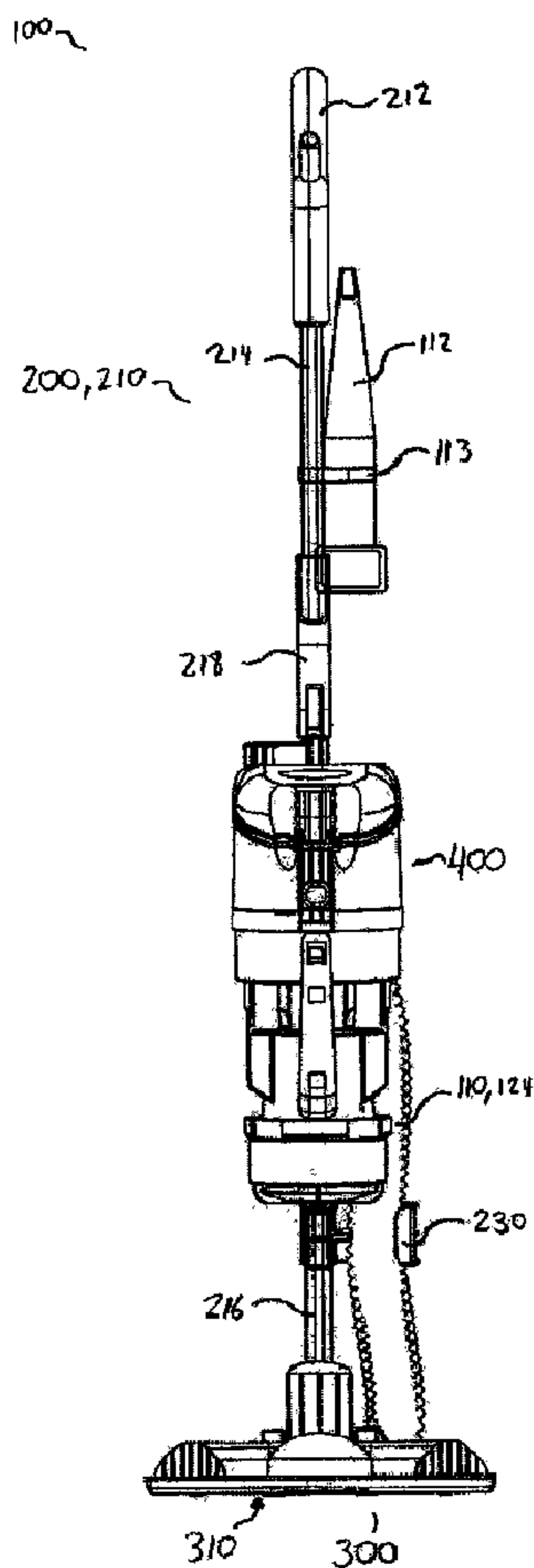




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(71) Demandeur/Applicant:  
G.B.D. CORP., BS  
(72) Inventeur/Inventor:  
CONRAD, WAYNE ERNEST, CA  
(74) Agent: BERESKIN & PARR LLP/S.E.N.C.R.L.,S.R.L.

(54) Titre : APPAREIL DE NETTOYAGE DES SURFACES AVEC DIFFERENTES CONFIGURATIONS DE NETTOYAGE  
(54) Title: SURFACE CLEANING APPARATUS WITH DIFFERENT CLEANING CONFIGURATIONS



(57) Abrégé/Abstract:

A surface cleaning apparatus may comprise a floor cleaning unit comprising a surface cleaning head. The surface cleaning apparatus may also comprise an upright section comprising a handle drivingly connected to the surface cleaning head, a portable

(57) **Abrégé(suite)/Abstract(continued):**

surface cleaning apparatus removably mounted to the handle and an air flow path extending having a flexible air flow conduit that forms at least part of an air flow path from the surface cleaning head to the portable surface cleaning apparatus. The surface cleaning apparatus may have at least two operating modes comprising; a first upright operating mode wherein the surface cleaning apparatus may be operable with the portable surface cleaning apparatus mounted to the handle, a second operating mode wherein the portable surface cleaning apparatus may be carried by a user and may be operable when removed from the handle in the absence of reconfiguring the flexible air flow conduit.

## ABSTRACT

A surface cleaning apparatus may comprise a floor cleaning unit comprising a surface cleaning head. The surface cleaning apparatus may also comprise an upright section comprising a handle drivingly connected to the surface cleaning head, a portable surface cleaning apparatus removably mounted to the handle and an air flow path extending having a flexible air flow conduit that forms at least part of an air flow path from the surface cleaning head to the portable surface cleaning apparatus. The surface cleaning apparatus may have at least two operating modes comprising; a first upright operating mode wherein the surface cleaning apparatus may be operable with the portable surface cleaning apparatus mounted to the handle, a second operating mode wherein the portable surface cleaning apparatus may be carried by a user and may be operable when removed from the handle in the absence of reconfiguring the flexible air flow conduit.

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## TITLE: SURFACE CLEANING APPARATUS WITH DIFFERENT CLEANING CONFIGURATIONS

### FIELD

The specification relates to a reconfigurable surface cleaning apparatus. In a preferred embodiment, the surface cleaning apparatus has an upright cleaning unit, a surface cleaning head and a detachably mounted portable surface cleaning apparatus in airflow communication with the surface cleaning head. In use, the portable surface cleaning apparatus can be detached from the upright cleaning unit and moved independently from the upright cleaning unit without having to reconfigure the airflow conduit between the portable surface cleaning apparatus and the surface cleaning head.

### INTRODUCTION

The following is not an admission that anything discussed below is prior art or part of the common general knowledge of persons skilled in the art.

Various types of surface cleaning apparatus are known. Typical upright vacuum cleaners include an upper section, including an air treatment member such as one or more cyclones and/or filters, drivingly mounted to a surface cleaning head. An up flow conduit is typically provided between the surface cleaning head and the upper section. In some such vacuum cleaners, a spine, casing or backbone extends between the surface cleaning head and the upper section for supporting the upper section. The air treatment member or members and/or the suction motor may be provided on the upper section.

Surface cleaning apparatus having a portable cleaning module that is removably mounted to an upright vacuum cleaner are known. See for example, US5,309,600. In addition surface cleaning apparatus having a removably mounted hand vacuum cleaner are also known. See for example US 4,635,315.

### SUMMARY

The following introduction is provided to introduce the reader to the more detailed discussion to follow. The introduction is not intended to limit or define the claims.

According to one broad aspect, a surface cleaning apparatus is provided is operable as an upright vacuum cleaner. For example, a vacuum cleaner may have a surface cleaning head for cleaning a floor. A support structure having a handle may be drivingly connected to the surface cleaning head such that a user can maneuver the surface cleaning head across the floor by manipulating the handle. The surface cleaning apparatus also comprises a portable surface cleaning unit that is selectively detachably mounted to the support structure. The portable surface cleaning unit preferably provides the vacuum suction and air treatment for the surface cleaning apparatus and is connected in airflow, or fluid flow, communication with the surface cleaning head such that the floor can be cleaned by the surface cleaning head.

Mounting the portable surface cleaning unit on the support structure increases the weight of the support structure and can affect the maneuverability and ease of use of the surface cleaning apparatus. Accordingly, in some cleaning situations the user may preferably detach the portable surface cleaning unit from the support structure and choose to, e.g., carry the portable surface cleaning unit by hand or by a strap while still using the support structure to drivingly maneuver the surface cleaning head. When the portable surface cleaning unit is detached, a user may more easily maneuver the surface cleaning head around or under obstacles, like furniture and stairs.

To enable the vacuum suction generated by the portable surface cleaning apparatus to reach the surface cleaning head when the portable surface cleaning unit is detached from the support structure, the airflow connection between the surface cleaning head and the portable surface cleaning unit is preferably at least partially formed by a flexible conduit, such as a flexible hose. The use of a flexible conduit allows a user to detach the portable surface

cleaning unit and maintain a flow connection between the portable surface cleaning unit and the surface cleaning head without having to reconfigure or reconnect any portions of the airflow conduit.

Accordingly, when the surface cleaning apparatus is in use, a user  
5 may detach the portable surface cleaning unit from the support structure without interrupting the airflow communication between the portable surface cleaning apparatus and the surface cleaning head. This allows a user to selectively detach and re-attach the portable surface cleaning unit to the support structure during use without having to stop and reconfigure the connecting hoses or airflow  
10 conduits.

It is also preferred that the portable surface cleaning is detachably connected to the surface cleaning head and may have its own nozzle. Accordingly, the surface cleaning apparatus may have a third mode of operation.

It is also preferred that the portable surface cleaning unit is  
15 removable from the surface cleaning apparatus without having to disengage a lock. For example, the portable surface cleaning unit may be held in place on an upright section of the surface cleaning apparatus by gravity. Accordingly a user may use one hand to lift the portable surface cleaning unit of the surface cleaning apparatus while still operating the surface cleaning apparatus with the user's  
20 other hand.

In one embodiment, surface cleaning apparatus may comprise a floor cleaning unit comprising a surface cleaning head. The surface cleaning head may have a dirty air inlet and a cleaning head air outlet. The surface cleaning apparatus may also comprise an upright section comprising a handle  
25 drivingly connected to the surface cleaning head, a portable surface cleaning apparatus or unit removably mounted to the handle and having an air inlet, an air outlet and a suction motor and an air flow path extending through the surface cleaning apparatus. The air flow passage may comprise a flexible air flow

conduit forming at least part of an air flow path from the surface cleaning head to the portable surface cleaning apparatus. The surface cleaning apparatus may have at least two operating modes comprising a first upright operating mode wherein the surface cleaning apparatus may be operable with the portable  
5 surface cleaning apparatus mounted to the handle and forming part of the air flow path and, a second operating mode wherein the portable surface cleaning apparatus may be carried by a user and may be operable when removed from the handle in the absence of reconfiguring the flexible air flow conduit.

In some examples, the portable surface cleaning apparatus is  
10 useable by itself without any attachments. Preferably, it has a built in surface cleaning nozzle. Any such nozzle known in the vacuum art may be used. Accordingly, when disconnected from the flexible air flow conduit, the portable surface cleaning apparatus may be directly ready for use.

In some examples, the flexible air flow conduit may comprise a  
15 portable portion that is removably mounted to the surface cleaning apparatus and the surface cleaning apparatus has at least one additional operating mode wherein the portable surface cleaning apparatus is carried by a user and operable when removed from the handle together with the portable portion of the flexible air flow conduit.

20 In some examples, the portable portion has an end distal to the portable surface cleaning apparatus and the distal end is adapted to receive a cleaning tool.

In some examples, the flexible air flow conduit has an end proximate the portable surface cleaning apparatus and the proximate end is  
25 removably mounted in air flow communication with the portable surface cleaning apparatus and the surface cleaning apparatus has at least one additional operating mode wherein the portable surface cleaning apparatus is operable when removed from the handle and from the flexible air flow conduit.

In some examples, the portable surface cleaning apparatus comprises a hand vacuum cleaner. Alternately, the portable surface cleaning apparatus may be carriable by, e.g., a strap.

5 In some examples, the surface cleaning apparatus may comprise an attachment member that is removably attached to the portable surface cleaning apparatus and the flexible air flow conduit is mounted to the attachment member.

In some examples, the attachment member forms part of airflow path from the surface cleaning head to the portable surface cleaning apparatus.

10 In some examples, the flexible air flow conduit is removably mounted to the attachment member.

In some examples, the handle comprises a portable surface cleaning apparatus mount that removably receives the attachment member.

15 In some examples, the portable surface cleaning apparatus is mounted to the upright section at a position spaced from the surface cleaning head.

In some examples, portable surface cleaning apparatus further comprises a nozzle that is selectively connectable in air flow communication with an accessory cleaning tool and the air flow path from the surface cleaning head  
20 to the portable surface cleaning apparatus.

In some examples, the portable surface cleaning apparatus comprises a hand vacuum cleaner having a nozzle that is configured for directly cleaning a surface.

25 In some examples, the upright section has an absence of a housing defining a recess for receiving the portable surface cleaning apparatus.

In some examples, the upright section comprises one or more thin support members.



In some examples, the upright section consists essentially of one or more thin support members.

It will be appreciated that an embodiment may contain one or more of features set out in the examples,

## 5 DRAWINGS

In the detailed description, reference will be made to the following drawings, in which:

Figure 1 is a front elevation view of an example of a vacuum cleaner;

10 Figure 2 is a back perspective view of the vacuum cleaner of Figure 1 with a portable surface cleaning apparatus mounted to a support structure;

Figure 3a is a back perspective view of the vacuum cleaner of Figure 1 with the portable surface cleaning apparatus removed from the support structure and in a position in which it may be carried by hand;

15 Figure 3b is a side elevation view of the portable surface cleaning apparatus of Figure 3a wherein the portable surface cleaning apparatus has been removed from the support structure and is in a position in which it may be carried by hand with flexible hose detached from the surface cleaning head;

20 Figure 4 is a partially exploded side perspective view of the vacuum cleaner of Figure 1 with the portable surface cleaning apparatus removed from air flow communication with the floor cleaning unit;

Figure 5 is a front isometric view of the vacuum cleaner of Figure 1 with the portable surface cleaning apparatus removed;

Figure 6 is side elevation view of a hand vacuum cleaner;

25 Figure 7 is a front elevation view of the hand vacuum cleaner of Figure 6;

Figure 8 is a bottom isometric view the hand vacuum cleaner of Figure 6;

Figure 9 is a bottom isometric view of the hand vacuum cleaner and an attachment member;

5 Figure 10 is a partially exploded bottom isometric view of the hand vacuum cleaner and an attachment member of Figure 9;

Figure 11 is a side isometric view of the attachment member of Figure 9;

10 Figure 12 is a front elevation view of the attachment member of Figure 11;

Figure 13 is a side isometric view of the attachment member of Figure 11;

Figure 14 is a partially exploded isometric view of the attachment member of Figure 11;

15 Figure 15 is a front isometric view of an alternate example of a vacuum cleaner with a portable surface cleaning apparatus mounted thereto;

Figure 16 is a partial rear isometric view of the vacuum cleaner of Figure 15;

20 Figure 17 is a rear isometric view of an alternate example of a vacuum cleaner with a portable surface cleaning apparatus mounted thereto;

Figure 18 is a partial front isometric view of the vacuum cleaner of Figure 17 with the portable surface cleaning apparatus removed;

Figure 19 is a partial top view of the surface cleaning head of the vacuum cleaner of Figure 17; and,

25 Figure 20 is a side elevation view of an alternate example of a vacuum cleaner with a portable surface cleaning apparatus mounted thereto.

