimeter 63 of the foot plate 62 is depicted as being elongated and substantially rectangular in the illustrated construction, other perimeter shapes and proportions may be used within the scope of the disclosure without limitation.

[0036] As best shown in FIG. 4, the suction nozzle 20 in a possible construction includes a continuous suction channel 21 that opens to the working surface 620 of the foot plate 62, and that is in fluid communication with the wand 53 through an exhaust opening 77. The porous spray bar 55, which as noted above is coupled to the tool

body 10 adjacent and aft of the fluid reservoir 54 of FIG. 2, is surrounded by the suction nozzle 20 and configured to receive and direct the cleaning fluid 34 from the fluid reservoir 54 onto the surface 11 of FIG. 3. As used here, "surrounded" means "completely surrounded on all sides" of the porous spray bar 55 as shown. However, variations may be contemplated within the scope of the disclosure short of a complete "360-degree" surround implementation, such as by installing transverse members along a length of the continuous suction channel 21 to construct the suction nozzle 20 from several elongated sections arranged end-to-end. For the purposes of optimizing extraction flow, however, and to allow the foot plate 62 of the tool body 10 to be moved in different directions without adversely affecting extraction flow, it is desirable to use an "endless" 360-degree loop construction of the continuous suction channel 21.

[0037] Referring to FIG. 5, the accessory tool 10T of FIGS. 3 and 4 is shown from a reverse angle, i.e., from an underside of the accessory tool 10T. In such an orientation, the actuator 57 is visible at a position that is adjacent to the tool end 53T of the wand 53, with the spray valve 58 of FIG. 2 contained within a nozzle conduit 580 on the underside of the wand 53. The continuous suction channel 21 in this particular embodiment has a hemispherical cross sectional shape as shown, e.g., a "U-shaped" channel or slot surrounding the porous spray bar 55 as described above. Additionally, one or more agitators 29 as described above with reference to FIG. 1 can be connected to or formed integrally with the tool body 10, for instance on the working surface 620 of the foot plate 62 or on another suitable portion of the tool body 10. Suitable constructions for the agitators 29 include, by way of example and not limitation, polymeric brushes, bristles, needles, or other projections that can be used to agitate dispensed cleaning fluid 34 on the surface 11 and thereby help extract debris therefrom.

[0038] Application-suitable porous diffusion media for constructing the porous spray bar 55 of FIGS. 4 and 5 can include perforated, porous, or sintered materials within the scope of the present disclosure. For instance, the porous spray bar 55 can be constructed from a sintered plastic material, e.g., polypropylene or polyethylene, or from a corrosion-resistant porous or sintered metal or metal alloy material such as aluminum or stainless steel. Sintered or porous ceramic materials could also be used in different constructions. Other possible constructions can be used in alternative embodiments, e.g., a planar bar or plate defining a plurality of orifices extending therethrough, e.g., with representative pores 70 and 72 shown in FIGS. 5A and 5B and described below.

[0039] As noted above, the porous spray bar 55 is intended to diffuse and evenly distribute cleaning fluid 34 on the surface 11 at a relatively low flow rate relative to flow rates of traditional extraction cleaners. For instance, the porous spray bar 55 can be constructed to provide a flow rate of at least about 50 ml/min when the fluid delivery system 30 of FIG. 1 is pressurized, e.g., to about 5-10 pounds-per-square-inch gauge (psig) up to about 300 ml/min. Within that defined exemplary range, the porous spray bar 55 in different embodiments could provide more narrowly defined "low-flow" rates relative to flow rates of typical extraction cleaners, such as about 50 ml/min to about 75 ml/min, or about 75 ml/min to about 100 ml/min, or about 100 ml/min to about 125 ml/min, or about 125 ml/min to about 150 ml/min, or about 150 ml/min to about 175 ml/min, or about 175 ml/min to about 200 ml/min, or about 200 ml/min to about 225 ml/min, or about 225 ml/min to about 250 ml/min, or about 250 ml/min to about 275 ml/min, or about 275 ml/min to about 300 ml/min. Flow rates as high as 500 ml/min or more could be used in other constructions. However, such flow rates approach those of traditional accessory tools and therefore would likely result in longer drying times relative to the disclosed lower flow rates.

[0040] In a possible embodiment, the porous spray bar 55 of FIG. 5 can be removably connected to the tool body 10. Such a construction would allow the user to replace the porous spray bar 55 in the event the porous spray bar 55 becomes damaged or worn. In an exemplary use scenario, multiple porous spray bars 55 could be made available with different corresponding flow rates, e.g., color-coded to correspond to different drying times and cleaning effectiveness levels. For instance, a first porous spray bar 55 could be provided in a first color to indicate medium drying times and cleaning effectiveness, a second porous spray bar 55 could be provided in a second color to indicate a relatively fast drying time with a relatively low cleaning effectiveness, and a third porous spray bar 55 could be provided in a third color to indicate a relatively slow drying time with a relatively high cleaning effectiveness. As all contemplated porosities are expected to be too small to see without magnification, color coding in this manner, or alternative surface markings, would make it easier for a user to select an appropriate option for a given cleaning task.

[0041] While the flow rate is not limited to a theoretical maximum or minimum, as noted above in practice flow rates of much less than about 50 ml/min would likely be too low to perform the desired cleaning functions, while flow rates of 500 ml/min or more would begin to approach the flow performance of traditional extraction cleaners, thus leading to possible fluid saturation and extended drying times. In terms of representative drying times, flow rates within the contemplated range may be on the order of about 10% to about 25% of flow rates used for traditional extraction cleaners. The porosity of the porous spray bar 55 coupled with surrounding of the porous spray bar 55 with the suction nozzle 20 to limit the amount of time the cleaning fluid 34 is in contact with the surface 11 can together shorten drying times by 50% or more, e.g., from close to an hour to less than a half hour for a typical 3-inch wide embodiment of the accessory tool 10T.

[0042] Referring briefly to the representative magnified plan view of FIGS. 5A and 5B, the materials used to con-

struct the porous spray bar 55 define openings or pores 70 or 72 of diverse sizes, with the actual size, shape, and distribution of the pores 70 or 72 varying with desired flow rate of the porous spray bar 55. For instance, FIG. 5A illustrates a representative pore 70 of about 625 microns (μ) to about 650μ in diameter, with the diameter being more or less even around the perimeter of the pore 70. While porosity of the porous spray bar 55 contemplated herein could approach the representative size of the pore 70 shown in FIG. 5A, embodiments of the porous spray bar 55 may use significantly smaller pores 72 as shown in FIG. 5B.

[0043] By comparison, the pores 72 of FIG. 5B are about 125μ to about 150μ (major dimension) by about 20μ to about 30μ (minor dimension), with the pores 72 appearing oblong or elongated relative to the pores 70 of FIG. 5A. Possible embodiments of the materials used to construct the porous spray bar 55 can have an average pore size ranging from about 15μ to about 170μ in order to achieve the above-noted low flow rates. For instance, at least some of the pores 72 can be about 15μ to about 30μ, while other pores 72 could be about 30μ to about 45μ, or about 45μ to about 60μ, or about 60μ to about 75μ, or about 75μ to about 90μ, or about 90μ to about 105μ, or about 105μ to about 120μ, or about 120μ to about 135μ, or about 135μ to about 150μ, or about 150μ to about 170μ.

