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(54) Title: A PIPE CONNECTOR FOR A SURFACE TREATING APPLIANCE

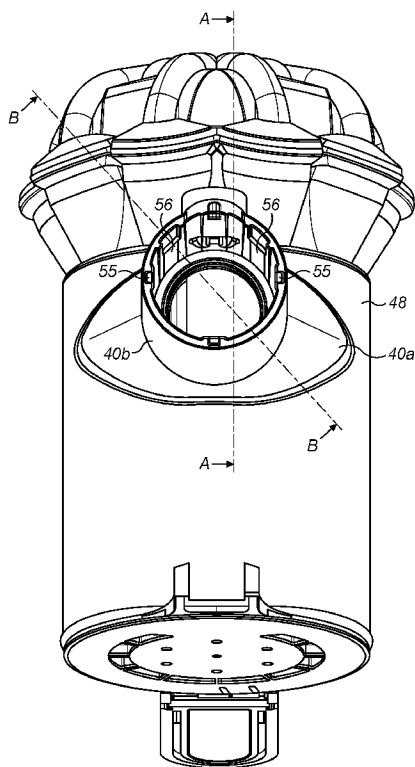


FIG. 5

(57) Abstract: A fluid carrying pipe (40), particularly in a surface treating appliance (25) for example a vacuum cleaner. The pipe (40) may be embodied as a fluid inlet nozzle (40) that is attachable to an outlet pipe of an accessory tool (32, 34), such as a cleaner head (34) or a wand (32). The pipe (40) includes a connecting end that is attachable to a second pipe, the connecting end of the pipe (40) having a pipe wall defining a fluid passage and electrical connection means (56) for establishing an electrical connection with the second pipe. The electrical connection means (56) comprises a conductive terminal (56) received by the pipe wall so as to provide an exposed contact portion (56a) of the terminal (56) on a surface of the pipe wall.



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SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, — *with international search report (Art. 21(3))*
GW, KM, ML, MR, NE, SN, TD, TG).

A PIPE CONNECTOR FOR A SURFACE TREATING APPLIANCE

5 Technical field

The invention relates to pipe connector for a surface treating appliance and particularly, although not exclusively, to a vacuum cleaner having an air inlet pipe attachable to an air outlet of a floor tool or other suitable accessory.

10

Background to the invention

There are several different types of vacuum cleaners available on the market that cater to the preferences of different users but which are also specialized for carrying out certain tasks. Some examples are upright cleaners, cylinder cleaners, handheld cleaners
15 and the so-called 'stick' or 'stick-vac' cleaners.

Vacuum cleaners generally include a main body having a motor and fan unit for generating a partial vacuum in order to draw a dirty airflow into a separating apparatus
20 of the machine. Some machines use an air-permeable bag as the separating apparatus, whereas others use a so-called 'bagless system' which may incorporate a cyclonic separator.

In either system, it is common for vacuum cleaners to have a nozzle to which a user
25 may connect a range of different floor tools selected appropriately to perform a suitable cleaning task, and one such vacuum cleaner and tool combination 1 is shown in Figure 1. Here, a handheld vacuum cleaner 2 includes a removable motorized tool 3. The vacuum cleaner 2 includes a handheld main body 4 broadly consisting of an upright handle or grip 5 having a battery pack 6 adjacent its lower end and a motor and fan unit
30 (not shown) located in a housing 7 at the upper end of the handle 5. The motor and fan

unit is operable by a trigger switch 8 on the handle 5 and generates an airflow through a cyclonic separator 9 unit that is removably connected to the main body 4.

The cyclonic separator unit 9 includes a cylindrical bin 10 oriented in an upright configuration relative to the handle 5 and includes an air inlet nozzle 11 extending forwardly from the bin 10. During operation of the motor and fan unit, air flows through the air inlet nozzle 11 and into the cyclonic separator unit 9 where dirt particles are stripped from the airflow and, from there, air flows into the main body 4 and is exhausted through a set of vent slots 12 at a rear end 13 of the main body 4.

Referring also to Figure 2 and 3, the tool is motorized and includes a cylindrical body 16 that is connectable to the air inlet nozzle 11 of the vacuum cleaner 3 by a neck 17. The cylindrical body 16 houses an elongate brush bar or 'agitator' (not shown) having a helical array of bristles that work to agitate dirt out of a floor surface, in use. The brush bar is driven by a motor unit 18 located to one side of the neck 17.

The neck 17 includes a tubular pipe 19 that terminates in a circular opening 20 and which is configured to mate with the air inlet nozzle 11 of the vacuum cleaner 3. Underneath the pipe 19 is a pair of electrical pins 21 that are mateable with a corresponding electrical connector block 22 housed in the air inlet nozzle 11. The front end of the air inlet nozzle 11 is shown in Figure 2 and it can be seen that the connector block 22 is located in a space between a tubular outer housing 23 of the nozzle 11 and a tubular inner pipe 24 of the nozzle 11. The connector block 22 is relatively large and this increases the overall size of the air inlet nozzle 11 and also increases manufacturing complexity. The electrical coupling between the connector block 22 and the pins 21 may also lack robustness since any damage to the pins means that they will not mate correctly with the connector block.

It is against this background that the invention has been devised.

Summary of the invention

Against this background, the invention resides in a surface treating appliance, in particular a vacuum cleaner, having a fluid inlet nozzle that is attachable to an outlet pipe of an accessory tool, such as a cleaner head or a wand. The fluid inlet nozzle
5 comprises a pipe having a pipe wall defining a fluid passage and electrical connection means for establishing an electrical connection with the outlet pipe of the accessory tool. The electrical connection means comprises a conductive terminal received by the pipe wall so as to provide an exposed contact portion of the terminal on a surface of the pipe wall.

10 Although the invention is embodied preferably in a surface treating appliance, the invention can also be embodied in any fluid carrying pipe in a surface treating appliance. Therefore, expressed more broadly, the invention can be considered to reside in a fluid carrying pipe for a surface treating appliance, the pipe having a connecting
15 end that is attachable to a second pipe, the connecting end of the pipe having a pipe wall defining a fluid passage and electrical connection means for establishing an electrical connection with the second pipe, the electrical connection means comprising a conductive terminal received by the pipe wall so as to provide an exposed contact portion of the terminal on a surface of the pipe wall.