## DESCRIPTION OF VARIOUS EXAMPLES

Various apparatuses or methods will be described below to provide an example of each claimed invention. No example described below limits any claimed invention and any claimed invention may cover processes or apparatuses that are not described below. The claimed inventions are not limited to apparatuses or processes having all of the features of any one apparatus or process described below or to features common to multiple or all of the apparatuses described below. It is possible that an apparatus or process described below is not an embodiment of any claimed invention.

10           Figures 1-5 exemplify an upright vacuum cleaner having a removably mounted portable surface cleaning apparatus, optionally a hand vacuum cleaner, wherein the portable surface cleaning apparatus has a nozzle that may have an open sided air flow chamber. It will be appreciated that the portable surface cleaning apparatus may be of any construction and may use  
15 any particular air treatment member (e.g., one or more cyclones comprising one or more cyclonic cleaning stages and/or one or more filters). It will also be appreciated that the upright structure to which the portable surface cleaning apparatus is removably attached may be of any particular design. Further, the floor cleaning unit may alternately, or in addition, use an open sided nozzle and  
20 may selectively receive an auxiliary cleaning tool.

Referring to Figures 1 to 5, a first example of a surface cleaning apparatus 100 is shown. The surface cleaning apparatus 100 is a vacuum cleaner that comprises a floor cleaning unit 200 comprising a surface cleaning head 300 having a support structure 210 pivotally mounted thereto and a  
25 portable surface cleaning apparatus 400 that is removably mounted to support structure 210. Support structure 210 may also be referred to as a handle, a backbone or an upright section.

As in the examples described in this specification, the surface cleaning apparatus 100 may be operated in a first or upright operating mode, as

exemplified in Figures 1 and 2, in which the portable surface cleaning apparatus 400 is mounted to the handle 210. Optionally, the surface cleaning apparatus 100 may be operated in a second operating mode, as exemplified in Figures 3a and 3b, in which the portable surface cleaning apparatus 400 is detached from the handle 210 and is carried by a user. When so carried, the portable surface cleaning apparatus may be connected in air flow communication with surface cleaning head 300 and/or using a nozzle provided on portable surface cleaning apparatus 400. In these alternate operating modes the user may carry the portable surface cleaning apparatus 400 by hand or by any other carrying means, including a strap, a shoulder strap, a harness and a backpack. Generally, when the portable surface cleaning apparatus 400 is removed from the handle 210 it is not placed on the ground, although it may be. Details regarding the operation of examples of a surface cleaning apparatus 100 in both the first and second operating modes are explained below.

In the example shown, the handle 210 has an upper portion 214 and a lower portion 216 that are optionally pivotally connected by a hinge 218. The handle 210 is attached to the surface cleaning head 300 and a user can move the surface cleaning head 300 along a surface to be cleaned by gripping and maneuvering the handle 210. Optionally, the lower portion 216 of the handle 210 can be hingedly or pivotally attached to the surface cleaning head 300, so that the lower portion 216 of the handle 210 can move relative to the surface cleaning head 300 during use. This may enable the user to move the surface cleaning head 300 beneath cabinets, furniture or other obstacles.

The upper portion 214 of the handle optionally includes a grip 212 that is shaped to be gripped by a user. In the example shown, the grip 212 is at the top, or upper end of the upper portion 214 of the handle 210 and is formed in a closed loop-type shape having surfaces that are rounded to increase user comfort. In other examples, the grip 212 may be of a different configuration or may be located at a different position on the upper portion 214 of the handle 210.

In addition to the grip 212, the upper portion 214 of the handle 210 optionally includes a bracket 113 that supports an auxiliary, or accessory or supplemental cleaning tool 112. In the example shown, the bracket 113 is configured to hold a single auxiliary cleaning tool 112, but in other examples the  
5 bracket 113 may be configured to hold more than one auxiliary cleaning tool 112. Also, while shown attached to the upper portion 214, it is understood that the bracket 113 may be attached to other locations on the surface cleaning apparatus, including the lower portion 216, the surface cleaning head 300 and/or the hand vacuum 400.

10 In the example shown, the upper and lower portions 214, 216 have a generally cylindrical or tube-like shape. However, in other examples, the upper and lower portions 214, 216 may any other type of thin support members having suitable cross-sectional shape including square, rectangular or polygonal. In addition, the upper and lower portions 214, 216 may be solid or hollow and may  
15 be formed from any suitable material, including plastic and metal. In other embodiments, it will be appreciated that handle may be a single unit, e.g., a support rod such that upper and lower portions 214, 216 are part of the same element. Alternately, upright section 210 may comprise a frame for removably receiving a portable surface cleaning apparatus.

20 The upper and lower portions 214, 216 of the handle 210 are optionally pivotally joined by hinge 218. When the hinge 218 is in a first position, as shown in Figures 1, 2, 4 and 5 the upper and lower portions 214, 216 of the handle 210 are generally aligned with each other. The hinge 218 is retained in this first position by a biasing or locking means so that first portion 214 of the  
25 handle 210 remains in a generally vertical aligned with lower portion 216 when not in use and so that movements of the first portion 214 of the handle 210 can be translated to the second portion 216. In use, the hinge 218 can be unlocked, or released from the first position and can move into a second position, wherein the grip 212 is preferably rotated forwardly.

In the example shown, the grip 212 comprises a hinge release 213 that can be activated by a user during use of vacuum cleaner 100 to unlock the hinge 218. When a user activates the hinge release 213, the retaining or locking means used to secure the hinge 218 in the first position is disengaged, allowing  
5 the hinge 218 to rotate or pivot, as shown in Figure 3a. As the hinge 218 rotates, the first portion 214 of the handle 210 can be moved into a plurality of angular positions relative to the second portion 216 handle 210. Optionally, the hinge 218 may rotate between, and lock into, a given number of set or indexed angular positions. Alternatively, the rotation of the hinge 218 may be continuously  
10 variable, after being initially unlocked, allowing for the first portion 214 to be moved into an indefinite number of angular positions relative to the second portion 216 (e.g., freely rotatable).

In the example of the vacuum cleaner 100 shown, the lower portion 214 of the handle 210 extends from the hinge 218 to the surface cleaning head  
15 300 and optionally comprises the portable surface cleaning apparatus mount 220 for receiving and supporting the hand vacuum 400. The lower portion 216 also optionally comprises a hose guide 230 for keeping the flexible hose 124 in close proximity to the backbone 200. When the portable surface cleaning apparatus 400 is detached or removed from the backbone 200 the flexible hose 124 may be  
20 removed from the hose guide 230, as shown in Figures 3a and 3b.

When the vacuum cleaner 100 is operated in the first or upright operating mode, the surface cleaning head 300 serves as a base portion of the vacuum cleaner 100 and is preferably in rolling contact with the surface to be cleaned. When the vacuum cleaner is 100 in an upright position (as exemplified  
25 in Figures 1, 2, 4 and 5) the surface cleaning head 300 is supported by optional main or rear wheels 320 and/or optional front wheels (not shown). However, when the vacuum cleaner 100 is moved into an angled position during use (as exemplified in Figure 3a) additional optional support wheel 321 that is provided on upright section 210 may also roll across the surface to be cleaned. In other

examples of the vacuum cleaner 100 the surface cleaning head 300 may include a greater or fewer number of wheels.

In the first operating mode, portable surface cleaning apparatus 400 is provided on backbone 200 and the user maneuvers both the backbone  
5 200 and the portable surface cleaning apparatus 400 by manipulating the grip 212 on the handle 210. User input on the grip 212 is transferred to the wheels 320 of the surface cleaning head 300 by the backbone 200.

The surface cleaning head 300 may also comprise a dirty air inlet 310 that is connected in fluid communication with a dirty air outlet 312 by one or  
10 more dirty air conduits (not shown). Preferably, the dirty air conduit is an air flow chamber wherein at least a portion of the lower side is open.

Preferably, as exemplified, portable surface cleaning apparatus 400 houses the air treatment members and the suction motor for surface cleaning apparatus 100. However, it will be appreciated that one or more additional air  
15 treatment members and/or an additional suction source may be provided elsewhere on surface cleaning apparatus 100.

When the vacuum cleaner 100 is operated in the second operating mode, the portable surface cleaning apparatus 400 is detached from the backbone 200 and accordingly, the backbone 200 and surface cleaning head  
20 300 can be moved independently of the portable surface cleaning apparatus 400. Preferably, as exemplified, when the portable surface cleaning apparatus 400 is removed from the backbone 200 it may also be detached from the airflow conduit 110 and operated as a hand vacuum that directly engages the surface to be cleaned. Alternately, or in addition, when the portable surface cleaning  
25 apparatus 400 is detached from the backbone 200 it may remain connected to the airflow conduit 110, for example flexible hose 124. When the portable surface cleaning apparatus 400 remains connected to the to the surface cleaning head 300 by, e.g., flexible hose 124, the user can continue to clean the floor

using the surface cleaning head 300, as exemplified in Figure 3a. Optionally, the user may detach the upstream end of the flexible hose 124 from the surface cleaning head 300 (or other portion of the surface cleaning apparatus 100 as necessary) and use the flexible hose 124 as a portable airflow conduit that can be carried and manipulated by the user separate from the backbone 200 and surface cleaning head 300, as exemplified in Figure 3b. This mode permits the user to operate portable surface cleaning apparatus 400 with the flexible hose, to which a cleaning tool having a nozzle may be attached.

While in some of the examples described the portable surface cleaning apparatus 400 has a nozzle 412 that may be used to directly clean a surface, in other examples of the surface cleaning apparatus the portable surface cleaning apparatus 400 need not have a nozzle that can directly engage a surface. In these examples, carrying the portable surface cleaning apparatus 400 separate from the backbone 200 and surface cleaning head 300 may still be advantageous as it may reduce the effort required to maneuver the backbone 200 and surface cleaning head 300 by removing the weight of the portable surface cleaning apparatus 400 or by permitting the surface cleaning head to be used under furniture (as exemplified in Figure 3a), and it may still allow the user to clean surfaces without the surface cleaning head 300 if the portable surface cleaning apparatus 400 remains connected to the portable length of flexible hose 124 or any other accessory or auxiliary cleaning device.

If the upright section 210 includes a suction motor and/or an air treatment unit, then the dirty air outlet 312 may, in turn, be coupled, optionally removably coupled, to the upstream end of the conduit, preferably a flexible hose 124, that extends from the dirty air outlet 312 of the surface cleaning head 300 to the upright section, such as the attachment member air inlet 126. The fluid pathway may continue through the attachment member passageway 128, which terminates in attachment portion air outlet 127, and through attachment portion air outlet 127 which mates with the opening 438 of the portable cleaning



apparatus 400. The connection between the attachment portion 120 and the portable cleaning apparatus 400 is discussed in greater detail below.

5 A mount is preferably configured to removably receive a portion of the portable surface cleaning apparatus and/or an attachment member removably mounted to the portable surface cleaning apparatus. One example of a mount is the mount 220 as exemplified. The mount is preferably configured to retain portable surface cleaning apparatus therein under the influence of gravity. Accordingly, a mechanical lock need not be used. In particular, a user may lift the portable surface cleaning apparatus off of upright section 210 without having to  
10 press a button or otherwise release a mechanical lock.

As exemplified in Figures 1-5 the mount 220 may be generally U-shaped and may be sized to receive collar 140 or other mounting portion of the attachment member 120. The inner surface of the mount 220 comprises a protrusion 222 that extends outward from the inner surface of the mount 220 and  
15 removably seats within the generally U-shaped channel 144 of the collar 140. It will be appreciated that mount 220 may comprise more than one member, as exemplified in Figures 14-15.

The mount 220 may be located in a variety of locations along the length of the second portion 216. Preferably, the mount 220 is positioned at  
20 approximately the waist height of the intended user (e.g., 2.5 – 3.5 feet above the floor) so that the user can attached or detach the hand vacuum 400 from the backbone 200 without bending over. This may decrease the stress and strain experienced by the user when the user removes the hand vacuum 400 from the backbone 200.

25 When attached to the portable surface cleaning apparatus 400 and seated in the mount 220 (as shown in Figures 1 and 2), the attachment member 120 transfers all or a portion of the load (i.e. the weight) of the hand vacuum 400 to the mount 220. Another portion of the load of the hand vacuum 400 may be

supported by an additional mounting bracket, such as mount bracket 224, which receives and supports optional rear wheel 480 of the portable surface cleaning apparatus 400. The surface of the mount bracket 224 may be complimentary to the curved shape of the optional rear wheel 480 so that the optional rear wheel  
5 480 can at least partially nest within mount bracket 224. In addition to supporting the weight of the portable surface cleaning apparatus 400, the attachment portion 120 also preferably serves as a fluid conduit establishing a fluid flow connection between the hand vacuum 400 and the airflow conduit 110, which preferably includes a flexible hose 124. In some examples, as exemplified in Figures 1-5,  
10 the flexible hose 124 may comprise substantially the entire length of the airflow conduit 110 connecting the hand vacuum 400 to the surface cleaning head 300. In other examples, as exemplified in Figure 20, the flexible hose 124 may comprise only a portion of the airflow conduit 110 and another portion of the airflow conduit 110 may be formed by the lower portion 216 of the backbone 200  
15 (e.g., a hollow support rod).

Loads placed on the mount 220 (via both the U-shaped opening and/or the mount bracket 224) are in turn transferred via the lower portion 216 of the handle 210 to the surface cleaning head 300 and ultimately to the floor or other type of surface being cleaned. The mount 220 may be made from any  
20 material that can support the weight of the hand vacuum 400, including plastic and metal.

In the example of the vacuum cleaner 100 shown, the optional rear wheel 480 of hand vacuum 400 and the attachment member 120 are each preferably freely received by the mount 220 and held in place by gravity. The  
25 protrusion 222 that seats within the channel 144 of the attachment member 120 also provides a degree of lateral support, restraining the movement of the attachment member 120 (and therefore the hand vacuum 400) when the handle 210 is moved from a vertical position to an angled position when in use. Further protrusion 222 may comprise a cam surface to assist in guiding protrusion 222

into channel 144 as the portable surface cleaning apparatus is lowered onto mount 220. Accordingly, the attachment member 120 and the optional rear wheel 480 are preferably not held in place by clips, straps or any other type of mechanical fastening means.

5           The absence of mechanical fasteners allows for simple, one-handed removal of the attachment member 120 and the hand vacuum 400 from the mount 220, without the need to unlock or undo any fasteners. One-handed detachment of the hand vacuum 400 may be advantageous as it allows a user to control and maneuver the backbone 200 with one hand while simultaneously  
10 removing the hand vacuum 400 from the mount 220 with the other hand. In use, this may allow a user to frequently attach and detach the portable surface cleaning apparatus 400 from the mount 220 in response to the user's needs, for example navigating around furniture, stairs or other obstacles on the surface to be cleaned.