[0044] In general, the number and size of pores 70 and/or 72 are selected to provide sufficient flow resistance at pressures typically generated within the extraction cleaner 12 of FIG. 1 to provide a desired lower volume of applied cleaning fluid 34. As noted above, exemplary flow rates of about 50 ml/min to about 300 ml/min may be suitable for the envisioned cleaning tasks performed using the accessory tool 10T. Additionally, as the cleaning fluid 34 can dry out during periods of inactivity, it is possible that residue may be left behind that could clog the tiny pores 70 and/or 72 of the porous spray bar 55. The representative pore size range of about 15μ to about 170μ and the various subranges described above by way of example are therefore intended to minimize clogging under expected operating conditions.

[0045] The particular materials used to construct the porous spray bar 55 should also be resistant or impervious to corrosion and chemical attack, and should have sufficient mechanical properties to withstand the forces and stresses induced during manufacturing and in-application use. Porous plastic materials made from polypropylene or ultra-high molecular weight polyethylene (UHMWPE) may be suitable for use with commercially available cleaning agents, with representative thicknesses of about 3 mm to about 4 mm. Likewise, as the porous spray bar 55 is moved across the surface 11 in various directions during the cleaning process, the surface of the porous spray bar 55 should be smooth to prevent damage to the fabrics or textiles used to construct the surface 11.

[0046] In terms of desirable cross-sectional shapes, the porous spray bar 55 could be formed in various shapes to allow for different mechanical designs. For instance, the porous spray bar 55 could have an extruded curved or semi-circular cross section as shown in FIGS. 2 and 5, with such a shape resisting deflection when pressure is applied to the accessory tool 10T and sliding smoothly over the surface 11 during use.

[0047] Referring now to FIG. 6, the tool body 10 described above can optionally include at least one suction relief device 74 configured to selectively reduce suction forces at or along the suction nozzle 20. That is, while the tool body 10 requires a sufficient seal between the suction nozzle 20 and the surface being cleaned (surface 11 of FIGS. 1-3) to optimize fluid recovery, the seal should not be so strong as to force the accessory tool 10 down onto the surface 11 or cause the upholstery or fabric of the surface 11 to bunch up at a front edge of the accessory tool 10T. To this end, the tool body 10 could be provided with passively or actively operable air leaks to help balance the suction down force with fluid recovery performance.

[0048] In the solution illustrated in FIG. 6, a reduction in suction forces at or along the suction nozzle 20 is provided via a series of vent channels 75 in the working surface 620. Use of the vent channels 75, e.g., notches or grooves arranged transverse to the suction nozzle 20 as shown and intersecting the suction nozzle 20 at approximate right angles, creates a "scalloped" surface profile to provide air leaks around the perimeter of the suction nozzle 20. That is, the vent channels 75 intersect the suction nozzle 20 such that the suction nozzle 20 is in fluid communication with an outer perimeter of the accessory tool 10T. The air leaks in turn reduce the down force on the working surface 620, which may have particular benefits when cleaning resilient woven textiles or delicate materials such as drapes.

[0049] As an alternative to the scalloped surface profile of FIG. 6, the suction relief feature 74 can include an active moveable member 76 as shown in the perspective views of the accessory tool 10T of FIGS. 7A and 7B, with "moveable" as used herein encompassing translation or rotation in different embodiments, and with "active" referring to a user-imparted adjustment force. For instance, the moveable member 76 can be disposed between the wand 53 and the neck 60 of the tool body 10. In a possible embodiment, the neck 60 can be constructed with a plurality of vent holes 82, e.g., equally-spaced through-holes of a suitable size. The moveable member 76 in one or more embodiments can include a rotatable blocking member 84 such as a semi-circular ring piece may be rotated by a user of the accessory tool 10T to selectively cover or uncover some or all of the vent holes 82 to thereby modify the strength of suction down forces at or along the suction nozzle 20.

[0050] That is, a user could rotate the blocking member 84 to close of all of the vent holes 82 for maximum suction performance when a strong down force on the suction nozzle 20 is not objectionable to the user. When less down force is desired, the user could uncover one or

more of the vent holes 82 by rotating the blocking member 84 as indicated by arrows BB in FIGS. 7A and 7B. While the blocking member 84 could be annular or ring-shaped as shown, other constructions could arrange the vent holes 82 along a flat surface of the accessory tool 10T, e.g., on the neck 60, the wand 53, or the tool body 10, with the blocking member 84 being a slidable or translatable plate in such a construction.

[0051] Referring now to FIGS. 8A, 8B, and 8C, the accessory tool 10T of the present disclosure is configured in some use scenarios to quickly clean flat upholstery having large surface areas as well as smaller/harder to reach surfaces. When cleaning a couch, for instance, the seat cushions typically have large exposed flat surfaces, while the arms might be contoured or shaped to present relatively narrow surfaces and crevices. Therefore, a user would be expected to maneuver the accessory tool 10T over both broad and narrow cleaning paths during a typical cleaning task.

[0052] To that end, the accessory tool 10T can optionally include a rotatable joint 85 connecting the tool body 10 to the wand 53. The rotatable joint 85, e.g., a universal joint or another multi-axis revolute joint, allows the tool body 10 to be manually rotated and locked into a first position relative to a longitudinal center axis 95 of the accessory tool 10T when cleaning relatively narrow or otherwise hard-to-reach areas of the surface 11. When large, flat, or otherwise easily accessible areas of the surface 11 are to be cleaned, the tool body 10 can be rotated into a second position relative to the longitudinal center axis 95. The second position, which is shown in FIGS. 8B and 8C, provides a maximum cleaning area coverage-per-cleaning stroke. An exemplary embodiment of the rotatable joint 85 is disclosed in US Patent 9,867,517.

[0053] The various structural modifications described herein are intended to solve the potential problem of extended drying times due to saturation of fabric upholstery and drapes, with such saturation caused by high flow volumes and associated distribution patterns typically adapted for extraction cleaning of high-traffic surfaces such as carpeting and rugs. While a user may seek to limit surface saturation using traditional spray nozzle-equipped extraction cleaners, e.g., by reducing the flow rate of the spray nozzle mounted beneath a wand or a hose-connected accessory tool, reducing the spray nozzle output flow can result in an uneven fluid distribution and suboptimal cleaning. The present accessory tool-based solutions therefore significantly reduce drying time of fabric or textile upholstered surfaces, drapery, and the like without reducing cleaning effectiveness. These and other attendant benefits of the present disclosure will be apparent to those skilled in the art in view of the following disclosure.

[0054] The following Clauses provide representative configurations of accessory tools, tool bodies, and extraction cleaners for as disclosed herein.

Clause 1: An accessory tool usable with an extraction cleaner for cleaning a surface, the accessory tool includes a tool body defining a fluid pathway, an airflow pathway, and a suction nozzle connected to the airflow pathway, wherein the tool body is connectable to the extraction cleaner via an accessory hose, and wherein the airflow pathway is configured to connect the suction nozzle via the hose to a fluid recovery system located aboard the extraction cleaner; a fluid reservoir in fluid communication with the fluid pathway and carried by the tool body, wherein the fluid pathway is configured to connect via the accessory hose to a fluid delivery system located aboard the extraction cleaner to receive the cleaning fluid from the fluid delivery system and direct the cleaning fluid to the fluid reservoir; and a porous spray bar coupled to the tool body adjacent the fluid reservoir and surrounded by the suction nozzle, the porous spray bar being configured to direct a cleaning fluid from the fluid reservoir onto the surface.