20 The invention provides a pipe connector that has a particularly 'low profile' as compared to the known pipe connectors used in such appliances. The connector may be incorporated into the fluid carrying pipes of the appliance without disrupting the smooth flow of fluid therethrough and avoid the need for a relatively large connector block to
25 be provided external to the pipes.

The terminal may be a single electrical contact, for example as may be appropriate for carrying an electrical signal, or it may be a pair of electrical contacts that may be appropriate for transmitting power to a receiving pair of contacts.

The terminal may be received by or otherwise embedded in the pipe wall to provide an exposed contact portion of the terminal on an internal surface of the pipe wall and, to achieve this, the pipe wall may define one or more channel shaped to receive the terminal.

5

Preferably, the terminal is formed from a stamped sheet of conductive material, for instance a suitably conductive metal, and so is substantially planar. In this case, therefore, the terminal can be considered to be shaped like a blade. A cooperating contact can therefore slide easily along the terminal when the nozzle is engaged with its mating pipe on the accessory tool.

10

Preferably the exposed surface of the blade is recessed from the surrounding region of pipe wall which promotes easy engagement with a fluid outlet pipe of the accessory tool. In order to engage with the terminals on the fluid inlet nozzle the fluid outlet pipe is also provided with a conductive terminal for connection to the terminal on the air inlet nozzle. In the case where the terminal on the fluid inlet nozzle on the appliance is provided on the internal surface of the pipe wall, the terminal of the fluid outlet pipe is provided on the exterior surface thereof.

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In order to promote a positive engagement between the terminals of the fluid inlet nozzle on the appliance and the fluid outlet pipe on the accessory tool, the terminal of the fluid outlet pipe of the accessory tool may comprise a foot for engaging the terminal of the fluid inlet nozzle. The foot may be biased into engagement with the terminal on the fluid inlet pipe.

25

Brief description of the drawings

Reference has already been made to the following figures in which:

30

Figure 1 is a side view of a known vacuum cleaner having an electrically powered accessory tool attached to it;

Figure 2 is a stylised view of the air inlet nozzle of the vacuum cleaner in Figure 1; and

5 Figure 3 is a view from the rear of the accessory tool shown in Figure 1.

In order that the invention may be more readily understood, embodiments will now be described by way of example only with reference to the accompanying drawings, in which:

10

Figure 4a is a view of a surface treating appliance in the form of a 'stick-vac' type vacuum cleaner including a handheld vacuum cleaner, a rigid wand, and a floor tool;

15

Figure 4b is a an exploded view of the stick-vac cleaner in Figure 4a;

Figure 5 is a view from the front of the handheld vacuum cleaner shown in Figures 4a and 4b, showing its air inlet nozzle in closer detail;

20

Figure 6 is a section view through part of the handheld vacuum cleaner in Figure 5 along line A-A showing the air inlet nozzle in detail;

Figure 7 is an enlarged view of the region ringed with a circle in Figure 6;

25

Figure 8 is a section through the air inlet nozzle of the vacuum cleaner in Figure 5 along line B-B but which also shows the wand being attached to the air inlet nozzle; and

30

Figure 9 is a section through the coupling between the end of the wand remote from the vacuum cleaner and the air outlet pipe of the floor tool which shows the electrical connection between these two components.

Detailed description of the embodiments

With reference to Figure 4a, a surface treating appliance 25 in the form of a vacuum cleaner of the 'stick-vac' type includes a handheld vacuum cleaner 30, a wand 32 having a first end 33 removably attached to the vacuum cleaner 30 and a second end 35 that is removably attached to a floor tool 34. The floor tool 34 is 'motorised' in the sense that it includes a rotatable brush bar (not shown) that is driven by an electric motor (also not shown). In Figure 4b, the surface treating appliance is shown in an exploded format with the handheld vacuum cleaner 30, the wand 32 and the floor tool 34 separated from each other.

The vacuum cleaner 30 includes main body 36 to which is attached a separating apparatus 38 having an air inlet nozzle 40. Similarly to the vacuum cleaner shown in Figure 1, the main body 36 includes an upright handle or grip 42 to which is connected a power source such as a battery 43 at a lower end of the handle 42. A main body housing 44 is located at an upper end of the handle 42 and this houses a suction generator in the form of a motor and fan unit, which is not shown in Figures 4a and 4b.

The separating apparatus 38 is removably connected to a forward portion of the main body housing 44 and is suitably configured to separate dirt and dust from an airflow that is drawn into the separating apparatus 38 by the suction generator through the air inlet nozzle 40 that projects from a front facing part of the separating apparatus 38. The precise form of separating apparatus 38 is not central to the invention and could therefore comprise a bagged or bagless system. Preferably, however, and as shown in Figures 4a and 4b, the separating apparatus 38 is a cyclonic separator comprising a cyclone pack 46 received within a cylindrical bin 48. The cyclone pack 46 includes an upstream cyclone and a plurality of downstream cyclones as described in EP2043494, the contents of which are incorporated by reference.

The handle 42 incorporates a trigger-style switch 50 that operates the vacuum cleaner. Preferably, the trigger switch 50 has a momentary operation in that the vacuum cleaner is switched on when the trigger switch 50 is pulled and the vacuum cleaner switches off when the trigger switch 50 is released. However, as an alternative the trigger switch 50 could operate such that a first press turns the vacuum cleaner on and a second press turns the vacuum cleaner off.

The air inlet nozzle 40 provides a passage through which air enters the separating apparatus 36. To this end, the air inlet nozzle 40 extends generally perpendicularly from the cylindrical bin 48 of the separating apparatus 38. An inner portion 40a of the air inlet nozzle 40 is flared so as to mate suitably with the curved surface of the cylindrical bin 48, and the flared inner portion merges into a generally tubular outer portion 40b.

The outer portion 40b of the air inlet nozzle 40 includes a catch 52 by which means a first wand connector 54 can be secured to the air inlet nozzle 40. An electrical connecting arrangement is provided to link electrical power from the vacuum cleaner to the wand 32 and, thus, also to the floor tool 34. The electrical connecting arrangement comprises a first pair of electrical terminals 56 provided on the air inlet nozzle 40 and a second pair of electrical terminals provided 58 on the wand connector 54.