15           While in the preferred example described above the mount 220 is free of fasteners, in another example the mount 220 may be outfitted with fastening devices for retaining the attachment member 120 and the additional wheel 480. Examples of possible fasteners include clips, snaps, and straps. Magnets may alternately or in addition be used. An advantage of using magnets  
20 may assist in holding the portable surface cleaning apparatus on the backbone but still permit one handed removal as no lock need be released.

          In some examples of a surface cleaning apparatus, as exemplified in Figures 1-19, the portable surface cleaning apparatus 400 may be connected to the attachment member 120, and the attachment member 120 may be seated  
25 on the mount 220 without the use of mechanical fasteners (e.g., it is gravity mounted). In these examples, when a user lifts the portable surface cleaning apparatus 400 of the upright section, attachment member 120 remains attached to the nozzle 412 and is freely removed from the mount 220 allowing for quick and easy detachment of the portable surface cleaning apparatus 400 from the

support structure. As described in more detail below, the portable surface cleaning apparatus 400 may optionally be detached from the attachment member 120 by the user if necessary. Accordingly, the portable surface cleaning apparatus 400 and the attachment member 120 may be an assembly that is  
5 removably mounted to the support structure.

In other examples, as exemplified in Figures 20, the attachment member 120 is connected to the mount 220 using a mechanical fastening means and the nozzle 412 of the portable surface cleaning apparatus 400 is freely seated upon, or gravity mounted on, the attachment member 120. In this  
10 example, the connection between the portable surface cleaning apparatus 400 and the attachment member 120 may be a slidable connections means, such as a complimentary tongue and groove arrangement. In this example, the portable surface cleaning apparatus 400 is still freely removable from the support structure 210, without the need to release or detach any fastening devices, but  
15 when the portable surface cleaning apparatus 400 is removed, the attachment member 120 remains connected to the support structure 210. If a user wishes to remove the portable surface cleaning apparatus 400 from the support structure 210 while maintaining the airflow connection to the surface cleaning head 300, the user may release the attachment member 120 from the mount 220 thereby  
20 maintaining the airflow connection to the surface cleaning head 300 while the portable surface cleaning apparatus 400 is detached.

In all examples of the surface cleaning apparatus 100 that include a detachable portable surface cleaning apparatus, it is possible for the user to detach the portable surface cleaning apparatus from the support structure  
25 without having to release any mechanical fasteners. In addition, in all examples of the surface cleaning apparatus 100 that include a detachable portable surface cleaning apparatus, it is possible for the portable surface cleaning apparatus to remain in airflow communication with the surface cleaning head 300 when

detached, and/or to be operably disconnected from the portable surface cleaning apparatus and used as a stand alone cleaning device.

5 It will be appreciated that, as exemplified in Figure 3a, the air flow passage between the portable surface cleaning apparatus 400 and the surface cleaning head 300 need not be reconfigured when portable surface cleaning apparatus 400 is removed. In other words, a hose need not be disconnected and then reconnected.

10 Optionally, instead of removing the attachment portion 120 from the mount 220, the hand vacuum 400 may be decoupled from the attachment portion while the attachment portion is positioned in mount 220, as shown in Figure 5. In an embodiment, it will be appreciated that attachment member 120 may not be removable from mount 220.

15 Referring to Figures 15-19, other examples of the vacuum cleaner 100 are shown. These figures exemplify features of a surface cleaning apparatus that may be used with any embodiment disclosed in herein, either individually or in any particular combination or sub-combination. The features exemplified in these figures include a surface cleaning head, a support structure for an upright or stick vacuum cleaner, and a handle mount for a surface cleaning apparatus.

20 In this description, an alternate structure, or mount, for supporting an air treatment unit and/or a suction motor is provided. As exemplified, the second portion 216 may include a generally upside down U-shaped wishbone portion 250. The wishbone 250 is optionally provided with a hinge 218 at the centre of an upper portion of the wishbone 252, and each prong 254 of the  
25 wishbone extends downward, and connects to a rib 256. The ribs 256 are preferably substantially parallel and cooperate to define an optional mount for receiving a removable surface cleaning unit, such as the split saddle configuration that is exemplified. Optionally, the ribs 256 may be integrally

formed with the prongs 254 of the wishbone portion 250, or they may be separate tubes or rods fastened to the prongs 254 of the wishbone 250, as shown.

A preferred mount comprises a pair of generally opposing saddle flanges 280 (one on each rib) that cooperate to provide a mount or a mounting location for the attachment member 120 that is connected to the hand vacuum 400. Due to the spacing of the ribs 256 and the general curvature of the hand vacuum 400, the hand vacuum 400 is preferably positioned in front of ribs 256. The attachment member 120 extends rearward of hand vacuum 400 and may be received on split saddle flanges 280 in a similar manner to mount 220. Alternately, it will be appreciated that hand vacuum 400 may be partially nest between, or be received between, the ribs 256.

As exemplified, to supportively engage the attachment member 120, each saddle flange 280 preferably includes a projection or protrusion (not shown) that is received within the channel 142 of the collar 140 (as described in more detail with reference to Figures 11-14 below). The generally curved profile of the collar 140 and channel 142 may enable the attachment member 120 (and the associated hand vacuum 400) to generally self-level or self-register between the ribs 256 when the user initially places the attachment member 120 on the saddle flanges 280. Like the mount 220 described above, the saddle flanges 280 may include magnets or other fastening devices to secure or retain the attachment member 120. Optionally, the mount 220 or any other suitable type of mounting hardware may replace the saddle flanges 280 in this example.

The lower ends of the ribs 256 may be attached to a bracket 260 having a generally opposite configuration than the wishbone. That is, the bracket may include two, upward facing projections 262, for attaching to the ribs 256, that are connected by a cross-member 264 to provide a single downward facing coupling point 266. The spaced apart ribs provide two mounting points. Various of such structure may be used.

Preferably, lower portion 216 is rotatably mounted to the cleaning head. Accordingly, a user may rotate grip 212 clockwise or counterclockwise to assist in steering the cleaning head. Accordingly an advantage of providing a single, downward facing coupling point may be the fact that a single coupling point can be pivotally and rotationally connected to the surface cleaning head 300. Another advantage is that a narrower rear end may be utilized for the floor cleaning unit.

Accordingly, as exemplified, the bracket 260 preferably also includes a housing 268, which is preferably hollow, having a lower opening 270 that connects to the surface cleaning head 300. As exemplified, housing 268 may be pivotally mounted to surface cleaning head, preferably at about the location of rear wheels 320, such as by having a portion pivotally mounted to the axle of rear wheels 320. Optionally, the connection between the lower opening 270 and the surface cleaning head 300 can be a rotatable and pivotal connection. The hollow housing 268 may extend from the lower opening 270, through the cross-member 264 to define an upper collar 272.

Optionally, as in this example, the surface cleaning head 300 includes a hollow conduit member 330 and a second air conduit 334. As exemplified in Figures 17-19, one example of the second air conduit 334 is a second flexible hose 335. In the preferred arrangement shown, the dirty air outlet 312 of the surface cleaning head 300 is connected to the second or upstream flexible hose 335 and the second flexible hose 335 extends from the dirty air outlet 312, through the hollow conduit member 330, through the hollow housing 268 to the upper collar 272. The downstream end of the second flexible hose 335 may be fixedly connected to the upper collar 272, or it may have a fitting that seats upon a surface of the upper collar 272 preventing the second flexible hose 335 from retracting within the hollow housing 268 while leaving the downstream end of the second flexible hose 335 free to extend upward, away from the upper collar 272.

The second flexible hose 335 forms part of the continuous airflow passageway that connects the dirty air outlet 312 of the surface cleaning head 300 to the opening 438 on the hand vacuum 400. To establish the continuous airflow passageway, the downstream end of the second upstream flexible hose 335 may be connected to the upstream end of the downstream flexible hose 124. The connection between the flexible hose 124 and the downstream end of the second flexible hose 335 is preferably a detachable connection so that the flexible hose 124 can be detached from the surface cleaning head 300 as described above.

Optionally, the second flexible hose 335 is also an extensible, or stretchable, hose that can extend when pulled on by the user. In some examples, the second flexible hose 335 is a stretch hose and may have a stretched length to non-stretched length ratio of between 2:1 – 6:1. In examples where the second flexible hose 335 is not stretchable, when a user removes the hand vacuum 400 from its mount during use, the maximum distance that the hand vacuum 400 can be separated from the backbone 200 and the surface cleaning head 300 is determined by the length of the flexible hose 124. However, in some instances, a user may wish to move the hand vacuum 400 a greater distance from the backbone 200, for example to pass the surface cleaning head 300 under a bed or other large piece of furniture. When a stretchable second flexible hose 335 is used, the downstream end of the second flexible hose 335 can unseat from the upper collar 272 and extend away from the bracket 260, whereby some of hose 335 may pass through housing 268 thereby lengthening the airflow conduit connecting the hand vacuum 400 to the surface cleaning head 300 and allowing the hand vacuum 400 to be moved further from the backbone 200 in use. Accordingly, it will be appreciated that some or all of the conduit that may be extended to provide additional length for an air flow passage may be stored on the surface cleaning head 300.



It will be appreciated that lower section 216 may be rotatably mounted on cleaning head 300 without hose 335 extending through a housing 268. Further, a housing 268 may be used even if lower section 216 is not rotatably mounted to cleaning head 300. Such a housing need not be pivotally mounted to surface cleaning head.

Preferably, the second flexible hose 335 is also resilient so that it will return to its original, un-stretched length when it is released by the user. The resilience of the second flexible hose 335 may tend to retract the second flexible hose 335 through the hollow housing 268 and the hollow conduit member 330 and may serve to re-seat the downstream end of the second flexible hose 335 on the upper collar 272. In this example, the second flexible hose 335 functions as a variable length air conduit and may reduce the need for a user to add extra hoses or conduit members to the vacuum 100 during use.

To allow for easy and repeated extension of the second flexible hose 335, the second flexible hose 335 may be sized to freely pass through both the hollow conduit member 330 of the surface cleaning head 300 and the hollow housing 268 of the bracket 260.

In the example shown in Figure 15-19, the hollow housing 268 is integral the bracket 260 and also serves as the coupling means that connects the lower portion 216 to the surface cleaning head 300. As shown, the coupling between the lower portion 216 and the surface cleaning head 300 may be the telescoping or overlapping engagement of the lower opening 270 over the surface cleaning head 300 hollow conduit member 330. In other examples, the coupling or attachment between the lower portion 216 and the surface cleaning head 300 may be any type of connection including a threaded connection, clamps or tabs. The connection between the lower portion 216 and the surface cleaning head 300 may be fixed or selectively releasable. An advantage of providing a single, downward facing coupling point 266 may be the fact that a single coupling point 266 can be pivotally and rotationally connected to the

surface cleaning head 300. Further, the hollow conduit member 330 may be pivotally connected to the surface cleaning head 300, as exemplified in Figures 15-19, and in other examples, the hollow conduit member 330 may be fixedly connected to the surface cleaning head 300, or integrally formed therewith.

5                   As shown, the hollow housing 268 may be integral with the bracket 260 and provide both a hollow passageway and an attachment point. However, in other examples, the hollow housing 268 may be external the bracket 260 and may be formed from a separate conduit. Similarly, the air flow conduit 110 connecting the attachment member 120 to the second flexible hose 335 may be  
10 the flexible hose 124 or any other suitable conduit, including flexible conduits, rigid conduits, conduits integral with the handle, as exemplified in Figure 20, and conduits external the handle, as exemplified in Figures 1-5.

                  Optionally, the ribs 256 (or another portion of the second portion 216) may be surrounded by a housing or shell. The housing may provide  
15 structural strength to the second portion 216 or it may merely provide an improved aesthetic appearance of the vacuum 100, or both. If a housing is formed around a section of the second portion 216 (or any other section of the handle 210 or backbone 200) the mount for supporting the hand vacuum (for example the mount 220 or the saddle flanges 260) may be within a recess in the  
20 housing. Providing a recess in the housing for receiving the hand vacuum may create a more integrated or seamless visual appearance when the hand vacuum is mounted to the backbone 200; it may also improve the rigidity of the backbone 200.

                  As exemplified, wishbone portion 250 preferably extends forwardly  
25 and provides a mount for upper portion 214 (i.e. the handle) at a forward point of the backbone. Further, passageway 268 extends rearwardly. Accordingly, when hand vacuum 400 is mounted to the backbone, the centre of gravity of the backbone and hand vacuum 400 combined is below a plane P extending from the axle of rear wheel 320 to the upper end of upper portion 214 (as exemplified

in Figure 17), thereby improving maneuverability of surface cleaning head 300. It will be appreciated that other constructions, such as that exemplified in Figures 1-5, may be used to position the centre of gravity behind the plane. In the example shown (best exemplified in Figure 5), the lower portion 216 includes an upper end, that is connected to the hinge 218 such that the upper portion 214 is drivingly connected to the surface cleaning head 300. In this construction the lower end includes a step-back or kinked-back portion 215. The step-back portion 215 enables the mount 220 to be positioned sufficiently behind the rear wheels 320 such that the centre of gravity of the combination of the backbone 200 and the hand vacuum 400 is below the plane P. As a result of this configuration, the vacuum 100 may be more stable when rotated and maneuvered by the user, especially when upper portion 214 is rotated about hinge 218. Specifically, locating the centre of gravity of the combination of the hand vacuum 400 and the backbone 200 below the plane P may tend to reduce the over rotation of the backbone 200 or over-steer of the vacuum 100 in use, and may reduce the strain on a user's arm and wrist.

It will be appreciated that the dual hose construction (i.e. the flexible hose 124 and the second flexible hose 335 of Figure 15-19) may be used in combination with any example disclosed herein or by itself in a surface cleaning apparatus. Similarly, the positioning of a removably mounted portable surface cleaning apparatus with a low centre of gravity may be used in combination with any example disclosed herein or by itself in a surface cleaning apparatus.

Referring now to Figures 6-14, examples of the portable cleaning apparatus 400 and the attachment member 120 of the vacuum 100 are shown in more detail. It will be appreciated that any portable surface cleaning apparatus may be used. Preferably, the portable surface cleaning apparatus uses cyclonic separation. More preferably, the portable surface cleaning apparatus is a hand vacuum cleaner.

The hand vacuum 400 can be operated as the vacuum suction supply for the vacuum 100 and it can be operated as a stand alone hand vacuum cleaner, that is movable along a surface to be cleaned by gripping and maneuvering handle 402, when it is removed from, or detached from the backbone 200. The hand vacuum 400 includes an upper portion 404, a lower portion 406, a front 408, and a rear 410. In the example shown, maneuvering handle 402 is provided at the upper portion 404. In alternate examples, maneuvering handle 402 may be provided elsewhere on the vacuum cleaner 400, for example at the rear 410.