Clause 2: The accessory tool of clause 1, wherein the tool body includes a foot plate forming a working surface, and wherein the suction nozzle includes a continuous suction channel that opens to the working surface of the foot plate.

Clause 3: The accessory tool of clause 2, that further includes one or more agitators connected to or formed integrally with the tool body on the working surface thereof.

Clause 4: The accessory tool of any of clauses 1-3, wherein the porous spray bar is constructed of a sintered material.

Clause 5: The accessory tool of clause 4, wherein the sintered material includes a sintered plastic material.

Clause 6: The accessory tool of any of clauses 1-3, wherein the porous spray bar is a planar bar or plate defining a plurality of orifices extending therethrough.

Clause 7: The accessory tool of any of clauses 1-6, wherein a flow rate of the cleaning fluid through the porous spray bar is at least about 50 milliliters per minute (ml/min).

Clause 8: The accessory tool of any of clauses 1-7, wherein the flow rate of the cleaning fluid through the porous spray bar is less than about 300 ml/min.

Clause 9: The accessory tool of any of clauses 1-8, wherein the tool body includes at least one suction relief device configured to selectively reduce suction at the suction nozzle.

Clause 10: The accessory tool of clause 9, wherein the at least one suction relief device includes a plurality of vent channels intersecting the suction nozzle such that the suction nozzle is in fluid communication with an outer perimeter surface of the accessory tool.

Clause 11: The accessory tool of clause 9 or 10, wherein the at least one suction relief device includes a plurality of vent holes formed in the accessory tool

and a moveable member configured to selectively cover and uncover one or more of the plurality of vent holes.

Clause 12: The accessory tool of any of clauses 1-11, wherein the porous spray bar is removably connected to the tool body.

Clause 13: An extraction cleaner includes a housing; a fluid delivery system carried by the housing and operable for dispensing a cleaning fluid; a fluid recovery system carried by the body and operable for recovering the cleaning fluid and debris entrained therein; an accessory hose connectable to the extraction cleaner; and an accessory tool connectable to the accessory hose, the accessory tool including: a tool body having a foot plate, the tool body defining a fluid pathway, an airflow pathway, and a suction nozzle in fluid communication with the airflow pathway, wherein the tool body is configured to connect to the accessory hose to fluidly connect the fluid pathway to the fluid delivery system, and to fluidly connect the airflow pathway to the fluid recovery system; a fluid reservoir carried by the tool body and in fluid communication with the fluid pathway such that the fluid reservoir is supplied with the cleaning fluid; and a porous spray bar connected to the tool body adjacent to the fluid reservoir and surrounded by the suction nozzle, wherein the porous spray bar is configured to direct the cleaning fluid from the fluid reservoir onto a surface.

Clause 14: The extraction cleaner of clause 13, wherein the extraction cleaner is an upright extraction cleaner and the housing is connected to a set of wheels.

Clause 15: The extraction cleaner of clause 13, wherein the extraction cleaner is a portable extraction cleaner having a handle, and the housing is connected to the handle such that a user carries the housing via the handle.

Clause 16: The extraction cleaner of any of clauses 12-14, wherein the foot plate includes a working surface, and wherein the suction nozzle includes a continuous suction channel that opens to the working surface of the foot plate.

Clause 17: The extraction cleaner of clause 16, further includes one or more agitators connected to or formed integrally with the tool body on the working surface.

Clause 18: The extraction cleaner of any of clauses 13-17, wherein the porous spray bar is constructed of a sintered plastic material or a sintered metal material.

Clause 19: An accessory tool for use with an extraction cleaner and an accessory hose connectable to the extraction cleaner, the accessory tool includes a tool body defining a fluid pathway, an airflow pathway, and a suction nozzle connected to the airflow pathway, wherein the tool body is configured to connect to the extraction cleaner via the accessory hose and includes a foot plate forming a working surface, the suction nozzle includes a continuous suction channel that opens to the working surface of the foot plate, and the fluid pathway is configured to connect to a fluid delivery system aboard the extraction cleaner via the accessory hose, and wherein the airflow pathway is configured to connect to a fluid recovery system via the accessory hose; a fluid reservoir carried by the tool body and in fluid communication with the fluid pathway; and a porous spray bar constructed of a sintered plastic material, connected to the tool body adjacent to the fluid reservoir, and surrounded by the suction nozzle, wherein a flow rate of cleaning fluid through the porous spray bar is at least about 50 milliliters per minute (ml/min) and less than about 300 ml/min

Clause 20: The accessory tool of clause 19, wherein the tool body includes at least one suction relief device configured to selectively reduce suction at the suction nozzle.

[0055] While some of the best modes have been described in detail, various alternative designs may exist for practicing the present teachings defined in the appended claims. Those skilled in the art will recognize that modifications may be made to the disclosed embodiments without departing from the scope of the subject disclosure. Moreover, the present concepts expressly include combinations and subcombinations of the described elements and features. The detailed description and the drawings are supportive and descriptive of the present teachings, with the scope of the present teachings defined solely by the claims.

Claims

1. An accessory tool (10T) usable with an extraction cleaner (12, 120, 220) for cleaning a surface (11), the accessory tool (10T) comprising:

   a tool body (10) defining a fluid pathway (50), an airflow pathway (52), and a suction nozzle (20) connected to the airflow pathway (52), wherein the tool body (10) is connectable to said extraction cleaner (12, 120, 220) via an accessory hose (13), and wherein the airflow pathway (52) is configured to connect the suction nozzle (20) via the accessory hose (13) to a fluid recovery system (18) located aboard said extraction cleaner (12, 120, 220);

   a fluid reservoir (54) in fluid communication with the fluid pathway (50) and carried by the tool body (10), wherein the fluid pathway (50) is configured to connect via the accessory hose (13) to a fluid delivery system (30) located aboard said extraction cleaner (12, 120, 220) to receive a cleaning fluid (34) from the fluid delivery sys-

tem (30) and direct the cleaning fluid (34) to the fluid reservoir (54); and

a porous spray bar (55) coupled to the tool body (10) adjacent the fluid reservoir (54) and surrounded by the suction nozzle (20), the porous spray bar (55) being configured to direct the cleaning fluid (34) from the fluid reservoir (54) onto said surface (11).

2. The accessory tool (10T) of claim 1, wherein the tool body (10) includes a foot plate (62) forming a working surface (620), and wherein the suction nozzle (20) includes a continuous suction channel (21) that opens to the working surface (620) of the foot plate (62).

3. The accessory tool (10T) of claim 2, further comprising:

one or more agitators (29) connected to or formed integrally with the tool body (10) on the working surface (620) thereof.

4. The accessory tool (10T) of any one of claims 1-3, wherein the porous spray bar (55) is constructed of a sintered material.

5. The accessory tool (10T) of claim 4, wherein the sintered material includes a sintered plastic material.

6. The accessory tool (10T) of claim 4, wherein the sintered material includes a sintered metal material.

7. The accessory tool (10T) of claim 4, wherein the sintered material includes a sintered ceramic material.

8. The accessory tool (10T) of any one of claims 1-7, wherein the porous spray bar (55) is a planar bar or plate defining a plurality of orifices extending therethrough.