Referring to the air inlet nozzle 40 in more detail with reference to Figure 5 to 9, the first pair of electric terminals 56 includes first and second electrical conductors that extend from the flared, inner portion 40a of the air inlet nozzle 40 and along a length of the tubular, second portion 40b. In this embodiment, the section of the conductors 56 that extend along the second portion 40b are substantially planar and, as such, include an upper surface 57 that lies adjacent to the interior surface of the tubular portion 40b of the nozzle 40 and a lower surface 59 that is exposed to the interior of the tubular portion 40b, which is shown most clearly in Figure 8.

A pair of ribs 53 is provided one on either side of the external surface of the wand connector 54 that are engagable with a corresponding keyway 55 provided on the

internal surface of the inlet nozzle 40. The fitment between the ribs 53 and keyway 55 ensure that the wand connector aligns with the inlet nozzle 40 correctly and securely.

At this point it should be noted that the first pair of terminals 56 is integrated into the tubular portion 40b of the air inlet nozzle 40 so as to provide a much lower profile of connector as opposed to the connector scheme in Figures 1 to 3. Whereas the air inlet nozzle of the conventional vacuum cleaner shown in Figure 2 requires a connector block between an inner fluid carrying pipe and an outer tubular structure, the electrical connecting arrangement of the invention allows the use of a single pipe thereby permitting the air inlet nozzle to be made more compact. This is useful in the drive towards manufacturing smaller, more portable vacuum cleaner appliances, and particularly handheld vacuum cleaner appliances.

The electrical conductors 56 in the air inlet nozzle 40 are formed from a single-piece of stamped metal sheet which provides a blade-like electrical contact section 56a along the tubular portion 40b of the nozzle 40 that is substantially planar in order to provide a smooth contact surface for a counterpart connector, as will be described. For this reason, the contact section 56a is received in a respective channel 55 defined in the interior surface of the wall of the tubular portion 40b such that the lower surface 59 of the contact section 56b lies flush with the surrounding region of wall or, alternatively, may lie slightly recessed from the surrounding region of wall. It should be noted that a comparable effect could be achieved by a section of electrically conductive metallic tape or ribbon secured to the pipe wall which serves as an electrical contact instead of the blade-like electrical contact section 56a that lies within the channel in this specific embodiment.

The region of the conductor 56 not in the tubular portion 40b which serves to link the conductor blade 56a to a power connector of the main body, may be planar as well and is identified in Figure 6 and 7 by the reference numeral 56b and will herein be referred to as the 'link section' 56b. For convenience the entire conductor 56 may be manufactured from the same piece of material. With particular reference to Figures 6

and 7, which show a section through line A-A in Figure 5, the link section 56b is shown as housed completely within the flared, inner portion 40a of the air inlet nozzle 40 and is shaped so as to expose a contact region of it on an upper part of the air inlet nozzle 40 for contacting a sprung-loaded electrical contact 60 provided on the front of the cyclone pack 46. In Figures 6 and 7 it should be noted that the link section 56b and the contact blade section 56a appear as separate parts because the connection between the two sections is not shown in the sectional plane. In fact, in this embodiment the link section 56b is integral with the blade section 56a and so is flat sheet of material. However, it should be appreciated that this is not essential and the link section 56b may be non-planar, for example in the form of a wire strand or composite wire. The important factor is that the contact blade section 56a has a generally flattened form so as to permit a smooth sliding connection.

As has been mentioned, the air inlet nozzle 40 is releasably connectable to the wand connector 54 by way of the catch 52. To this end, the wand connector 54 includes a pipe end 62 that is dimensioned so that is insertable into the tubular section 40b of the air inlet nozzle 40. As shown in Figure 4b and mentioned above the pipe end 62 includes the pair of electrical terminals 58 that are connectable to the electrical terminal pair 56 provided on the air inlet nozzle 40. Figure 8 shows a section through the air inlet nozzle 40 in Figure 5 along line B-B but which includes the wand connector 54 coupled to the nozzle and therefore shows the second pair of electrical terminals 58 in more detail. It should be appreciated that the section line B-B passes through only one of the terminal pair 58, so only one of the terminals is shown in Figure 8, although both terminals in the pair 58 can be considered to be identical for the purposes of this description.

The electrical terminal 58 is formed from a stamped metal part that is housed within the wand connector 54 and includes an engagement member in the form of a sprung-loaded contact foot 64 that protrudes from an aperture 66 in the pipe end 62 of the wand connector 54. In this embodiment, the terminal 58 is shaped so that the contact foot 64 is cantilevered from a folded end 58a of the terminal which provides the contact foot 64

with a degree of resilience so that it can retract into the aperture 66 when pressed but is able to spring back into its initial state of protruding through the aperture 66. The folded end 58a of the terminal 58 is connected to a power lead 69 that extends away from the terminal 58 down through a longitudinal chamber 71 formed in the wall of the wand 32 in order to connect to a further electrical connection provided on a second wand connector 68 on the other end of the wand 32, as illustrated on Figures 4a and 4b.

Figure 9 shows a section through the second wand connector 68 along the same sectional plane as Figure 8. Here, an outlet pipe 70 of the floor tool 34 is received into the interior of the second wand connector 68. An electrical connecting arrangement is provided to establish an electrical connection from the second wand connector 68 to the floor tool 32 and is arranged substantially the same as the electrical coupling as described above between the air inlet nozzle 40 and the first wand connector 54.

More specifically, the electrical coupling includes a first pair of terminals 80 provided on the second wand connector 68 and a second pair of terminals 82 provided on the outlet pipe 70 of the floor tool 34. Note that due to the plane of section illustrated in Figure 9, only one of each pair of terminals 80, 82 are shown.

In Figure 9, the terminal 80 of the first pair is configured in the same way to the terminal pair 56 on the air inlet nozzle 40 and, therefore, the terminal 80 includes a blade-like contact section 84 that is received in a channel defined in the end pipe of the second wand connector 68. In effect, therefore, the blade-like contact section 84 is embedded in the wall of the second wand connector 68.