10 In the example shown, the hand vacuum 400 comprises a nozzle 412 and a cyclone unit 414, which together preferably form a cleaning head portion 416 of the hand vacuum 400. In the example shown, the cleaning head portion 416 is provided at the front 408 of the hand vacuum 400.

Nozzle 412 comprises a dirty air inlet 418, through which dirty air is drawn into the portable cleaning apparatus 400, and when used as a hand vacuum cleaner the nozzle 412 directly engages a surface to be cleaned. An airflow passage extends from the dirty air inlet 418 to a clean air outlet 420 of the hand vacuum 400. In the example shown, clean air outlet 420 is at the rear 410 of the hand vacuum 400. It will be appreciated that clean air outlet may optionally be connected to a fluid conduit provided in the floor cleaning unit.

Cyclone unit 414 is provided in the airflow passage, downstream of the dirty air inlet 418. In the example shown, the cyclone unit 414 comprises one cyclone 422, and one dirt chamber 424. In alternate examples, the cyclone unit 414 may include more than one cyclone, and more than one dirt chamber. Further, the cyclones chambers may be arranged in stages, and may be provided in parallel or in sequence. Alternately, or in addition, one or more filters or other dirt separation members may be used.

In the example shown, the nozzle 412 is positioned at the lower portion 406 of the portable cleaning apparatus 400. More preferably, as in the example shown, nozzle 412 is positioned at the bottom of the portable cleaning apparatus 400, and is preferably beneath the cyclone unit 414 when used as a hand vacuum cleaner and is between the cyclone unit 414 and the mount 220 when attached to the backbone 200. Further, as in the example shown, the nozzle 412 is preferably fixedly positioned at the lower portion 406 of the portable cleaning apparatus 400. That is, the nozzle 412 is not movable with respect to the remainder of the portable cleaning apparatus 400, and is fixed at the lower portion 106 of the portable cleaning apparatus 400. As shown in Figures 7 and 8, nozzle 412 has a width  $W_N$  and, as shown in Figure 11, coupling plate 123 has a width  $W_p$  that is generally the same as width  $W_N$ .

Nozzle 412 exemplifies a particular design for an open sided nozzle. Open sided nozzle 412 has an open side that faces the surface to be cleaned when the nozzle is placed against a surface to be cleaned. Accordingly, nozzle 412 defines an air flow chamber that has an open lower side. In operation, air will flow longitudinally through the air flow chamber to an air exit. It will be appreciated that only part of the nozzle may have an open lower side. Alternately, all of the nozzle, from an air inlet end to the air outlet, may have an open lower side. It will be appreciated that various other design may be used.

Referring now to Figures 8-14, nozzle 412 comprises an upper nozzle wall 426. In the example shown, the upper nozzle wall 426 comprises a portion 419 of a wall 415 of the cyclone unit. Nozzle 412 further preferably comprises a depending wall 428 extending downwardly from the upper nozzle wall 426. The depending wall 428 is generally U-shaped. The height of the depending wall may vary. The open end of the U-shape defines an open side wall 430 of the nozzle 414, and forms the dirty air inlet 418 of the portable cleaning apparatus 400. In the example shown, the open side wall 430 is provided at the front of the nozzle 414 and forms a portion of a flow passage that

is in communication with the opening 438. When in use as a hand vacuum, optional wheels 435 are in contact with a surface and the open side wall 430 sits above and is adjacent a hard surface to be cleaned. It will be appreciated that depending wall 428 may be positioned only rearward of opening 438. Alternately, 5 or in addition, depending wall 428 may be provided adjacent the lateral sides of opening 438. The depending walls may be discrete walls or they may be joined together as exemplified. The walls may be continuous or discontinuous.

In the example shown, the lower end 432 of the depending wall 428 defines an open lower end 434 of the nozzle 414. The open lower end 434 10 extends to the front 408 of the hand vacuum 400, and merges with the open side 430. In use, the open lower end 434 faces a surface to be cleaned. In the example shown, a plurality of wheels 435 are mounted to the depending wall 428, and extend below the lower end 432 of the depending wall 428. Accordingly, when in use as a hand vacuum, when wheels 435 are in contact 15 with a surface, the lower end 432 of the depending wall 428 is spaced from a surface to be cleaned, and the space between the lower end of the depending wall 428 and the surface to be cleaned form a secondary dirty air inlet to the portable cleaning apparatus 400 when used as a hand vacuum.

The upper nozzle wall 426, depending wall 428, and open lower 20 end 434 of the nozzle 412 define an airflow chamber 436 of the nozzle. An opening 438 is preferably provided in the upper nozzle wall 426, and is in communication with the airflow chamber 436. When in use as a hand vacuum, the wheels 435 are in contact with a surface, the opening 438 faces a surface to be cleaned, air enters the dirty air inlet 418, passes horizontally through the 25 airflow chamber 436, and passes into the opening 438. Opening 438 is in communication with a cyclone inlet passage 439, which is in communication with a cyclone air inlet 440 of cyclone 422. In some embodiments, opening 438 need not be in upper wall 426.

Nozzle 412 and attachment member 120 are configured such that attachment member 120 may form part of the air flow conduit to opening 438 when attachment member 120 is mounted to hand vacuum 400. For example, when the portable cleaning apparatus 400 is used in combination with the backbone 200 and the surface cleaning head 300, the opening 438 in the nozzle 412 is in sealed, fluid communication with the air outlet 127 of the attachment member 120. By way of this connection, a continuous fluid pathway is established between the dirty air input 310 of the surface cleaning head 300 and the opening 438.

It will be appreciated that attachment member 120 may be removably mounted to nozzle 412 by any engagement means known in the connecting arts. Further, attachment member may be of any configuration. Attachment member may be part of, or may be connected to, an accessory cleaning tool by any means, such as a flexible hose. The flexible hose may be hose 110 if hose 110 is removably mounted to the floor cleaning unit.

As exemplified, attachment member 120 is removably engaged with nozzle 412 by the engagement of pivoting arms in slots provided on nozzle 412. Accordingly, for example, nozzle 412 may also include a slot 490 defining a recess in the depending wall 428 that is adjacent the upper nozzle wall 426. The slot 490 preferably extends continuously along the U-shaped portion of the nozzle depending wall 428 and may be bounded at each end by corners 492. The attachment member 120 includes two arms 150 each having a shoulder 154 and being pivotally connected to the coupling plate 123 using pins 156 (alternatively, the arms 150 could be resilient). Figure 14 is a partially exploded view of the attachment member 120, illustrating one example of the rotational connection between the coupling 142 and the collar 140. In the example shown, the coupling 142 comprises a cylindrical body wall that passes through an opening in the collar 140. Once the coupling 142 had been inserted into the collar 140 it is retained using fastening clip 143. The combination of the coupling

plate 123 and the arms 150 may also be described as connecting portion, mounting portion or nozzle mounting portion of the attachment member 120.

In order to assemble the mount on nozzle 412, coupling plate 123 may be slid into the open end of airflow chamber 436. Accordingly, when the  
5 coupling plate 123 of the attachment portion 120 is slid into the airflow chamber 436, the arms 150 are pressed together by the nozzle 412 walls until the point when arms 150 are aligned with slot 490 (i.e. when the shoulders 154 are advanced past the corners 492). When the arms 150 are aligned with the slot 490, the attachment member 120 is "clicked-in" or locked in place when the arms  
10 150 spread apart and the shoulders 154 of the arms 150 become lodged behind the corners 492 of slot 490. The arms 150 may be manually separated or the attachment member may include a biasing means (not shown) that biases the arms 150 apart. With the arms 150 in the spread configuration the attachment member 120 cannot be slidingly removed from the nozzle 412. When a user  
15 wishes to detach the attachment means 120 from the nozzle 412 the user may squeeze upstanding tabs 152 together thereby allowing the shoulders 154 to slide past the corners 492. The mount may alternately be inserted by squeezing upstanding tabs 152 together so that plate 123 may be inserted in chamber 436.

When the hand vacuum 400 is coupled to the attachment member  
20 120 the airflow chamber 436 may receive, and be partially filled with the coupling plate 123 of the attachment portion 120. The coupling plate 123 is preferably shaped to be slidingly received within the airflow chamber 436.

Insertion of the coupling plate 123 into the airflow chamber 436 serves to register the air outlet 127 with the nozzle opening 438. As shown, the  
25 air outlet 127 has a width  $W_0$  and a length  $L_0$  that are preferably the same as the width  $W_0$  and a length  $L_0$  of the opening 438. A sealing gasket 123 may provided at the juncture of the openings.



The attachment member 120 and the nozzle 412 may also include a plurality of magnets 158 that magnetically couple the attachment member 120 to the nozzle 412 to improve the connection between them and ensure that air outlet 127 is properly registered with opening 438. It will be appreciated that, in  
5 an alternate embodiment, only magnets maybe used. Other mounting means may be used. For example, a plurality of latches may be used or air outlet 127 may extend into opening 438.

Optionally, when the attachment member 120 is coupled to the portable cleaning apparatus 400, the upstream end of the air conduit 110 (for  
10 example hose 124) can be detached from the surface cleaning head 300 and the combination of the attachment member 120 and the flexible hose 124 (decoupled from the surface cleaning head 300) can serve as an auxiliary or accessory cleaning tool. The free end of the hose 124 may be maneuvered by the user to clean objects and surfaces that cannot be cleaned using the surface cleaning  
15 head 300. In some examples, the upstream end of the flexible hose 124 may be connected to the auxiliary cleaning tool 112. Alternatively, the flexible hose 124 may be removed from the attachment member 120 and the auxiliary cleaning tool 112 may be mounted directly to the air inlet 126 of the attachment member 120. It will be appreciated that tool 112 may have a plate 123 and arms 150 provided  
20 at the coupling end thereof.

Optionally, the attachment member 120 may be removed from the nozzle 412 and the auxiliary cleaning tool 112 may be fitted directly to the nozzle 412, without the use of a flexible hose 124 or other type intermediate air conduit. In addition to the auxiliary or accessory cleaning tool 112, the nozzle 412 may be  
25 directly connected to any one of a number of cleaning tools that have been provided with the an appropriate attachment member, including wands, brushes, crevasse tools and other hoses.

Clean air outlet 420 is provided downstream of the cyclone unit 414, suction motor and optional post-motor filter contained optionally within the

cleaner body 460. Clean air outlet 420 may comprise a plurality of apertures formed in housing 461. The cleaner body 460 may also contain one or more of a separation plate, a dirt chamber a pre-motor filter and a plurality of connecting fluid conduits or passageways.

5                   In the example shown, cleaner body 460 is removably mounted to  
head portion 416. For example, cleaner body 460 may be entirely removable  
from head portion 416, or pivotably mounted to head portion 416. Accordingly,  
cleaner body 460 and head portion 416 may be separated in order to provide  
access to the interior of cleaner body 460 or head portion 416. This may allow a  
10 pre-motor filter to be cleaned, changed, or serviced, or the motor to be cleaned,  
changed or serviced. Alternately, head portion 416 may be cleaned or serviced.  
For example, any dirt stuck in the enclosed passages portable cleaning  
apparatus 400 may be removed. Alternately, a replacement cleaner body 460 or  
head portion 416 may be provided, and may be mounted to an existing head  
15 portion 416 or cleaner body 460, respectively.

One or more additional rear wheels 480 may be mounted to housing 461 at lower portion 406, and may be used in conjunction with wheels 435 when the portable cleaning apparatus 400 is used as a hand vacuum. When the portable cleaning apparatus 400 is attached to the backbone 200 the  
20 additional wheel 480 preferably engages with the mount bracket 224 and partially supports the portable cleaning apparatus 400 on the handle 210 as described above.

Preferably, as exemplified, the portion of the attachment member 120 that is used to mount the attachment member to the backbone may also  
25 comprise part of the air flow path from surface cleaning head 300 to hand vacuum cleaner 400. For example, the attachment member 120 may include a mounting portion or collar 140 that includes a coupling 142 and defines a channel 144. The collar 140 is connected to the airflow passageway 128, or alternatively may be connected directly to the air conduit 110. Optionally, the coupling 142 is

a rotatable coupling that allows the airflow passageway 128 to rotate relative to the collar 140. The upstream end of the airflow passageway 128 defines the air inlet 126. In operation, the air inlet 126 is preferably coupled to the airflow conduit 110 that extends to the surface cleaning head 300 (the flexible air hose 124 in the example shown). The air inlet 126 is releasably coupled to the flexible air hose by clips 160. Downstream of the coupling 142 an enclosed airflow passage connects the airflow passage 128 to the air outlet 127. It will be appreciated that the attachment member 120 need not comprise part of the air flow passage. For example, coupling 142 may be located out of the flow path defined by passageway 128. Alternately, plate 123 need not have opening 127. Accordingly, attachment member may have a first part that is secured to hand vacuum 400 and a second distinct part that completes that air flow passage from surface cleaning head 300 to opening 438.

The airflow passageway 128 may be flexible or rigid and may be generally straight or may have a curved shape, as shown. Preferably, the curved airflow passageway 128 subtends fewer than 45 degrees.

It will be appreciated that the reconfigurable construction may be used by itself or with any other feature disclosed herein. In addition, any of the features disclosed herein may be used by themselves, or with any other feature, and may include the reconfigurable construction.

What has been described above has been intended to be illustrative of the invention and non-limiting and it will be understood by persons skilled in the art that other variants and modifications may be made without departing from the scope of the invention as defined in the claims appended hereto.

## CLAIMS:

1. A surface cleaning apparatus comprising:
  - (a) a floor cleaning unit comprising a surface cleaning head having a dirty air inlet, a cleaning head air outlet and an upright section comprising a handle  
5 drivingly connected to the surface cleaning head;
  - (b) a portable surface cleaning apparatus removably mounted to the handle and having an air inlet, an air outlet and a suction motor; and,
  - (c) an air flow path extending through the surface cleaning apparatus and including a flexible air flow conduit forming at least part of an air flow path  
10 from the surface cleaning head to the portable surface cleaning apparatus, wherein the surface cleaning apparatus has at least two operating modes comprising
    - (i) a first upright operating mode wherein the surface cleaning  
15 apparatus is operable with the portable surface cleaning apparatus mounted to the handle and forming part of the air flow path; and,
    - (ii) a second operating mode wherein the portable surface cleaning apparatus is carried by a user and operable when removed from the handle in the absence of reconfiguring the flexible air flow conduit.
- 20 2. The surface cleaning apparatus of claim 1 wherein the portable surface cleaning apparatus is useable by itself without any attachments.
3. The surface cleaning apparatus of any of claims 1-2 wherein the portable surface cleaning apparatus comprises a nozzle.  
25
4. The surface cleaning apparatus of any of claims 1-3 wherein the flexible air flow conduit comprises a portable portion that is removably mounted to the surface cleaning apparatus and the surface cleaning apparatus has at least one additional operating mode wherein the portable surface cleaning

apparatus is carried by a user and operable when removed from the handle together with the portable portion of the flexible air flow conduit.