9. The accessory tool (10T) of any one of claims 1-8, wherein a flow rate of the cleaning fluid (34) through the porous spray bar (55) is at least about 50 milliliters per minute (ml/min).

10. The accessory tool (10T) of claim 9, wherein the flow rate of the cleaning fluid (34) through the porous spray bar (55) is less than about 300 ml/min.

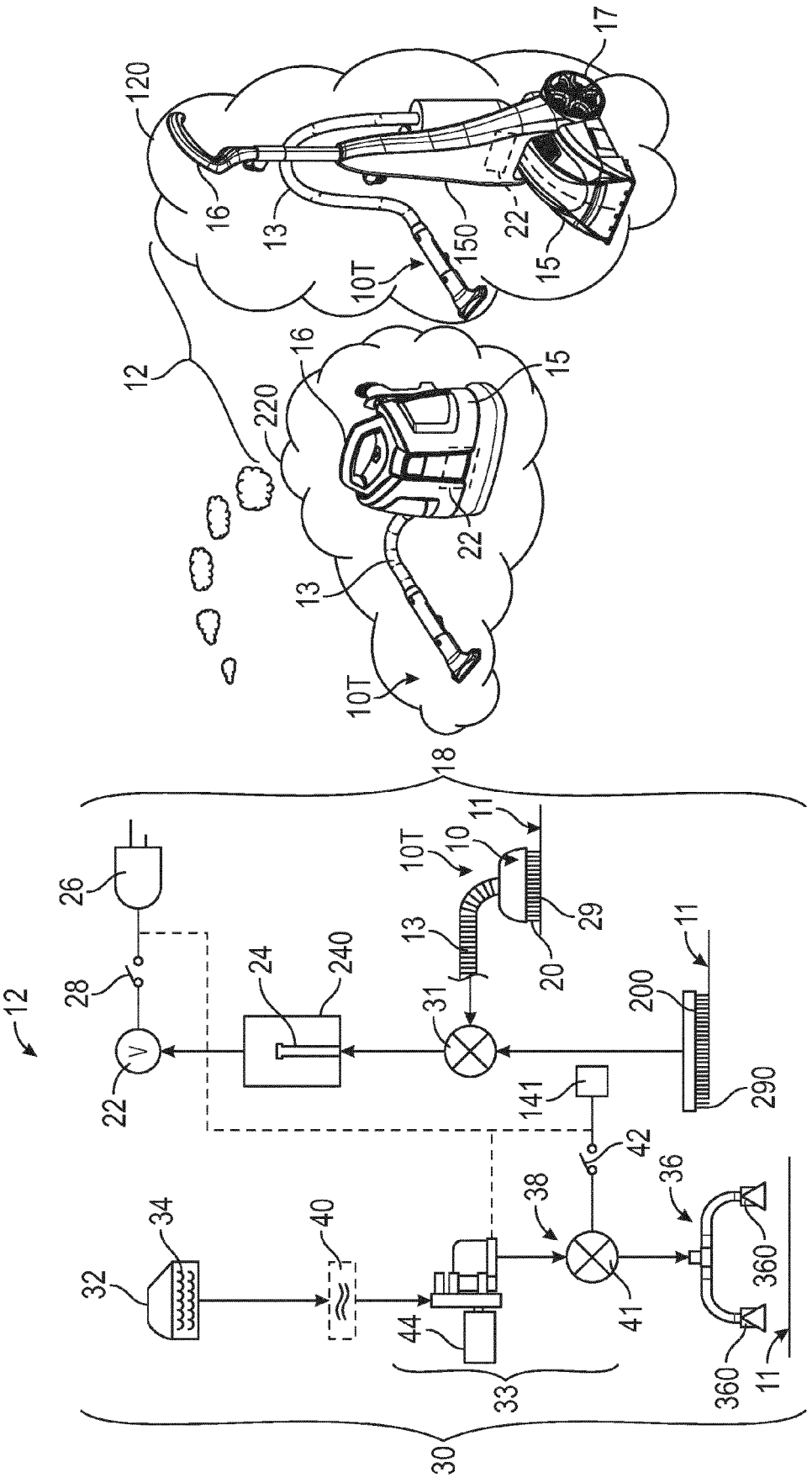
11. The accessory tool (10T) of any one of claims 1-10, wherein the tool body (10) includes at least one suction relief device (74) configured to selectively reduce suction at the suction nozzle (20).

12. The accessory tool (10T) of claim 11, wherein the at least one suction relief device (74) includes a plurality of vent channels (75) intersecting the suction nozzle (20) such that the suction nozzle (20) is in fluid communication with an outer perimeter (63) surface of said accessory tool (10T).

13. The accessory tool (10T) of claim 11, wherein the at least one suction relief device (74) includes a plurality of vent holes (82) formed in said accessory tool (10T) and a moveable member (76) configured to selectively cover and uncover one or more of the plurality of vent holes (82).

14. The accessory tool (10T) of any one of claims 1-13, wherein the porous spray bar (55) is removably connected to the tool body (10).

15. The accessory tool (10T) of any one of claims 1-14, wherein the porous spray bar (55) defines pores (70, 72) between about 15μ to about 170μ.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16
13
150
22
15
10T
12
16
15
220
22
13
10T
18
12
26
28
24
240
22
10T
10
11
13
29
20
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11
33
30