The blade-like contact section 84 provides a substantially planar contact surface for engagement with a respective terminal 82 provided on the floor tool outlet pipe 70. Here, the terminal 82 of the outlet pipe 70 is configured in the same way as the terminals 58 of the first wand connector 54 as described above. Accordingly, the terminal 82 includes an engagement member in the form of a sprung-loaded contact foot 86 that protrudes from an aperture 88 in the outlet pipe 70. The contact foot 86 is

sprung by virtue of its folded form such that the contact foot 86 is cantilevered from a folded end 90 of the terminal 82. Although not shown in Figure 9, the folded end 90 of the terminal 82 is connected to an electrical system of the floor tool which may include, for example, an electrical motor (not shown) for driving a rotatable brush bar 92 of the floor tool 34.

As will be appreciated from the above description, the connecting arrangement is common to both the interface between the air inlet nozzle 40 and the first wand connector 54 and between the second wand connector 68 and the floor tool 34 and, in principle, could be applied to any interface between a pair of air or fluid carrying pipes. So, although the connection arrangement has been described with reference to a vacuum cleaner such that the floor tool outlet pipe 70, the wand 32 and the air inlet nozzle 40 carry a flow of air, the invention is applicable to other appliances in which an electrical connection needs to be provided across a pipe interface. For example, suitable pipe work could be provided to carry liquid or an air/liquid mix in a floor washing machine.

In the above description, the blade-like contact sections 56a, 84 have been described as being integrated into the interior surface of the air inlet nozzle 40 and the second wand connector 68, respectively, so that the contact section 56a, 84 can be engaged by the sprung-loaded foot 60, 86 of the corresponding terminal of the mating part. However, although this configuration is preferred, it is not essential and instead the blade-like contact section 56a, 84 could be provided on the exterior surface of the air inlet nozzle 40 (or the second wand connector 68) to engage with a suitable sprung-loaded foot provided on an interior surface of the mating part.

In the above embodiment the blade-like contact section of the terminals has been described as planar and the other terminal has been described as including a protruding contact foot for engaging with the planar blade-like contact section. Alternatively, the terminal having the contact foot may also be planar so as to form a face-to-face connection with the blade-like contact section.

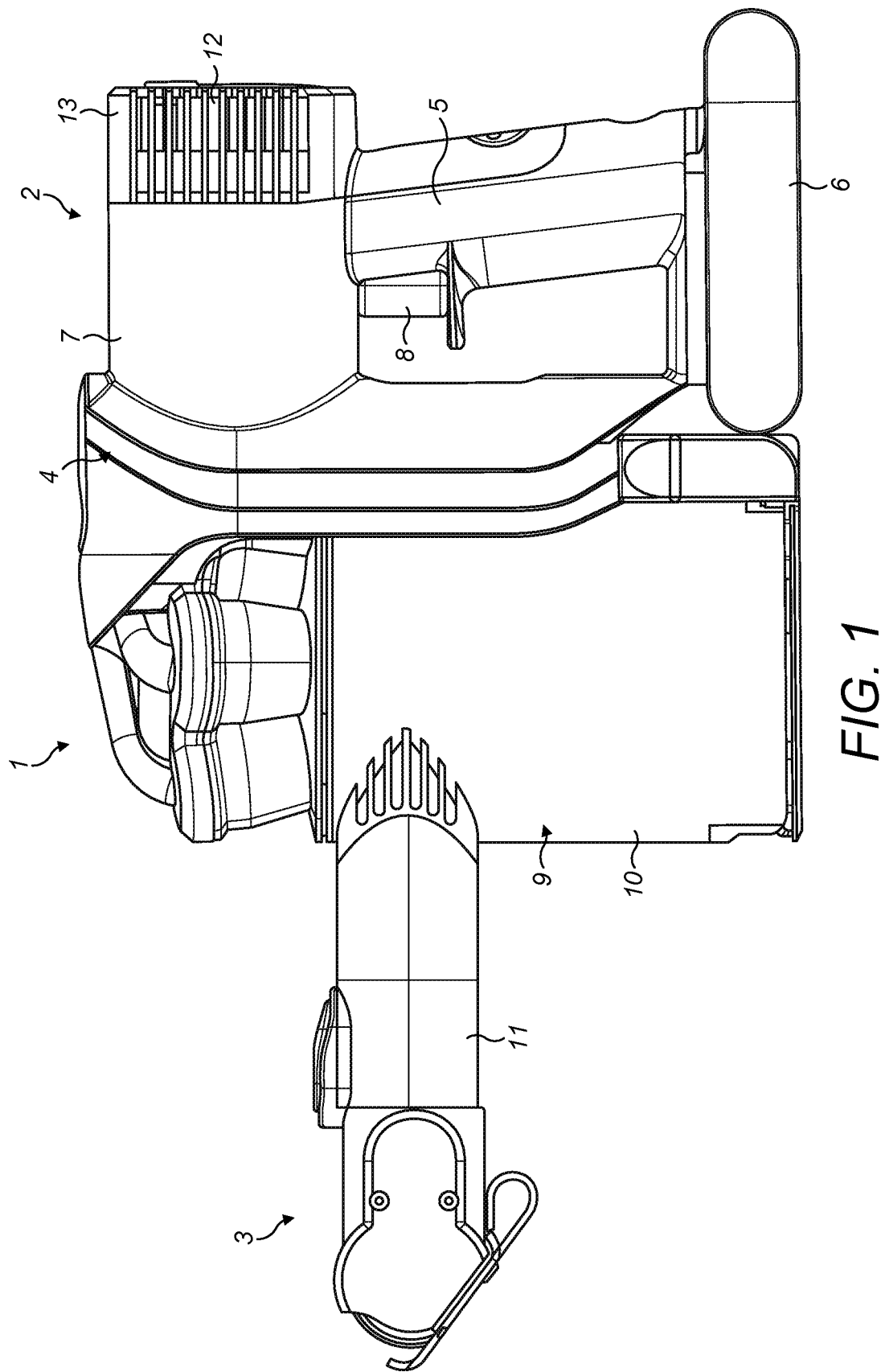
It will be appreciated that the provision of pairs of terminals in the connection arrangements described above is suitable for transmitting electrical power, be it DC or AC, across a pipe interface. However, the invention is considered to encompass single terminals which, although unsuitable for providing positive and negative lines of the
5 voltage supply, could be suitable for providing an electrical signal for example.