- 5 5. The surface cleaning apparatus of claim 4 wherein the portable portion has  
5 an end distal to the portable surface cleaning apparatus and the distal end is adapted to receive a cleaning tool.
- 10 6. The surface cleaning apparatus of any of claims 1-5 wherein the flexible air  
10 flow conduit has an end proximate the portable surface cleaning apparatus and the proximate end is removably mounted in air flow communication with the portable surface cleaning apparatus and the surface cleaning apparatus has at least one additional operating mode wherein the portable surface cleaning apparatus is operable when removed from the handle and from the flexible air flow conduit.  
15
- 15 7. The surface cleaning apparatus of any of claims 1-6 wherein the portable  
15 surface cleaning apparatus comprises a hand vacuum cleaner.
- 20 8. The surface cleaning apparatus of any of claims 1-7 further comprising an  
20 attachment member that is removably attached to the portable surface cleaning apparatus and the flexible air flow conduit is mounted to the attachment member.
- 25 9. The surface cleaning apparatus of claim 8 wherein the attachment member  
25 forms part of airflow path from the surface cleaning head to the portable surface cleaning apparatus.
10. The surface cleaning apparatus of any of claims 8-9 wherein the flexible air flow conduit is removably mounted to the attachment member.

11. The surface cleaning apparatus of any of claims 8-10 wherein the handle comprises a portable surface cleaning apparatus mount that removably receives the attachment member.
- 5
12. The surface cleaning apparatus of any of claims 1-11 wherein the portable surface cleaning apparatus is mounted to the upright section at a position spaced from the surface cleaning head.
- 10
13. The surface cleaning apparatus of any of claims 1-12 wherein portable surface cleaning apparatus further comprises a nozzle that is selectively connectable in air flow communication with an accessory cleaning tool and the air flow path from the surface cleaning head to the portable surface cleaning apparatus.
- 15
14. The surface cleaning apparatus of any of claims 1-13 wherein the portable surface cleaning apparatus comprises a hand vacuum cleaner having a nozzle that is configured for directly cleaning a surface.
- 20
15. The surface cleaning apparatus of any of claims 1-14 wherein the upright section has an absence of a housing defining a recess for receiving the portable surface cleaning apparatus.
- 25
16. The surface cleaning apparatus of any of claims 1-15 wherein the upright section comprises one or more thin support members.
17. The surface cleaning apparatus of any of claims 1-16 wherein the upright section consists essentially of one or more thin support members.
- 30

Application number/numéro de demande: 2658381

Figures: 15-16-17-18-19-20

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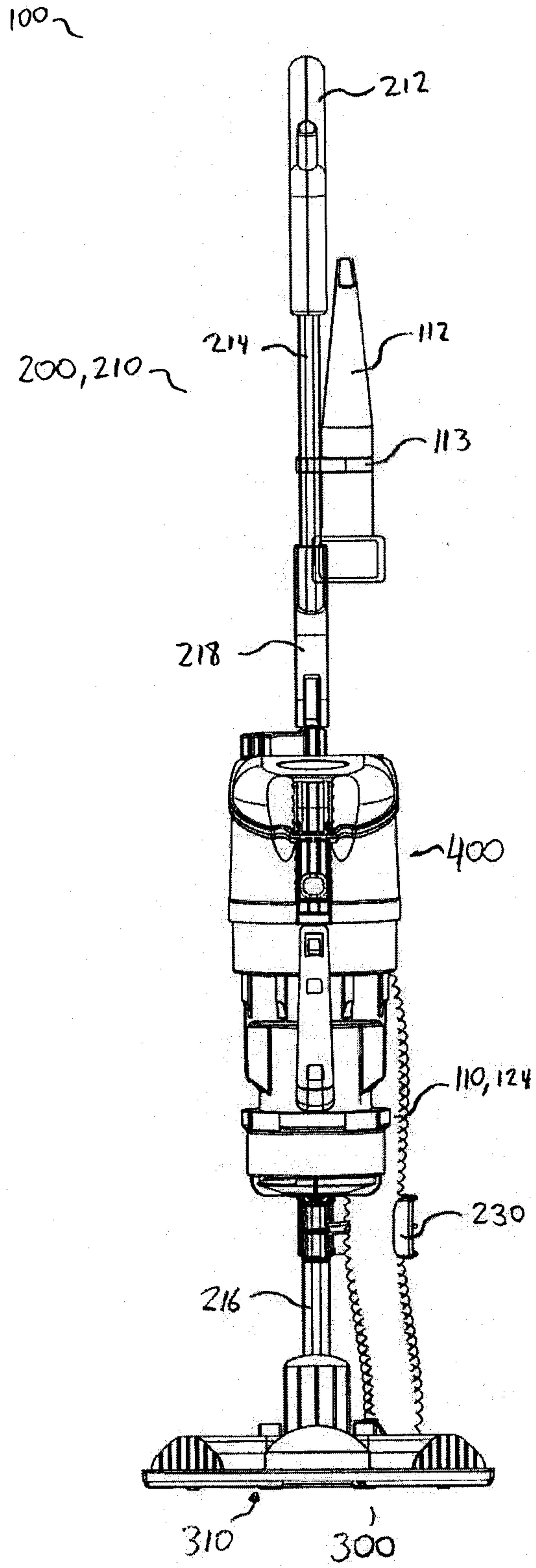