FIG. 1

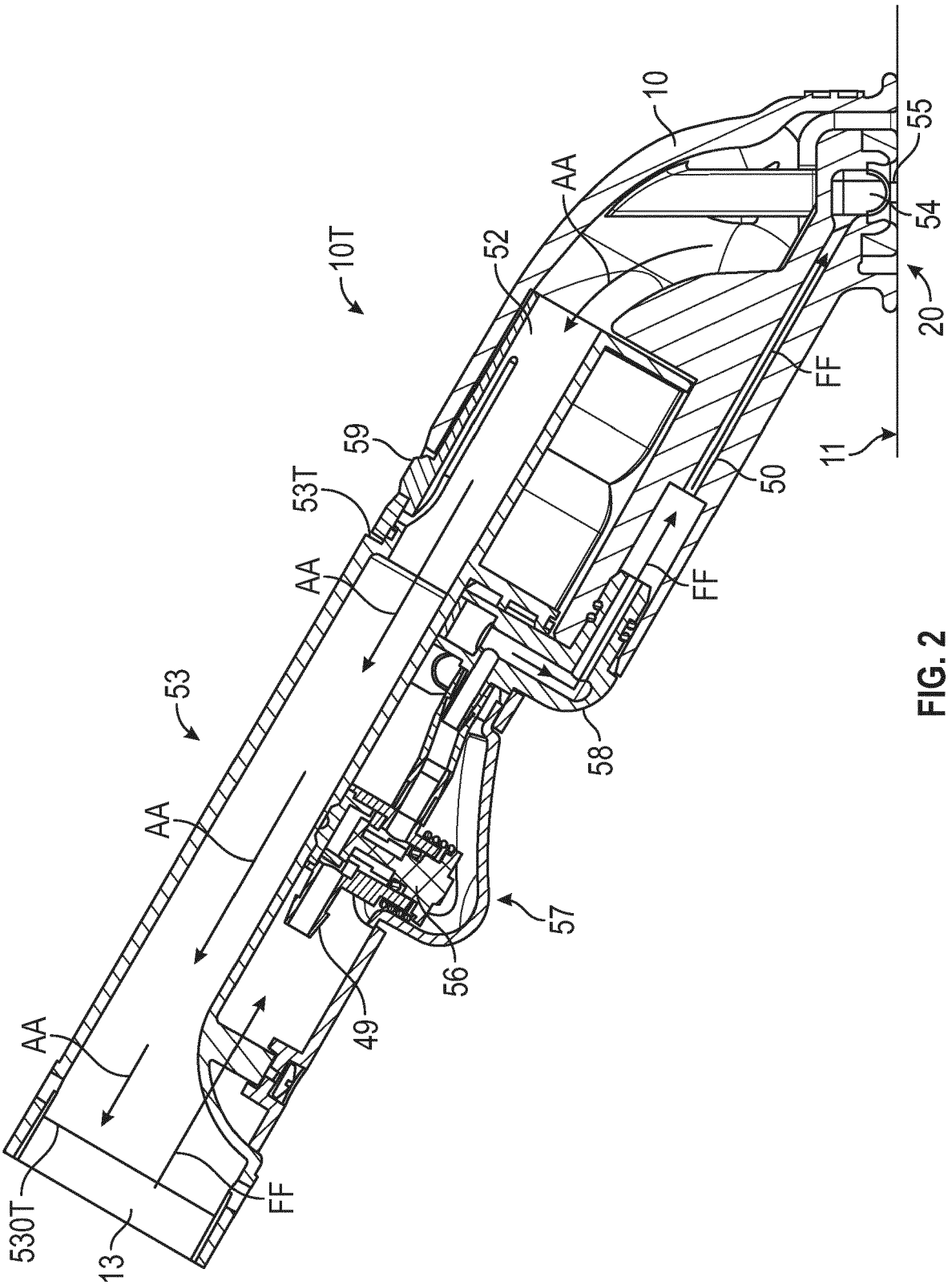
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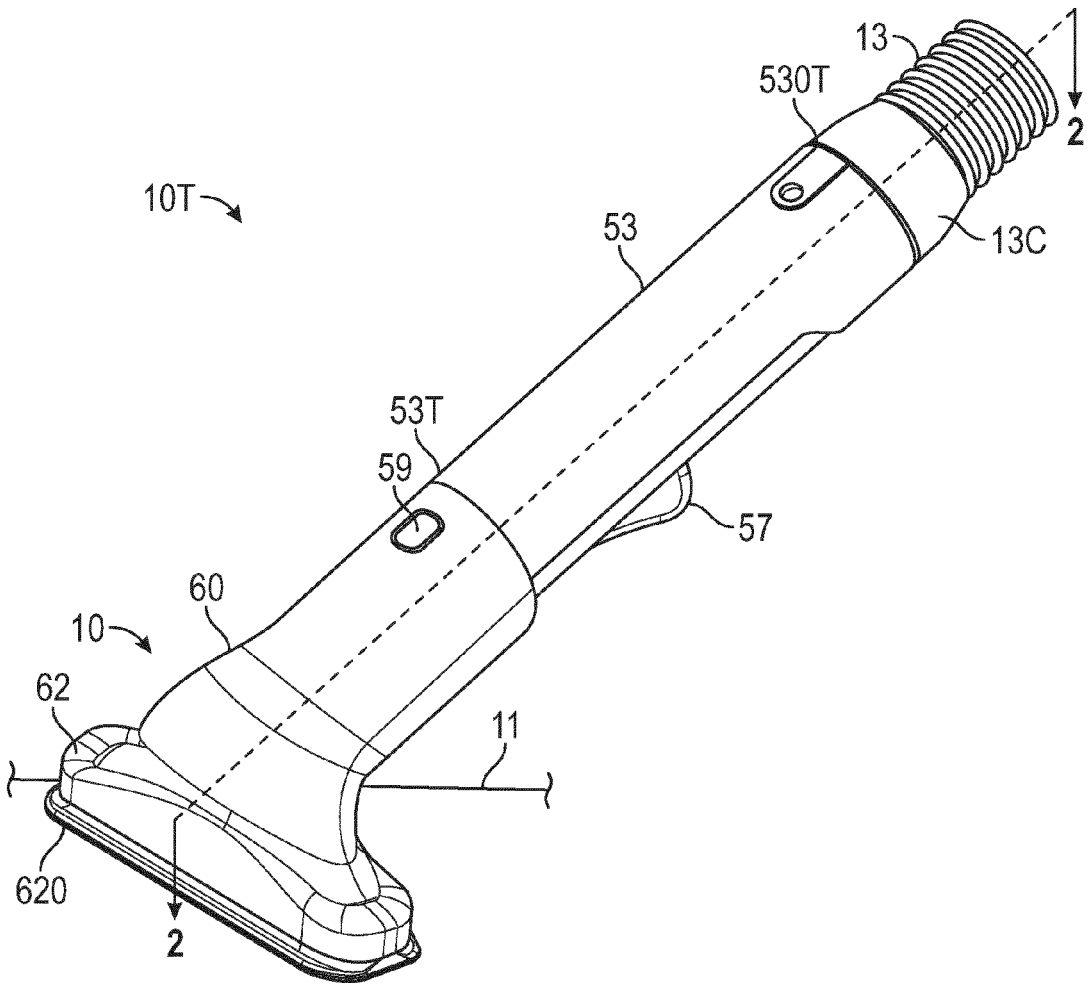
FIG. 2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2
10T
53
13C
53T
59
57
60
10
62
11
620
2