Although some alternatives to the specific embodiments have been described here, the skilled person will appreciate that various changes and modifications may be made without departing from the inventive concept as defined by the claims.

CLAIMS

- 5 1. A fluid carrying pipe for a surface treating appliance, the pipe having a connecting end that is attachable to a second pipe, the connecting end of the pipe having a pipe wall defining a fluid passage and electrical connection means for establishing an electrical connection with the second pipe, the electrical connection means comprising a conductive terminal received by the pipe wall so as to provide an exposed contact portion of the terminal on a surface of the pipe wall.
10
2. The pipe of claim 1, wherein the terminal is received by the pipe wall to provide an exposed contact portion of the terminal on an interior surface of the pipe wall.
- 15 3. The pipe of claim 1 or 2, wherein the terminal is received in a respective channel defined in the pipe wall.
4. The pipe of any preceding claim, wherein the terminal is substantially planar.
- 20 5. The pipe of any of the preceding claims, wherein the terminal is in the form of a blade.
6. The pipe of any preceding claim, wherein the exposed surface of the blade is recessed from the surrounding region of pipe wall.
- 25 7. The pipe of any one of the preceding claims, wherein the terminal is formed from a single piece of stamped metallic sheet material.
8. The pipe of any of the preceding claims wherein the terminal is a
30 complementary pair of conductive contacts.
9. A surface treating appliance having a fluid inlet nozzle, wherein the fluid inlet nozzle includes the pipe of any one of claims 1 to 8.

10. The surface treating appliance of claim 9, including an accessory tool having a fluid outlet pipe being connectable to the fluid inlet nozzle of the surface treating appliance, the fluid outlet pipe having a terminal for connection to the terminal
5 on the air inlet nozzle.
11. The appliance of claim 10, wherein the terminal of the fluid outlet pipe is provided on an exterior surface of the fluid outlet pipe.
- 10 12. The appliance of claims 10 or 11, wherein the terminal of the fluid outlet pipe includes a spring-loaded engagement member for engaging the terminal of the fluid inlet nozzle.
- 15 13. A fluid carrying pipe, or surface treating appliance, as described herein with reference to or as illustrated in the accompanying drawings.



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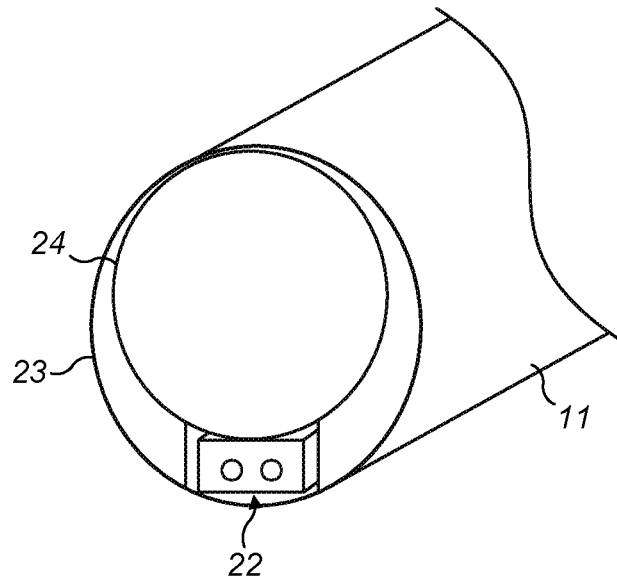