FIG. 1



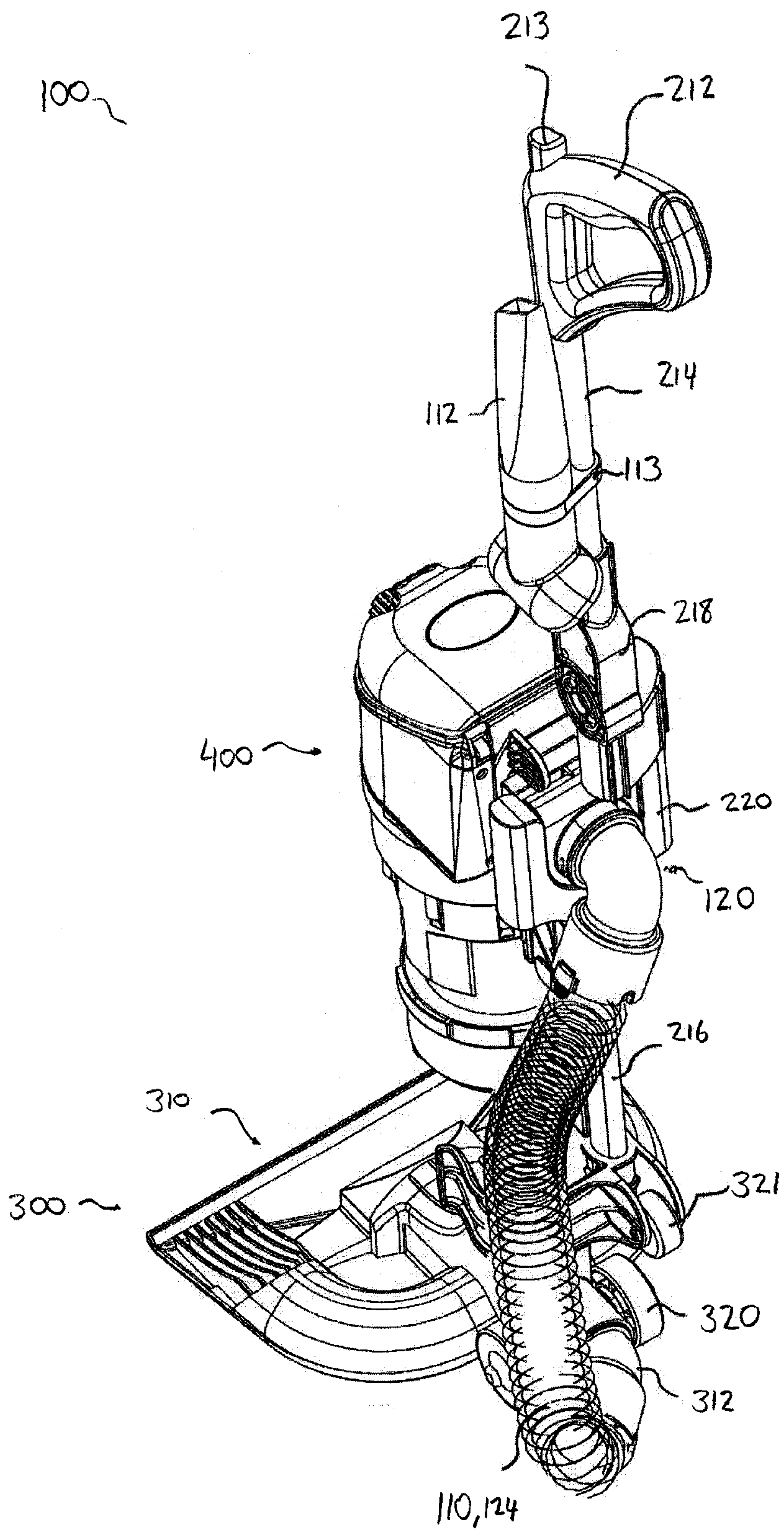


FIG. 2

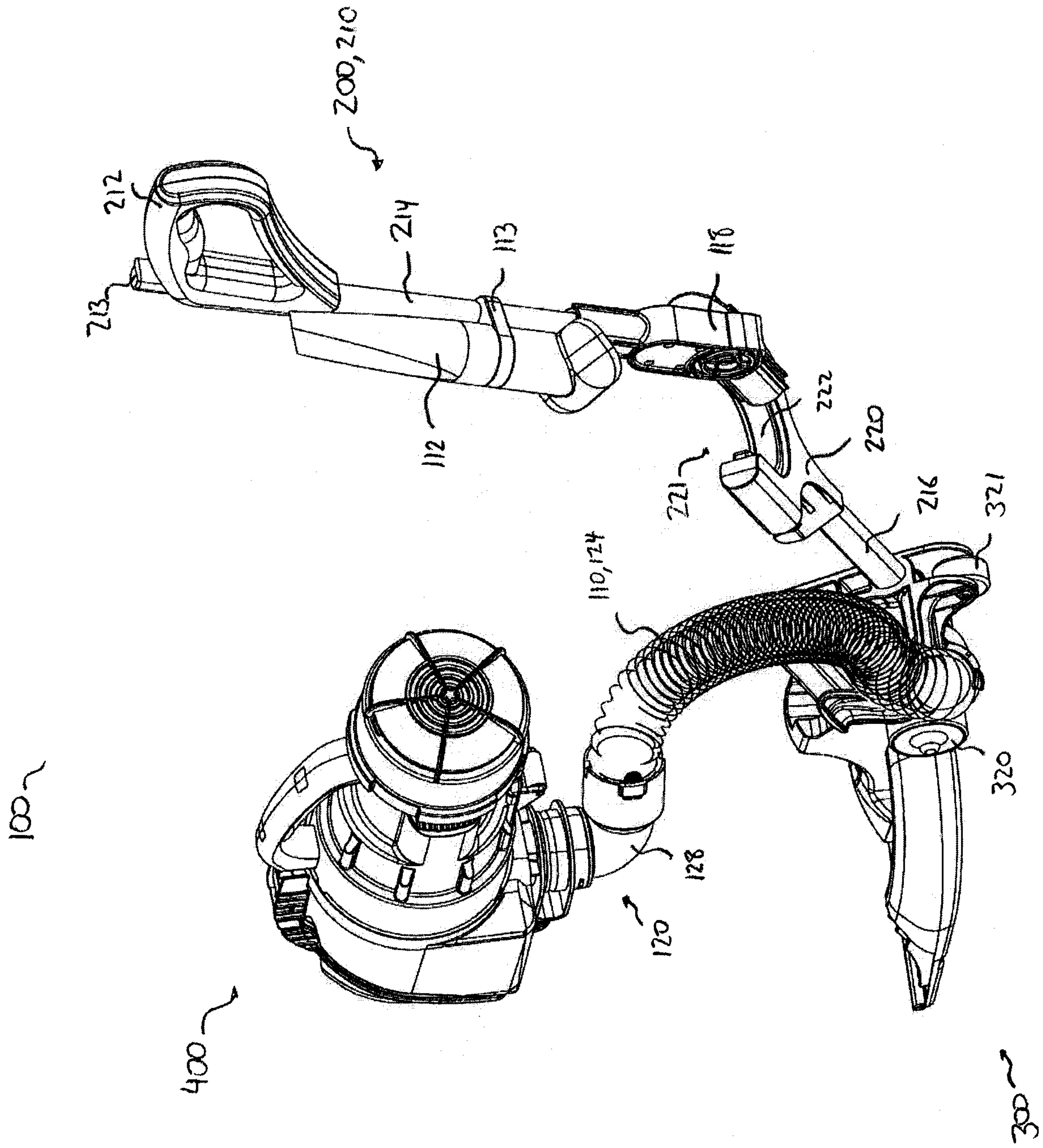


FIG. 3a

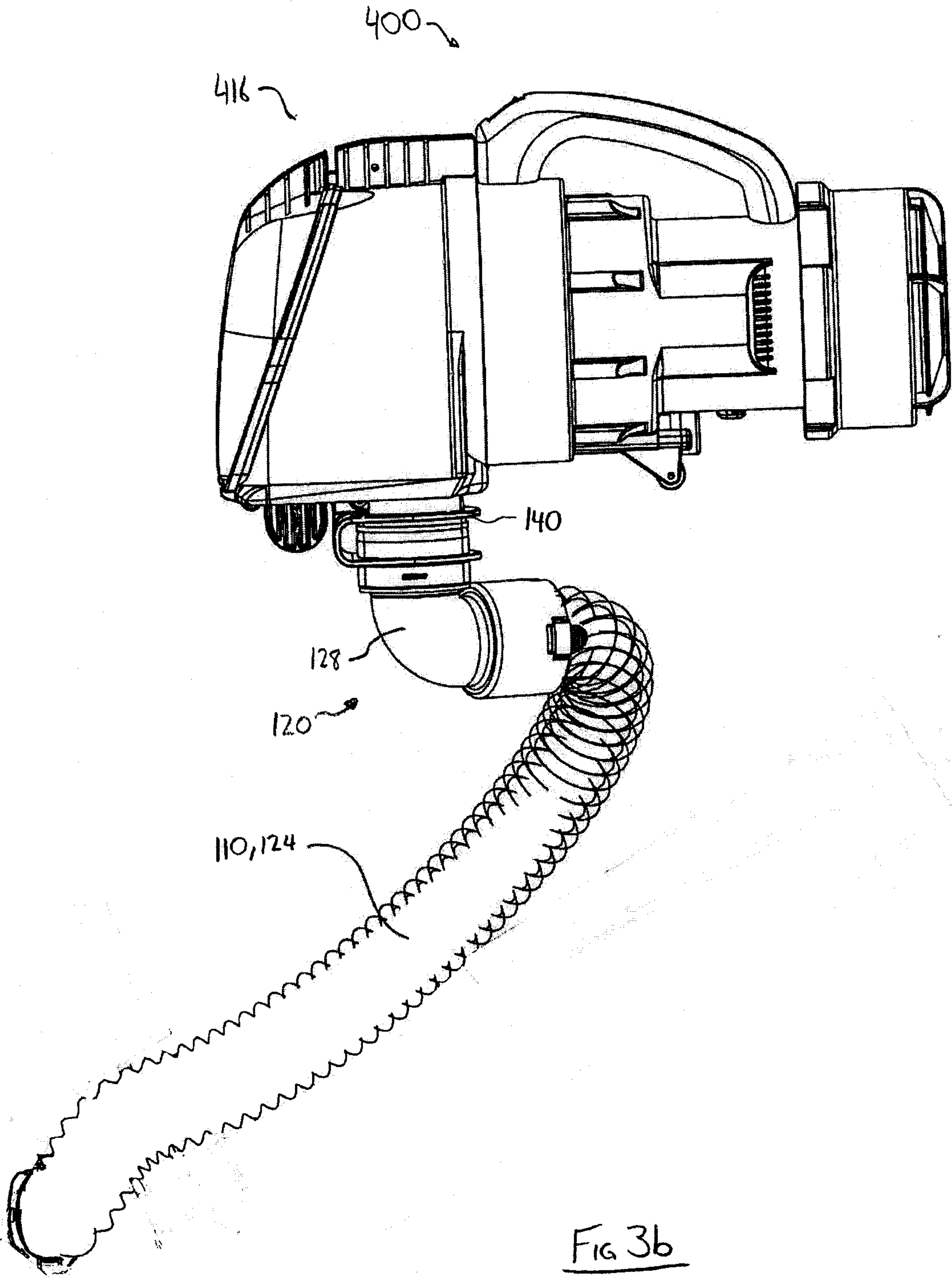


FIG 3b

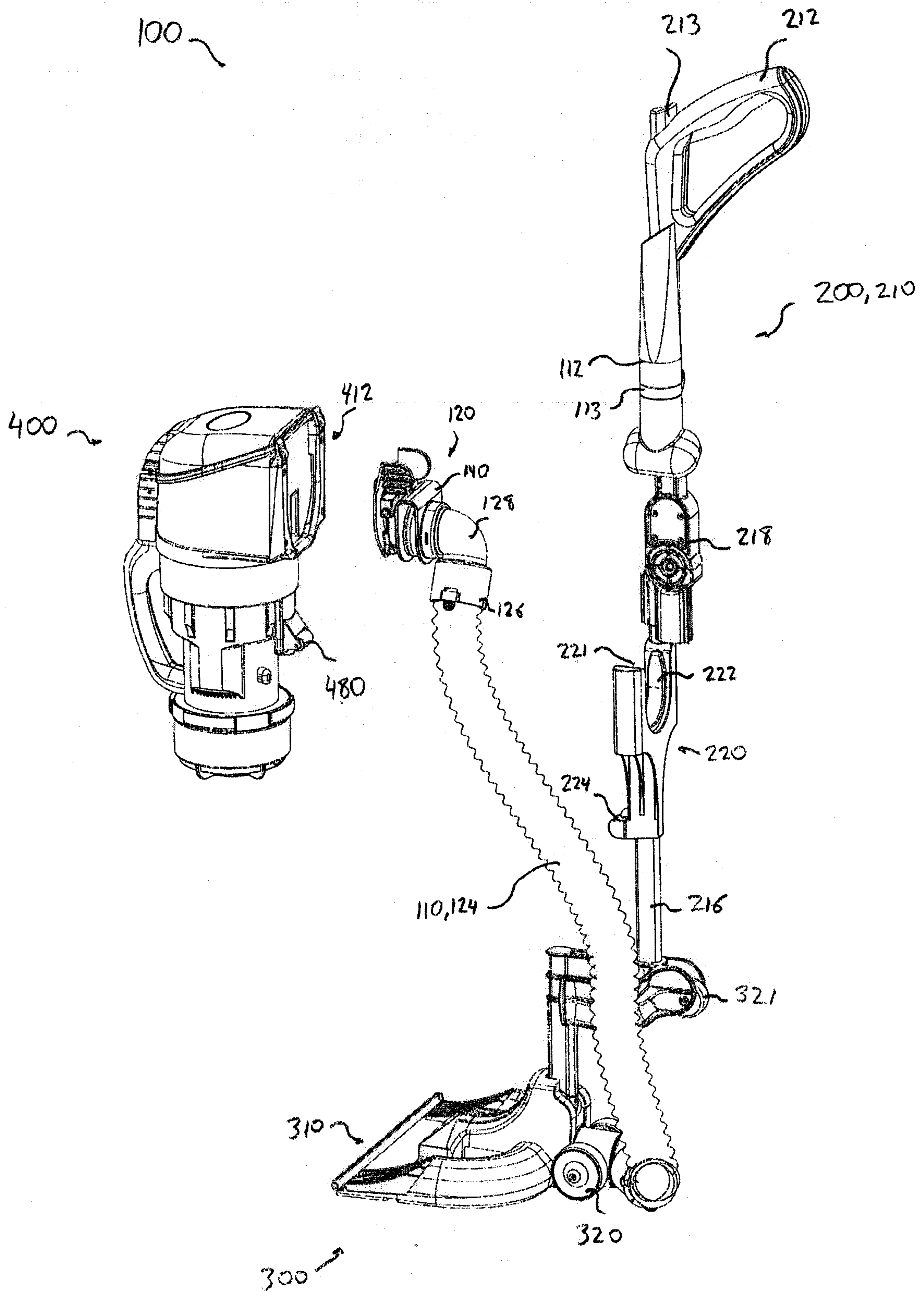


FIG. 4

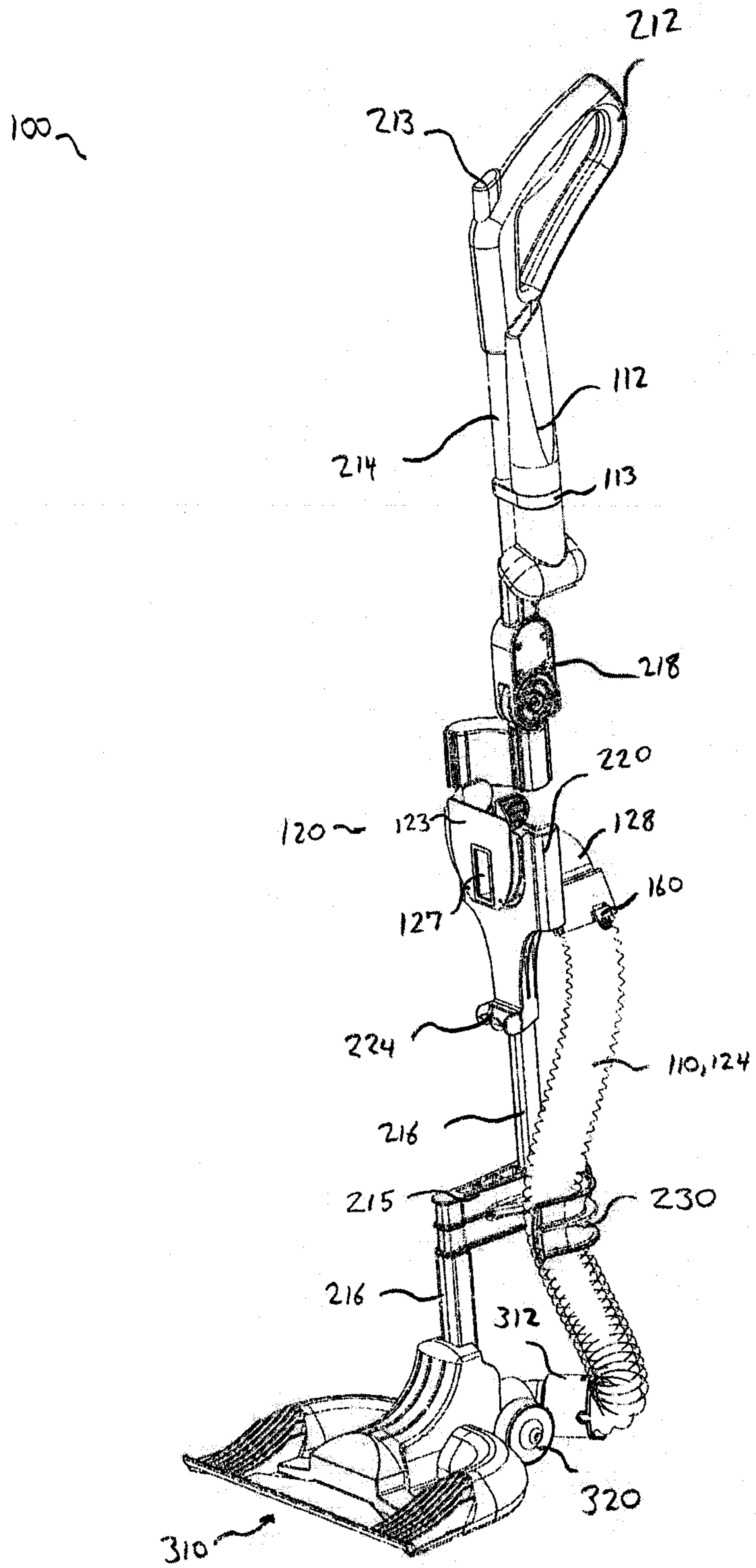