FIG. 3

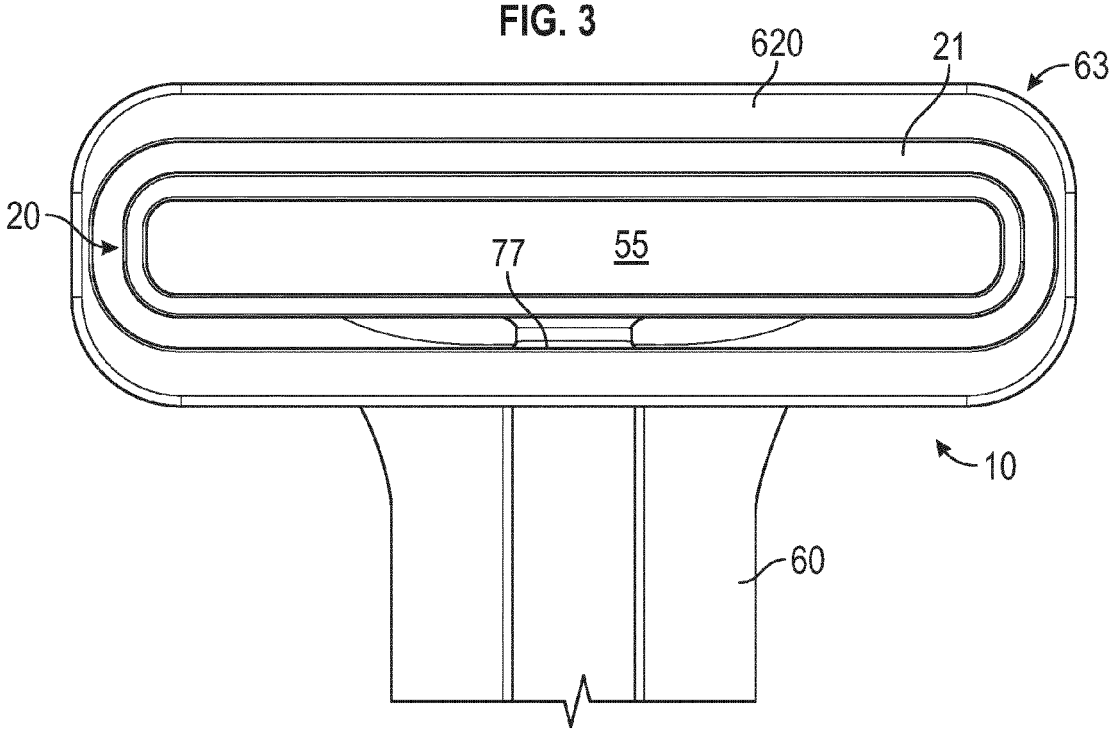

620
21
63
20
77
55
10
60

FIG. 4

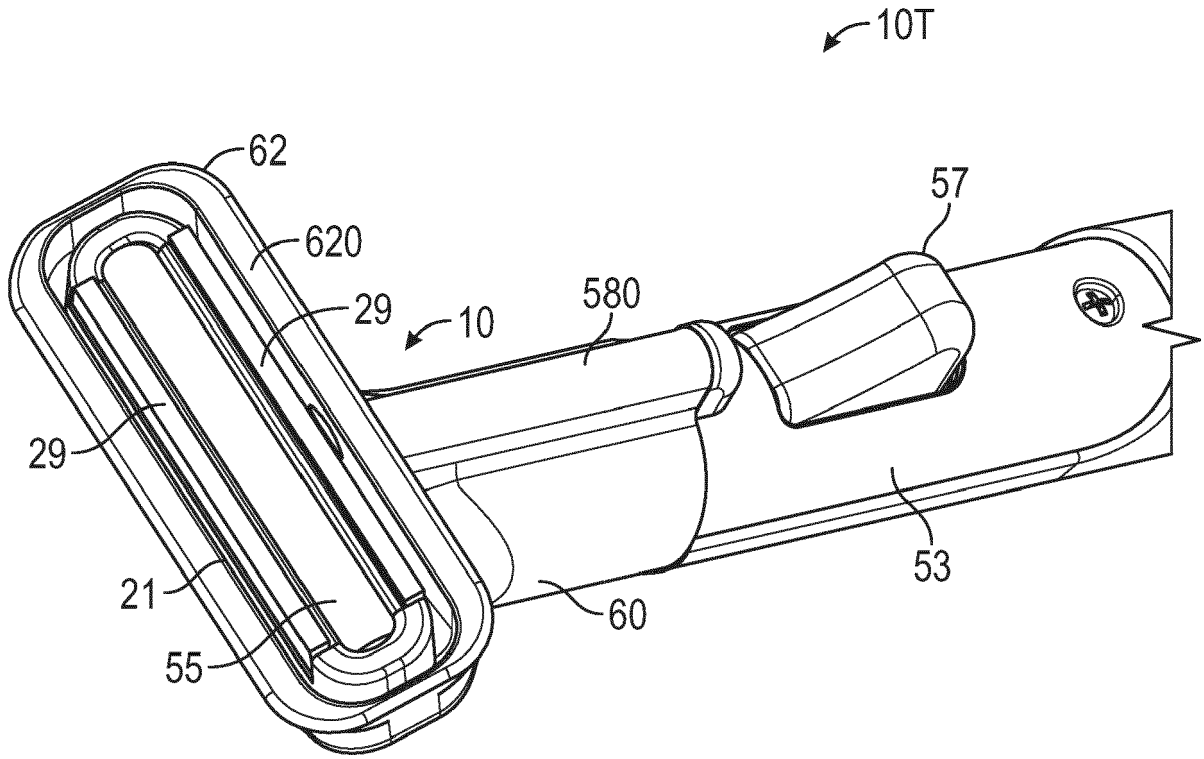


FIG. 5

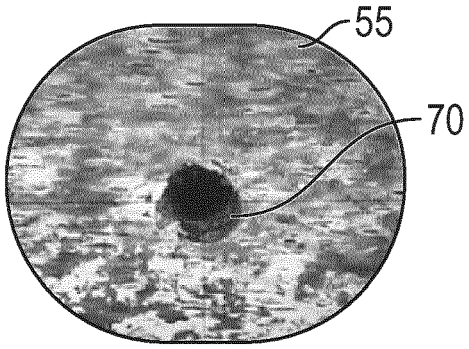


FIG. 5A

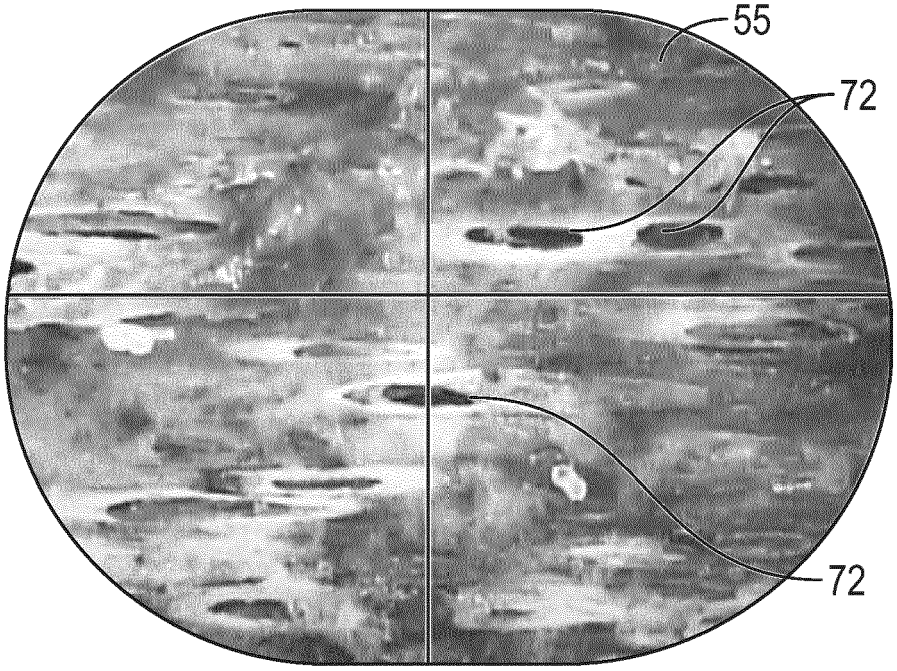


FIG. 5B