FIG. 2

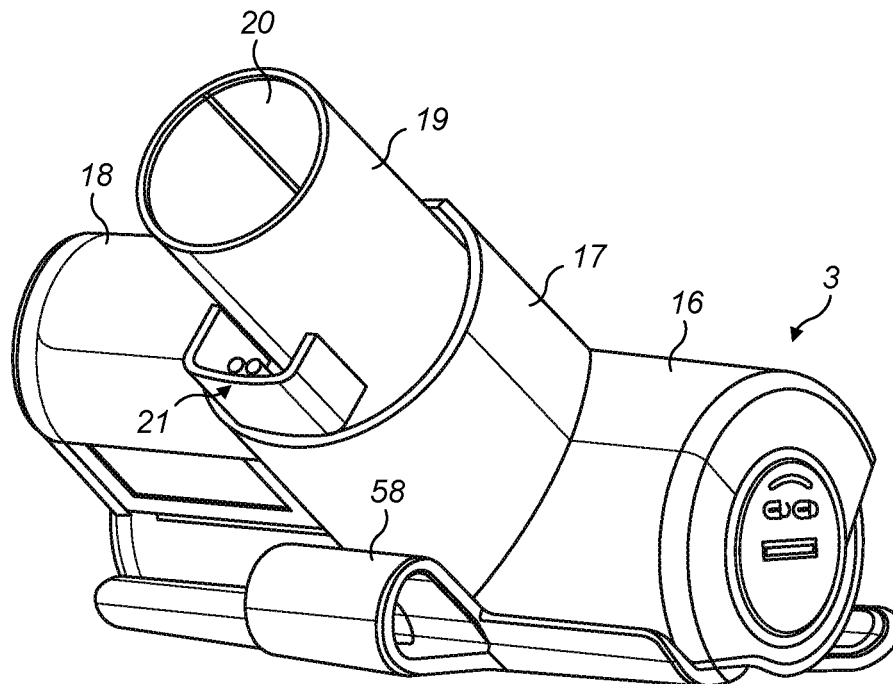


FIG. 3

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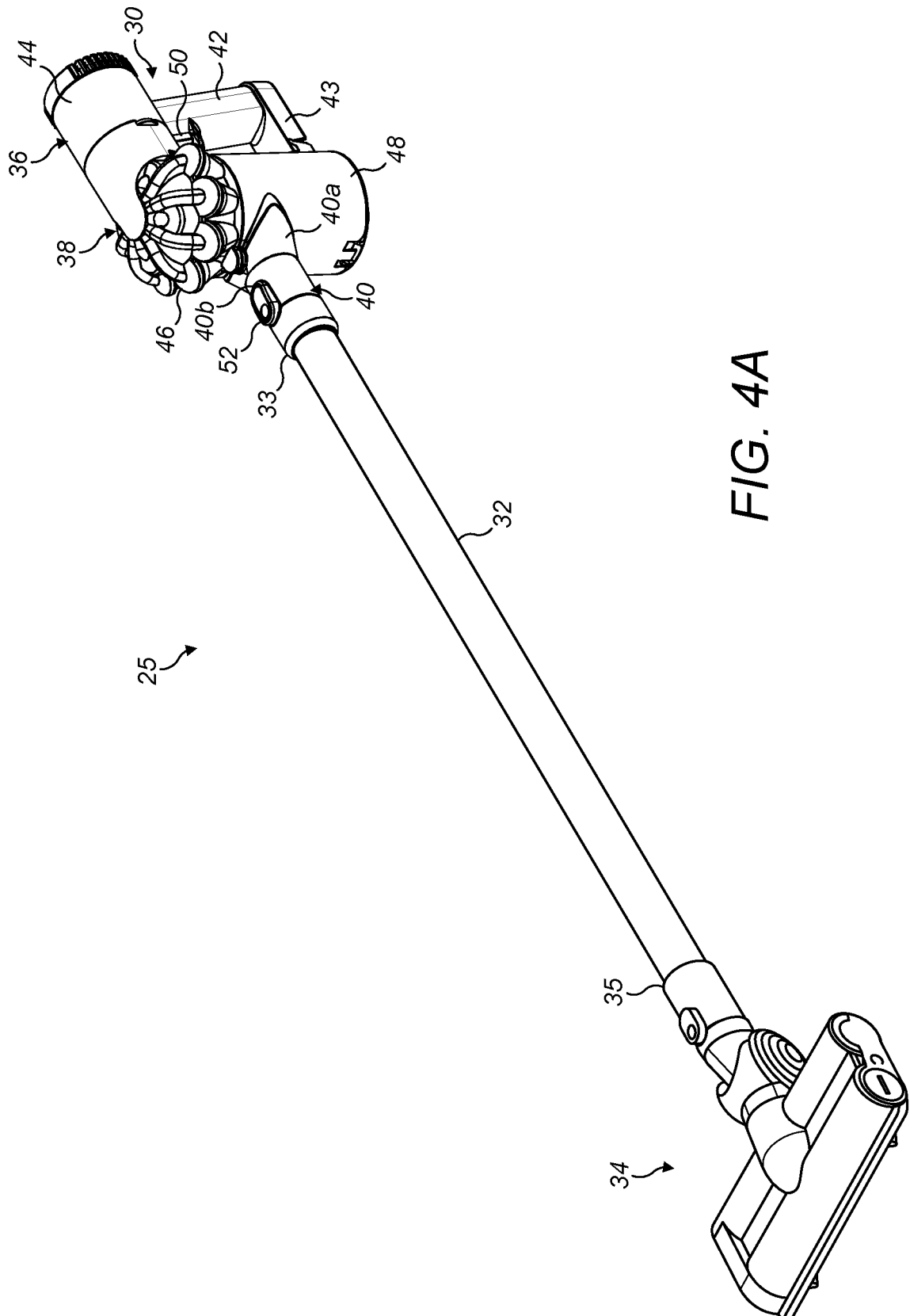
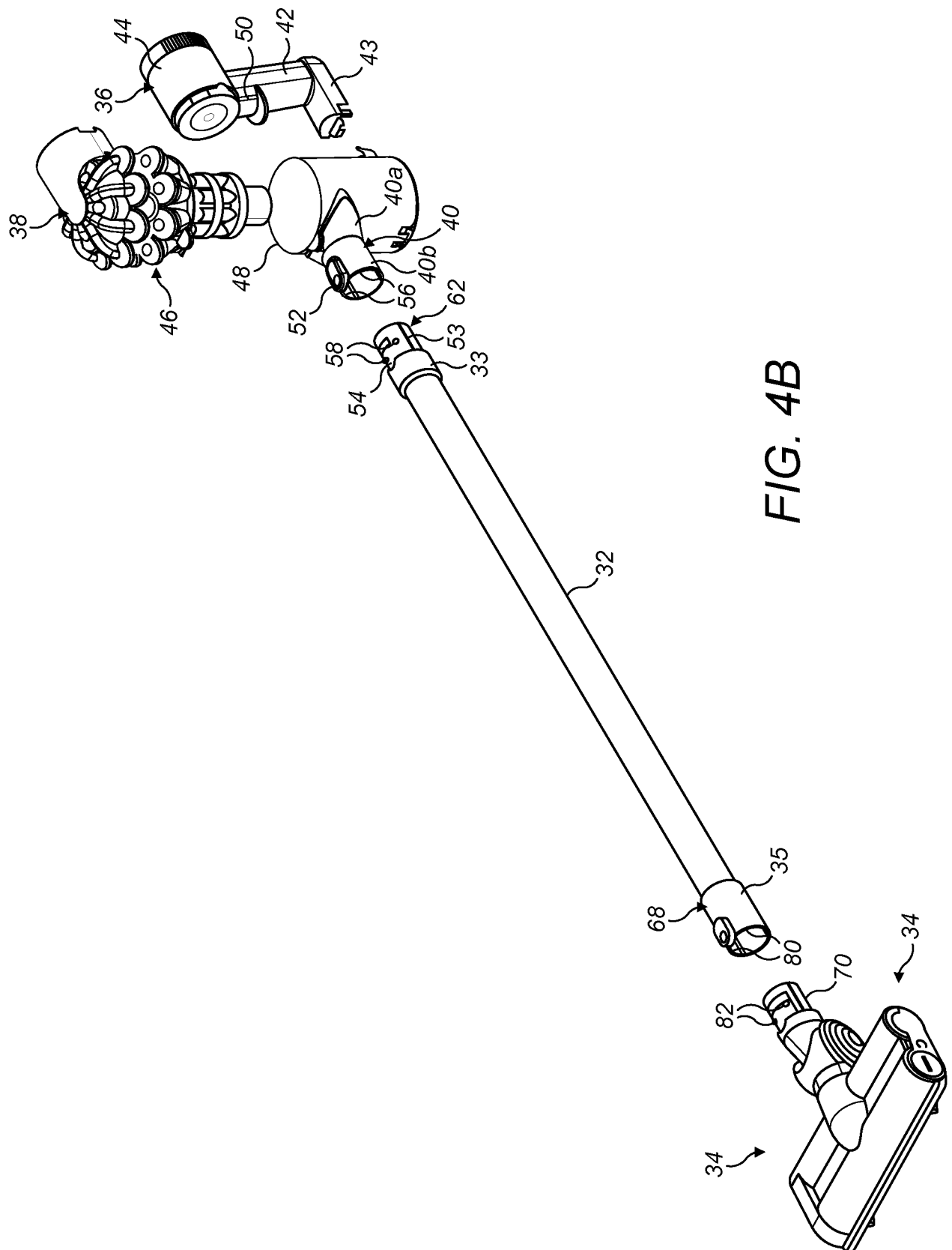