FIG. 5

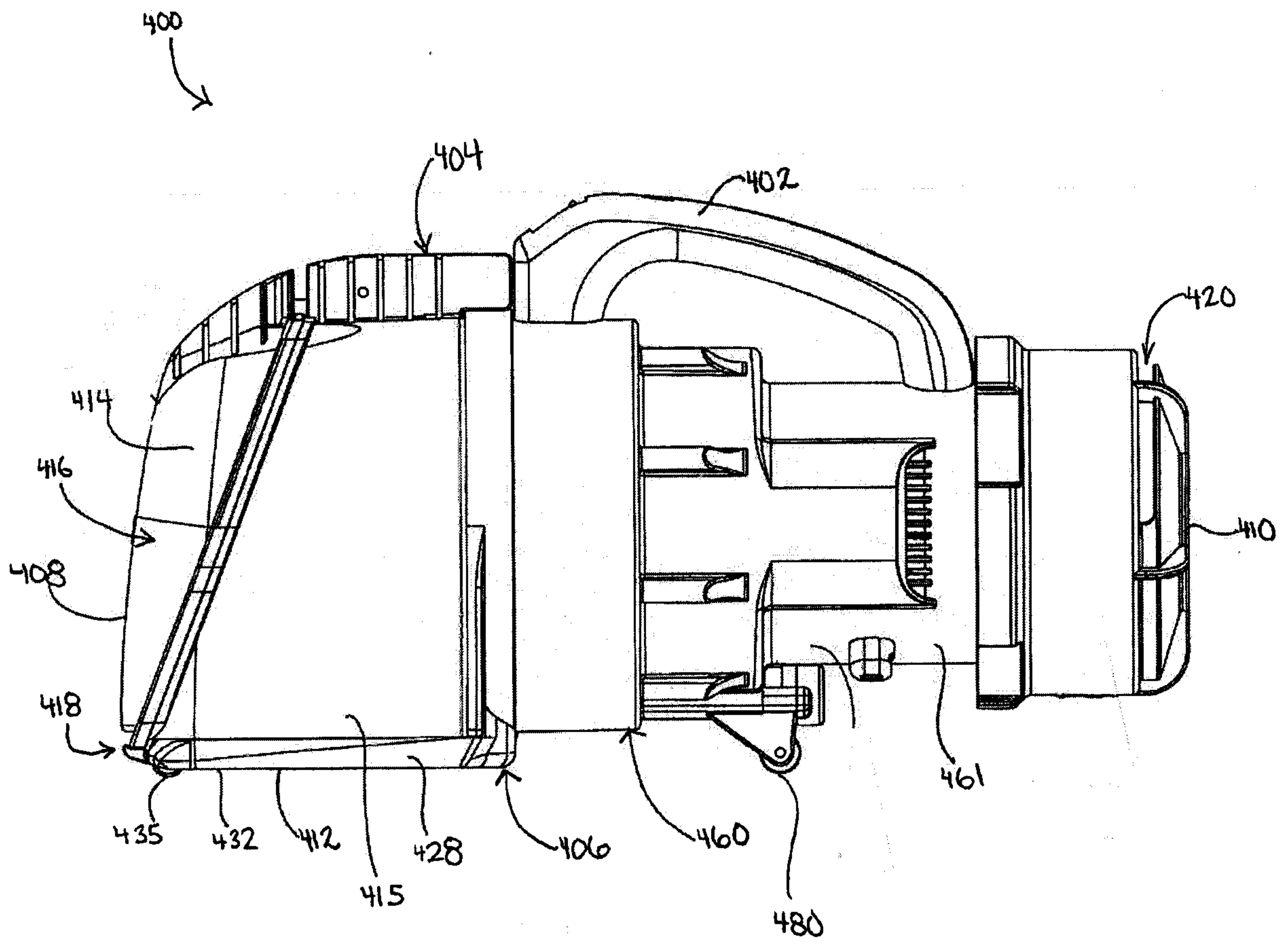


FIG. 6

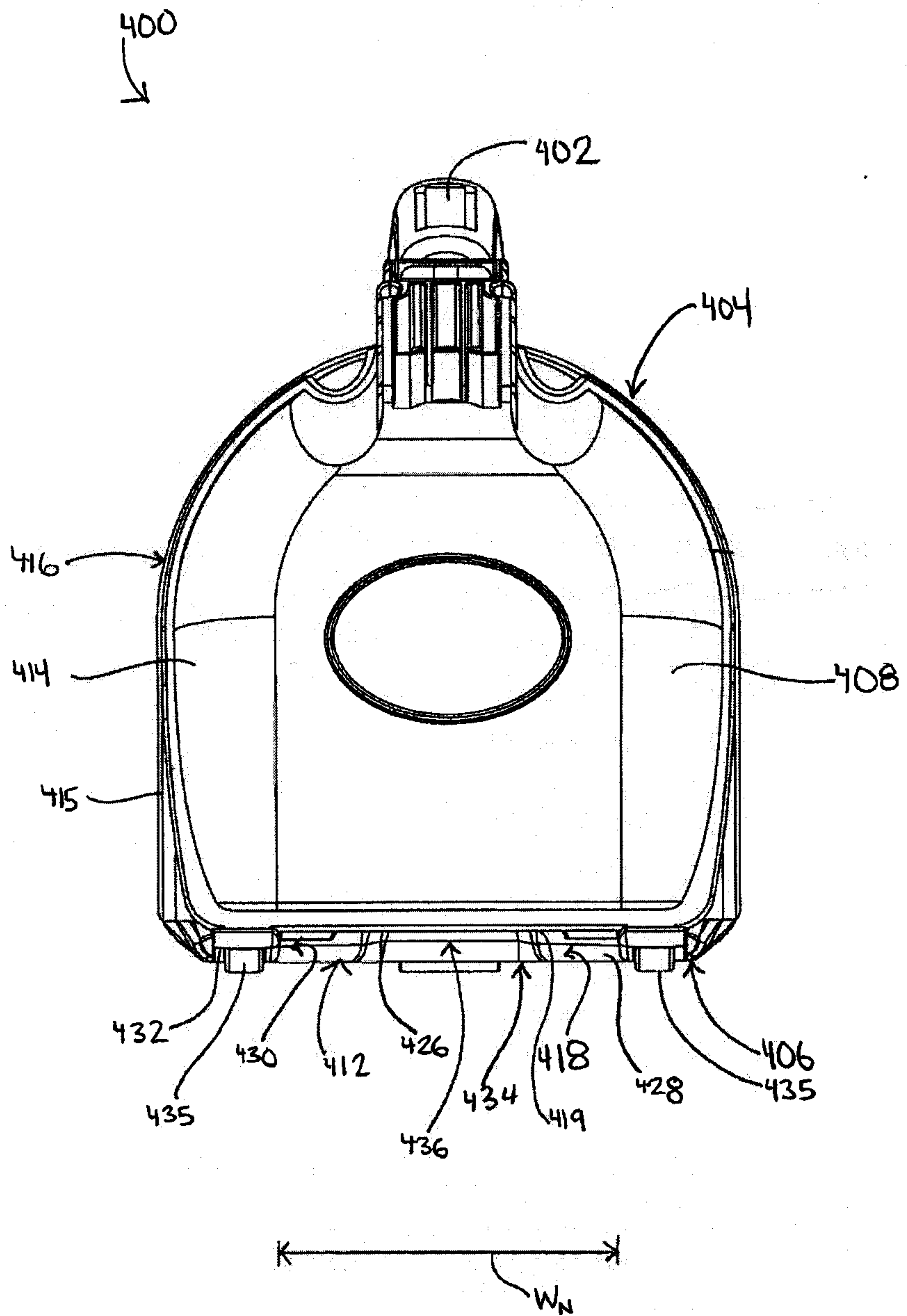


FIG. 7

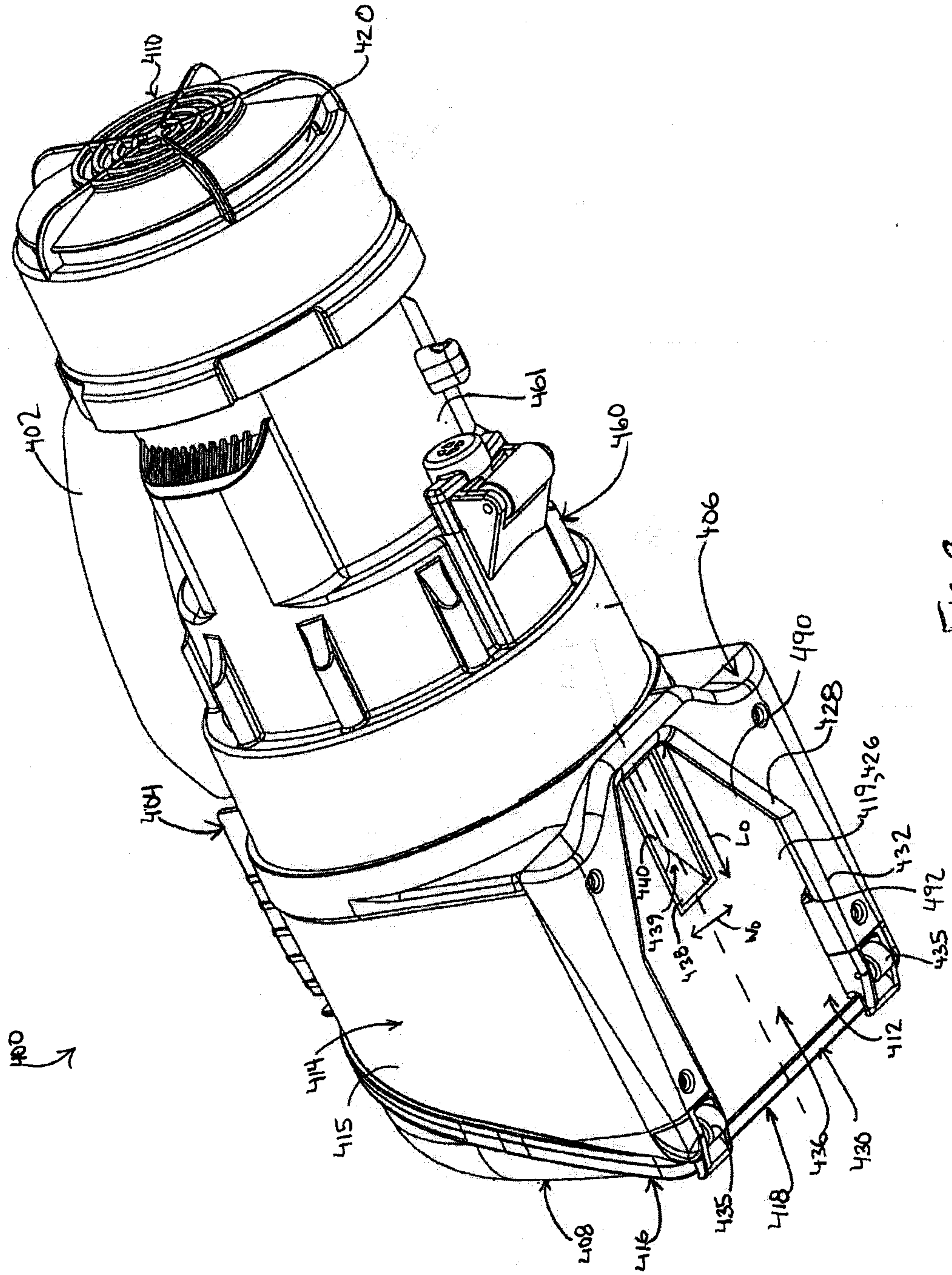


FIG. 8



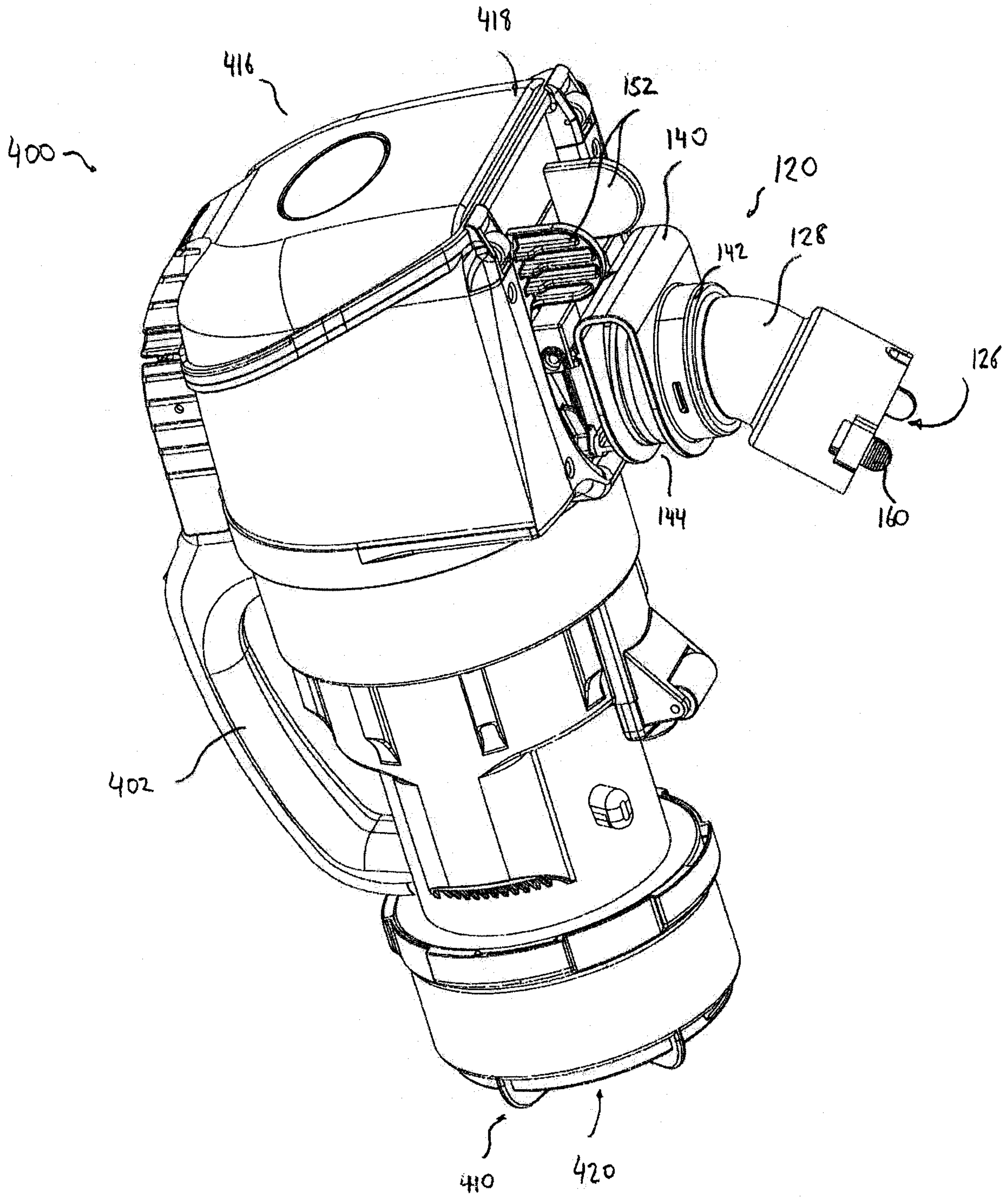


FIG. 9