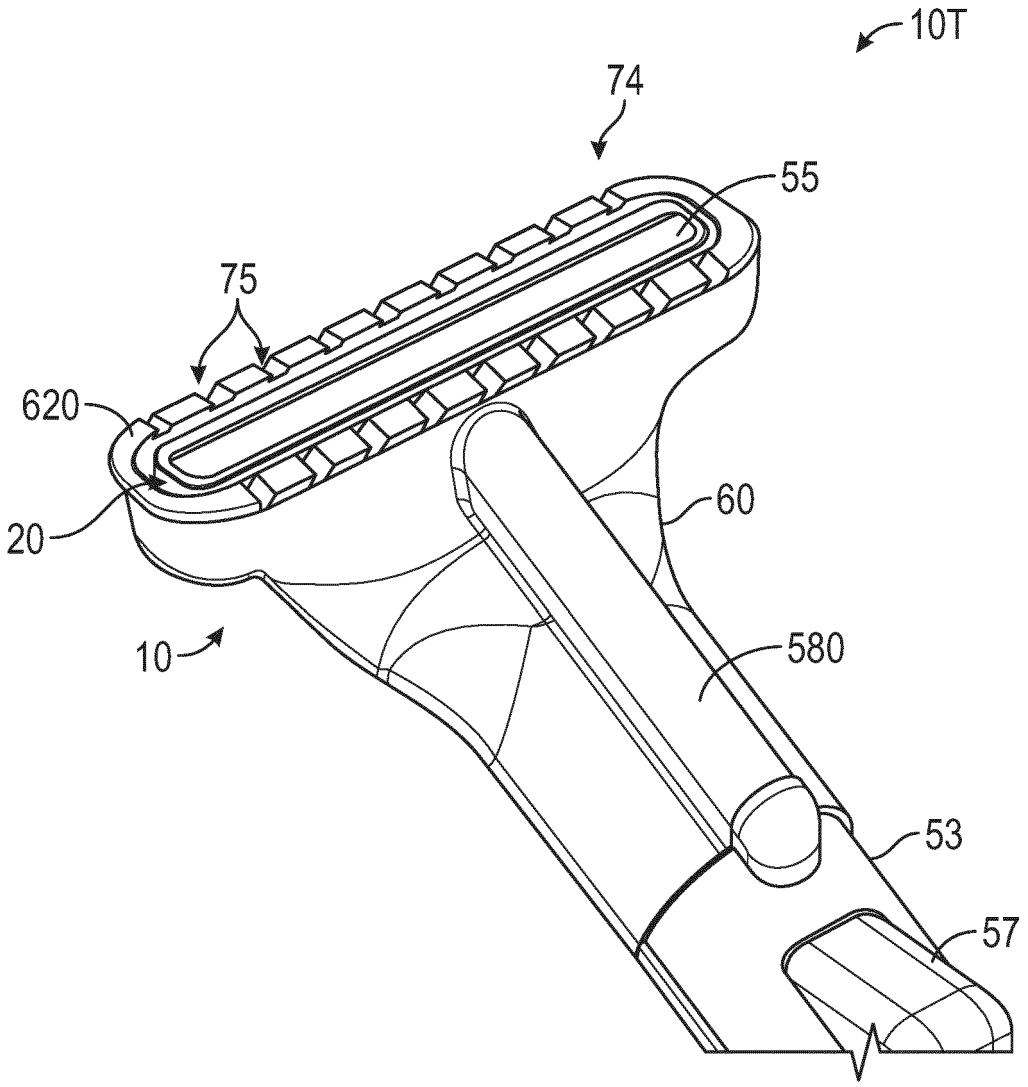
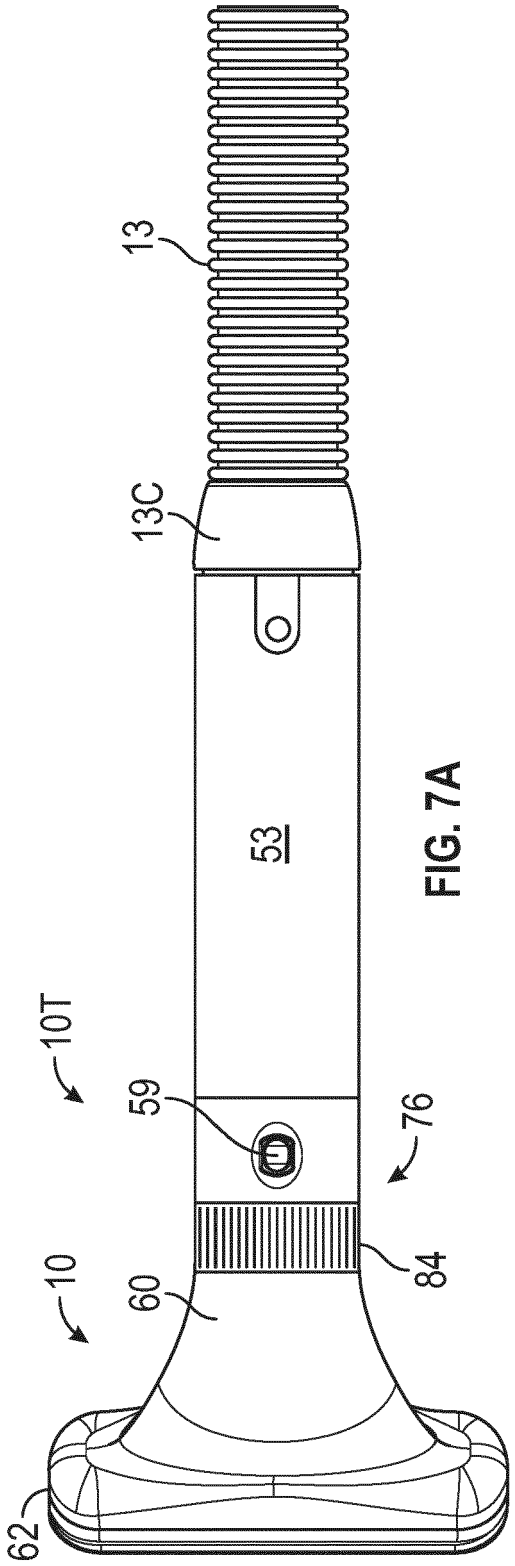


FIG. 6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53
10T
59
76
10
60
84
62

FIG. 7A

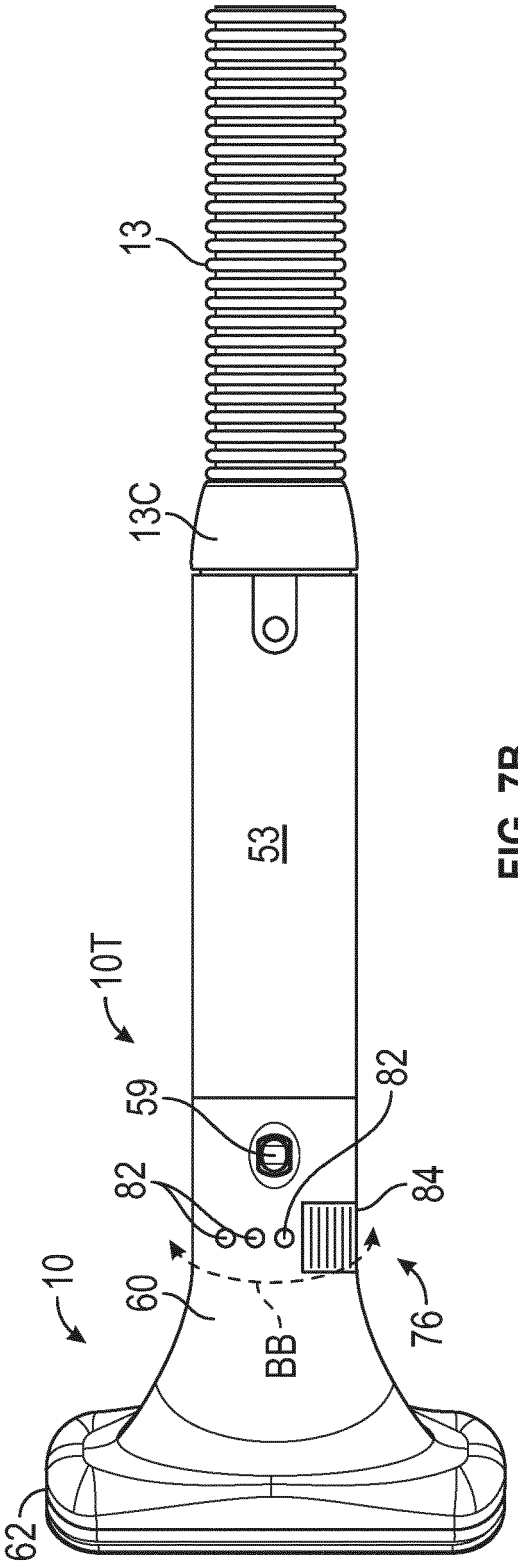
13
13C
53
10T
59
82
82
84
10
60
BB
76
62