FIG. 4A

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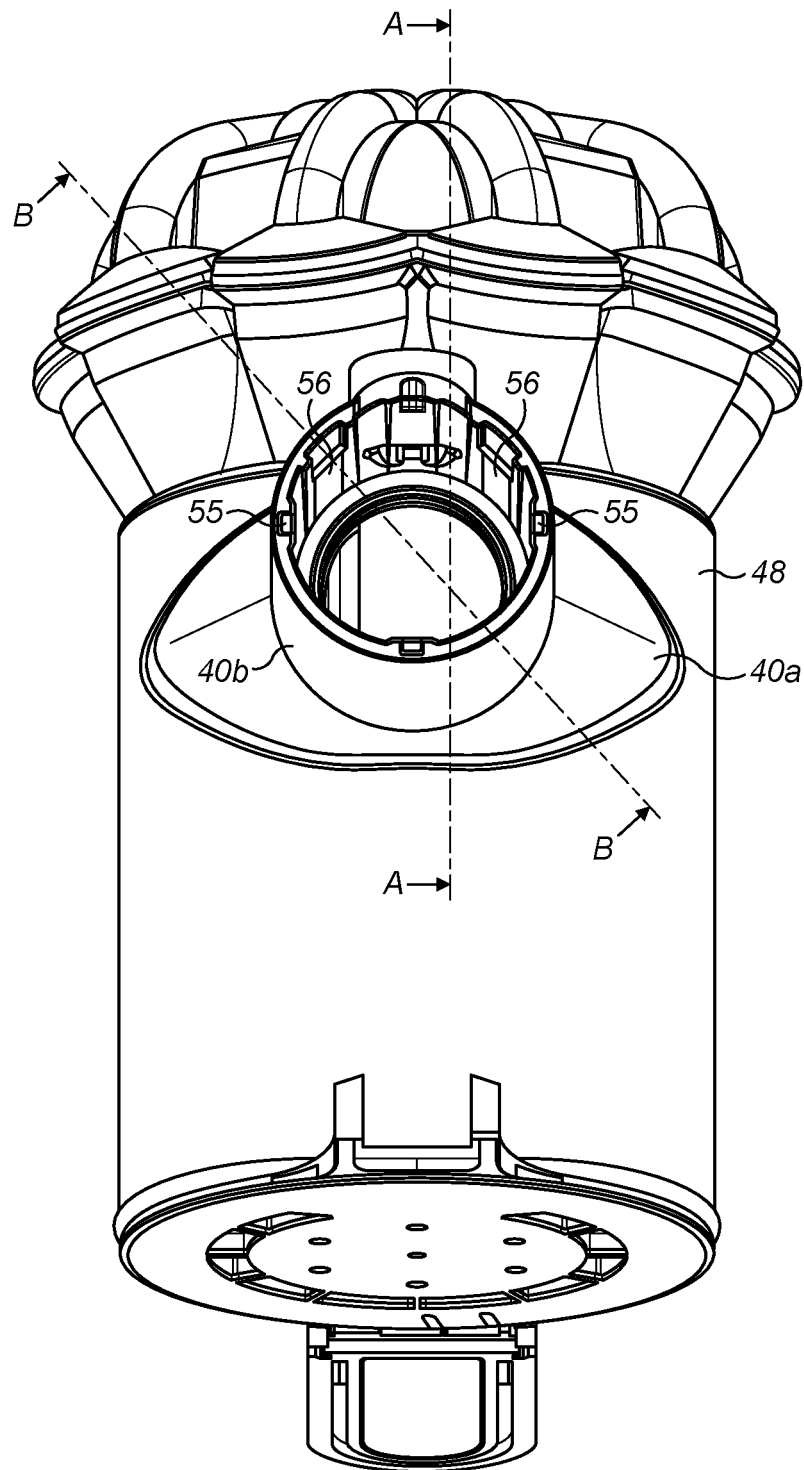