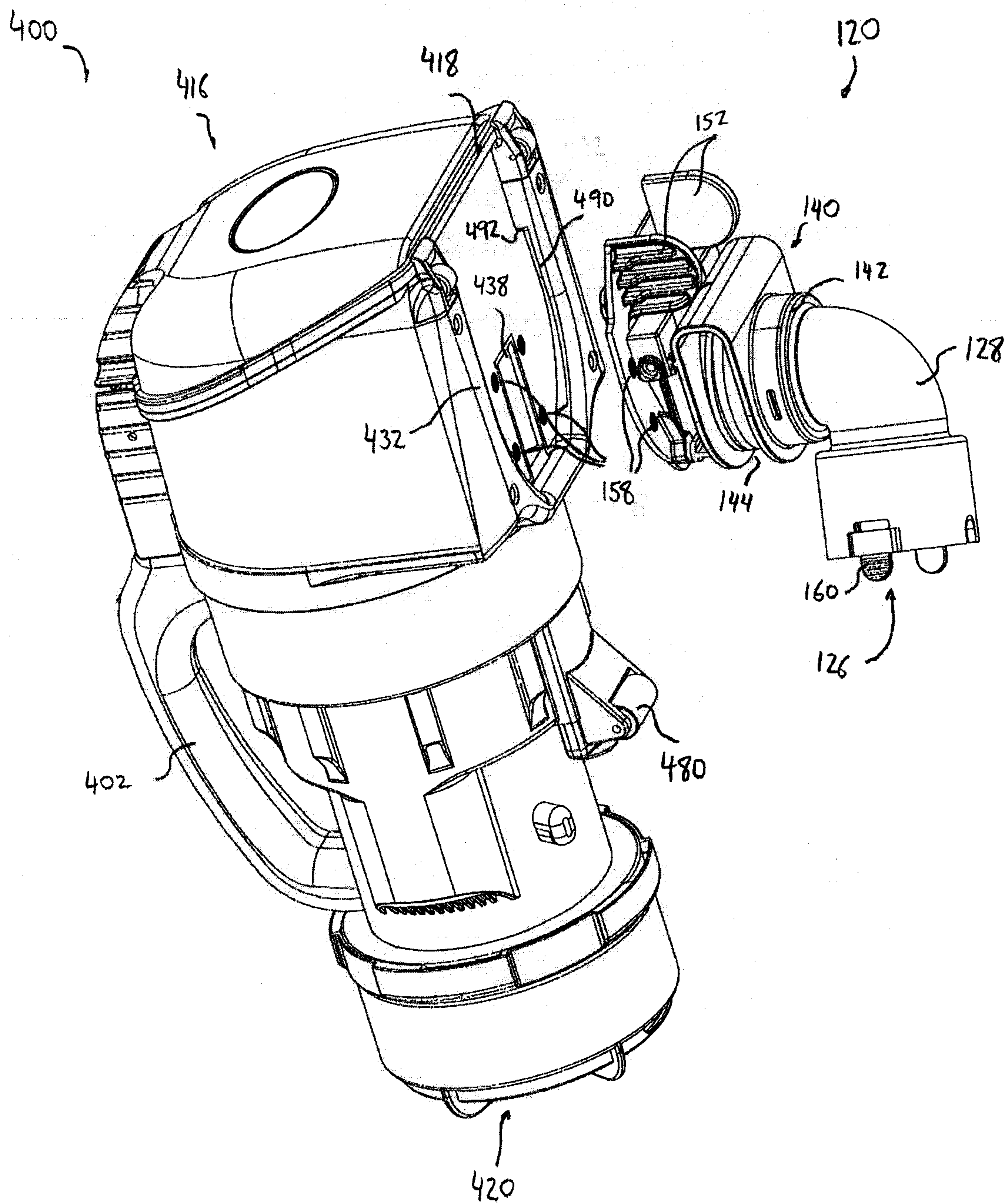


FIG. 10

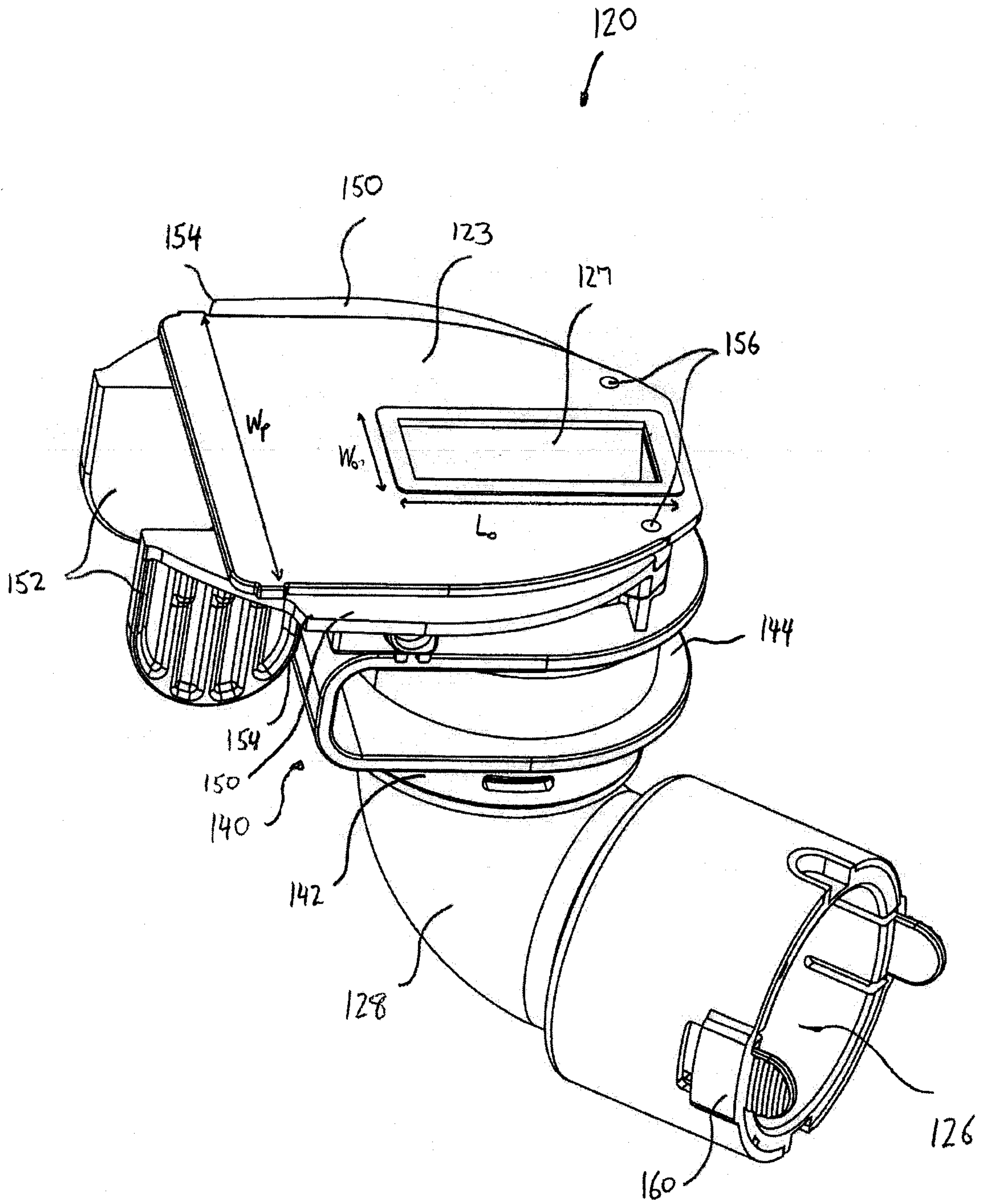


FIG. 11

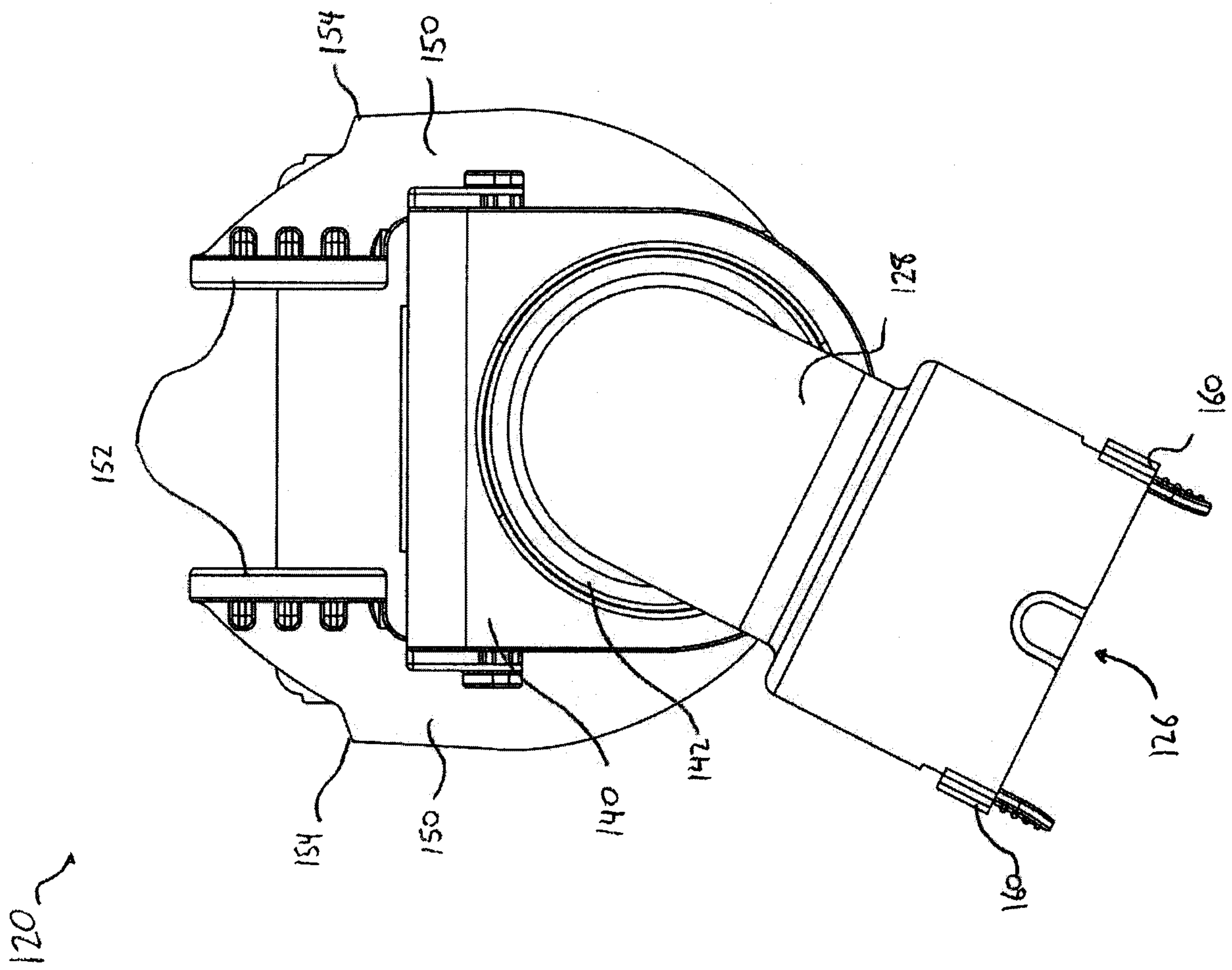


FIG. 12

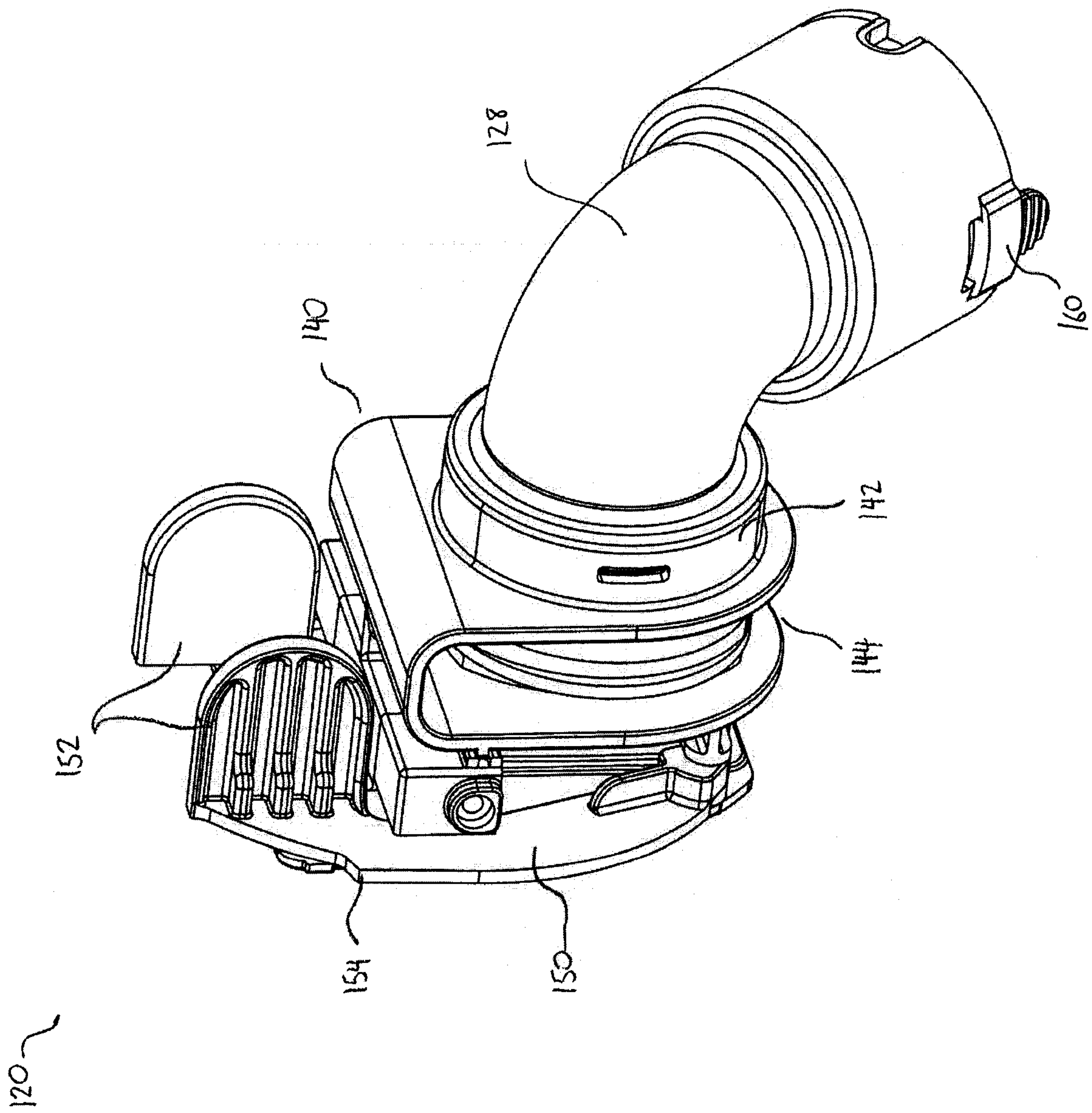


FIG. 13

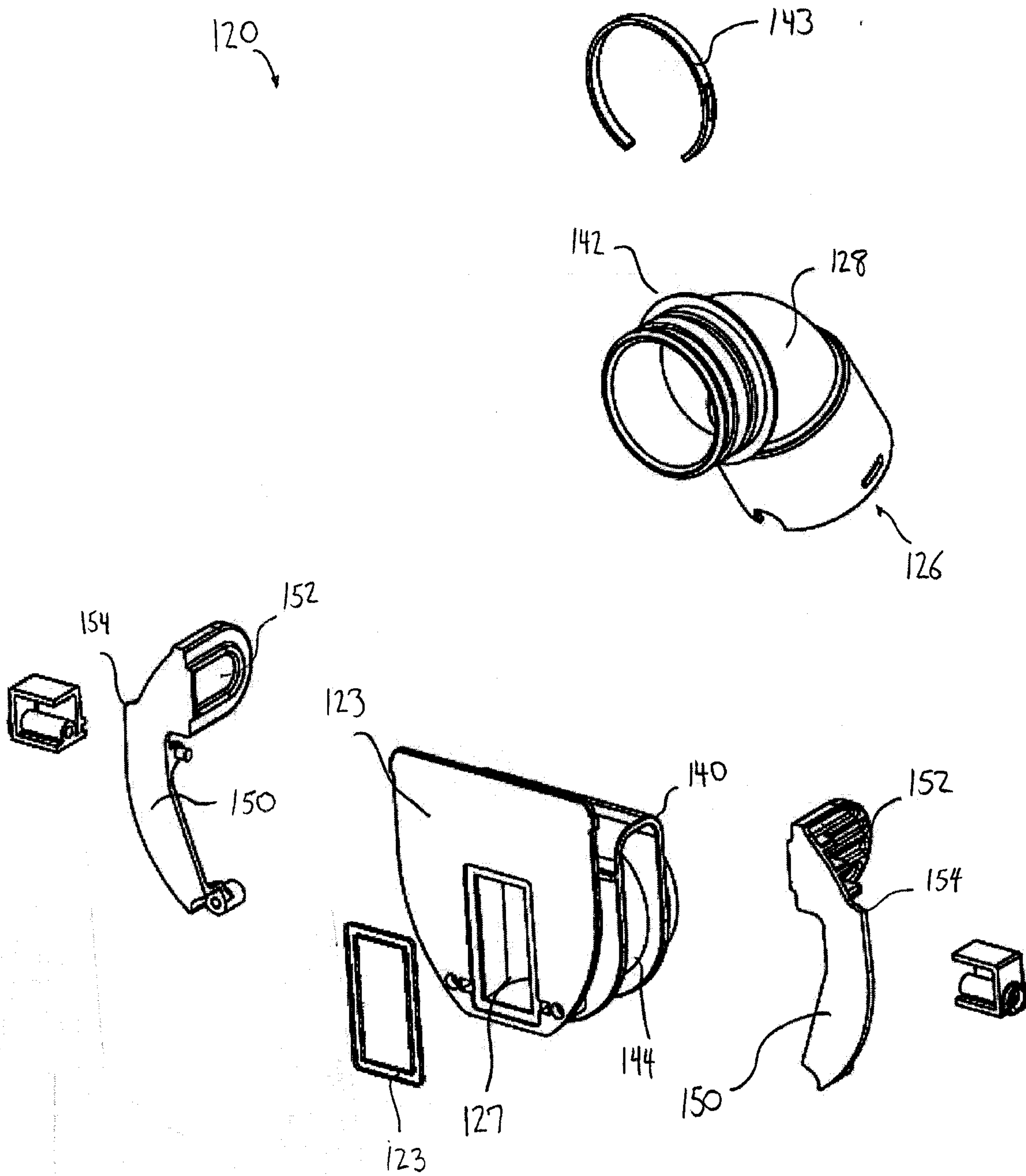


FIG. 14

100