FIG. 7B

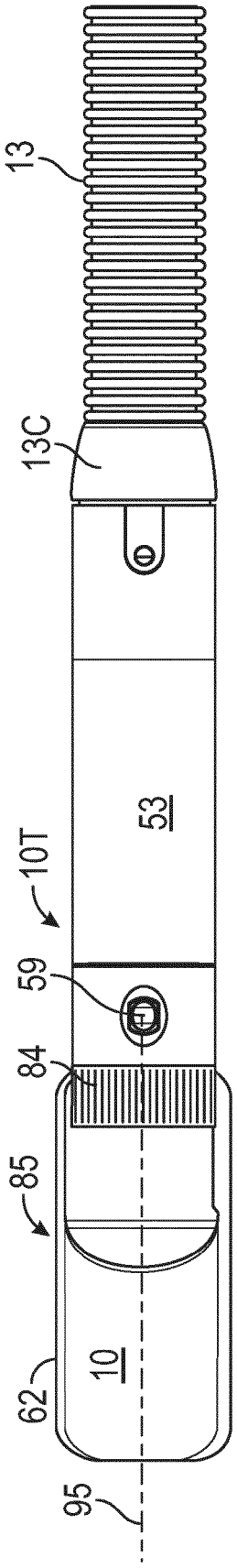

FIG. 8A

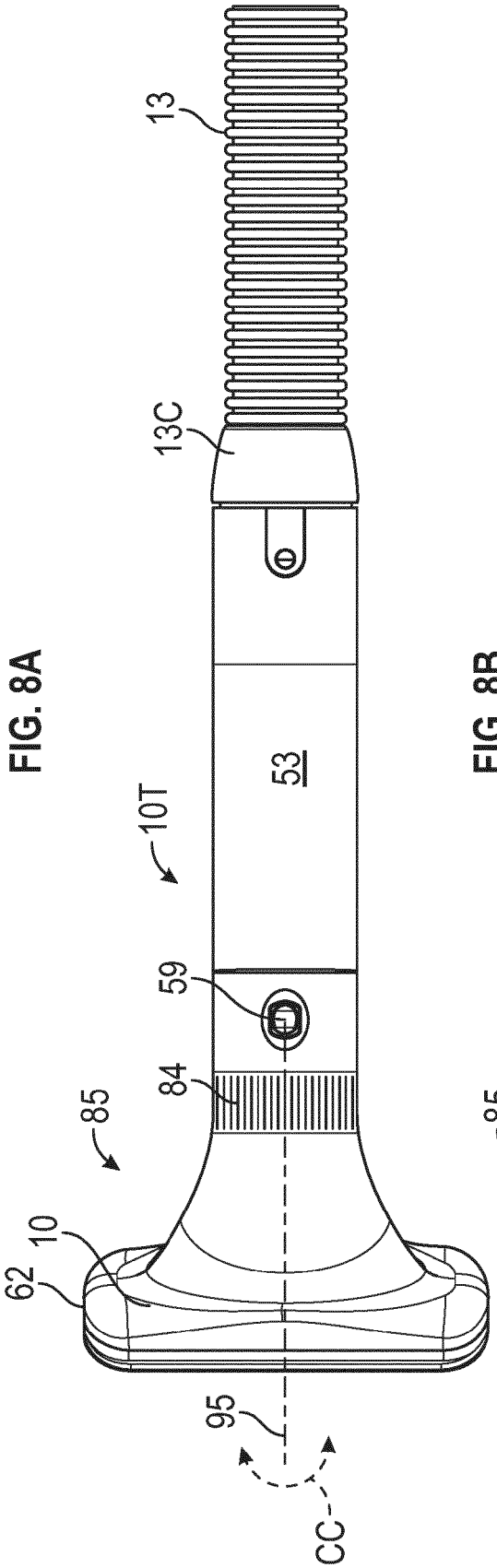

FIG. 8B

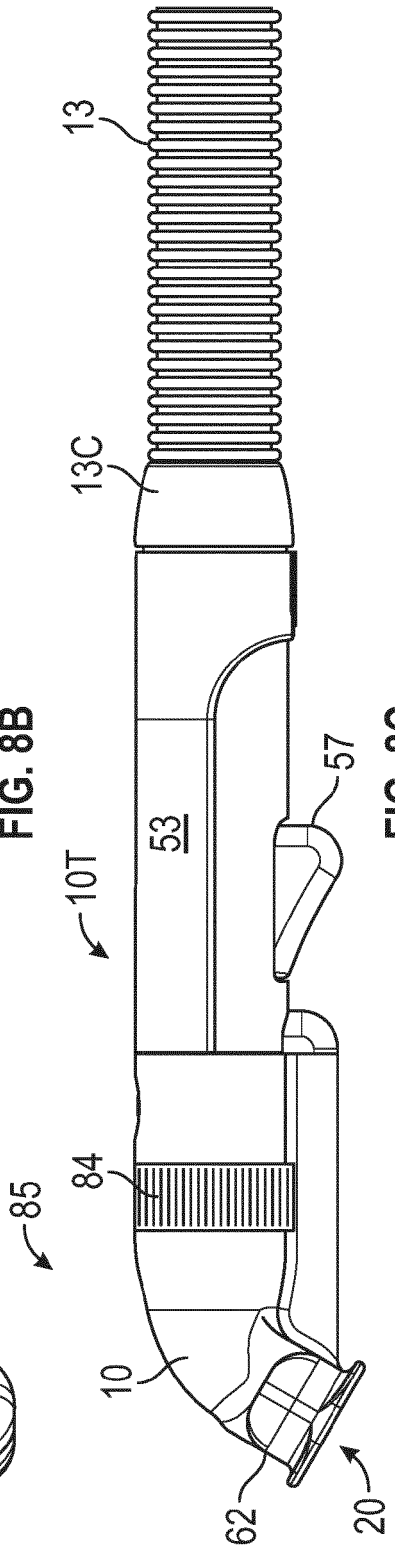

FIG. 8C

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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