FIG. 5

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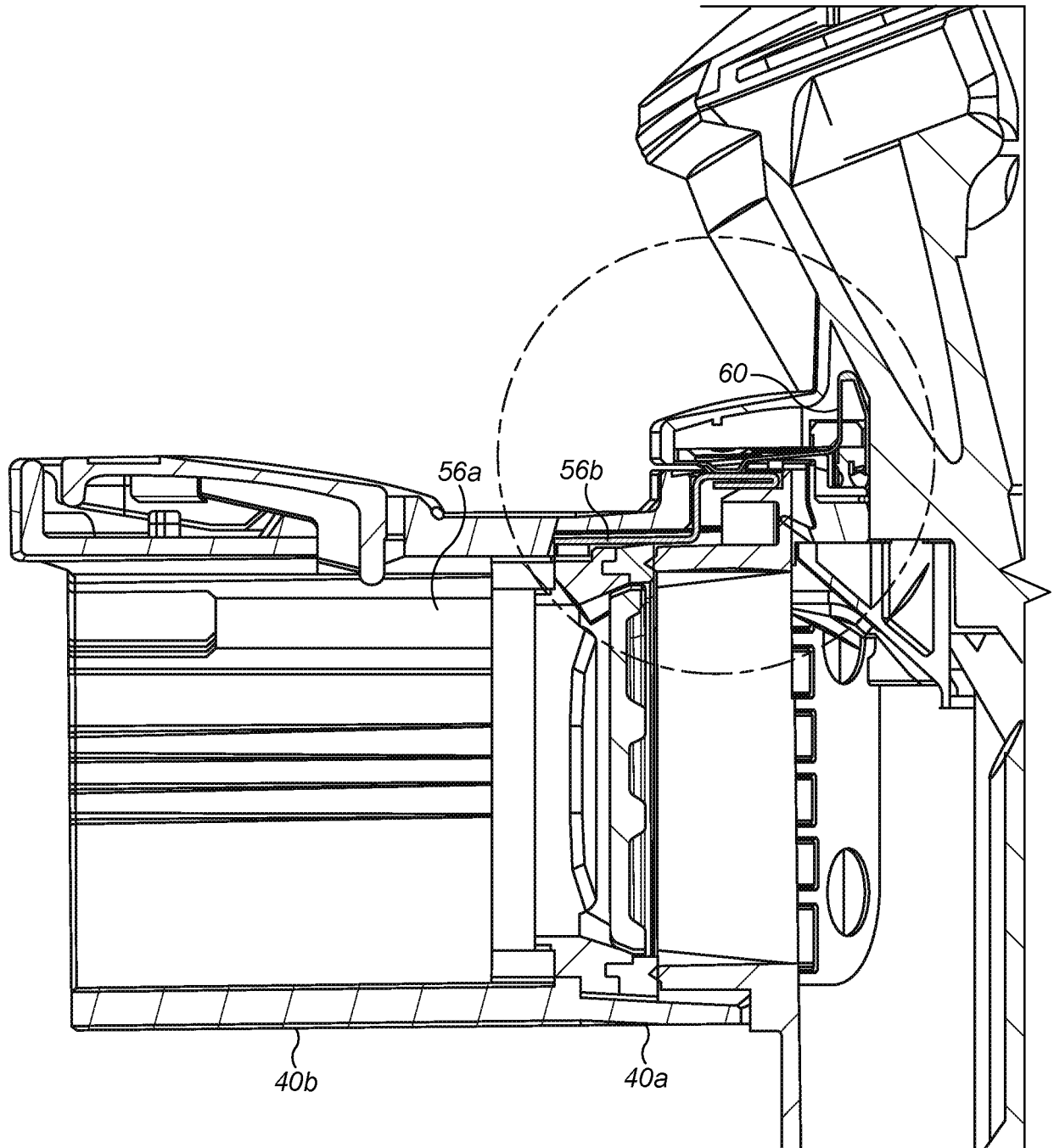


FIG. 6

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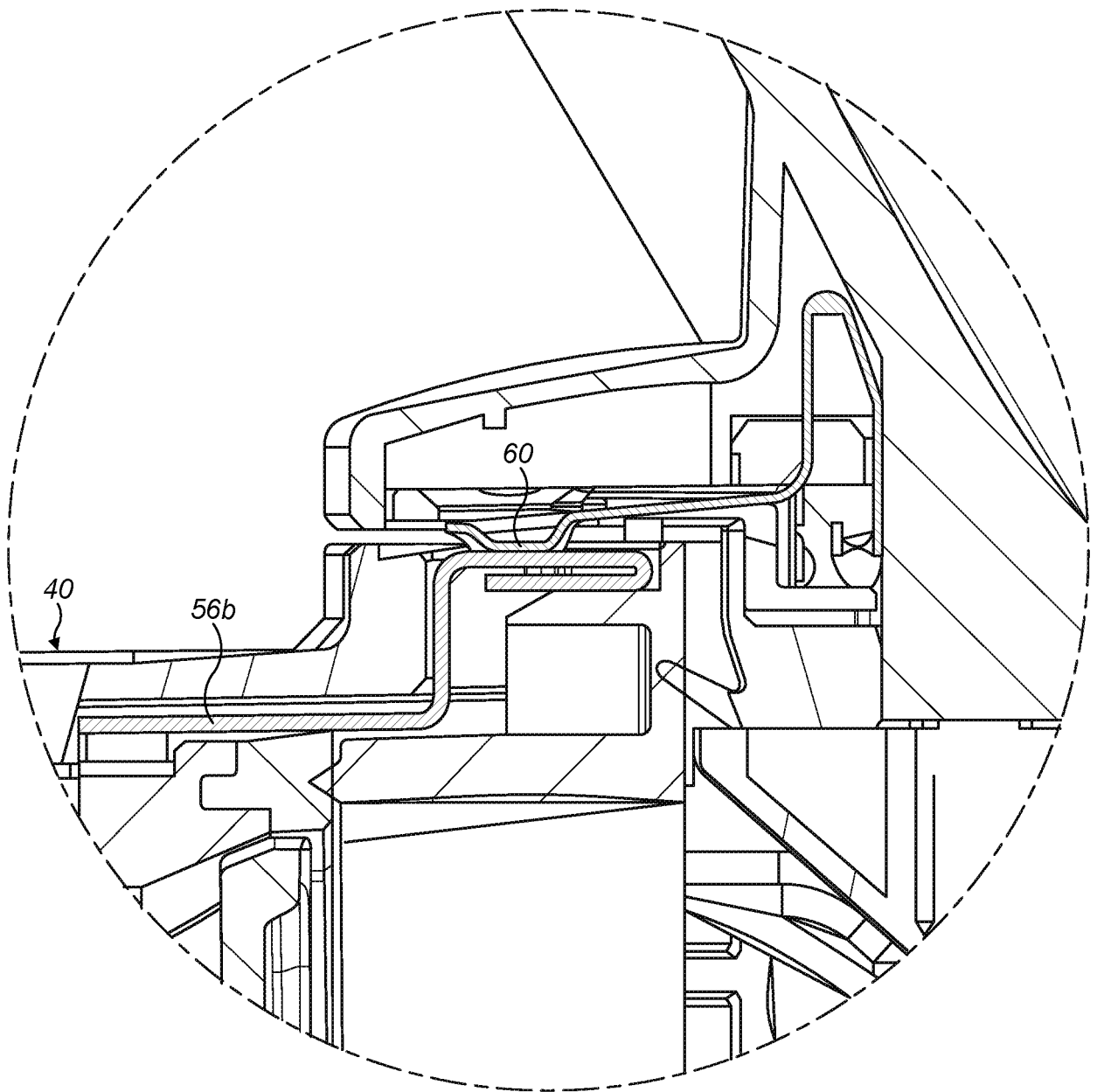


FIG. 7

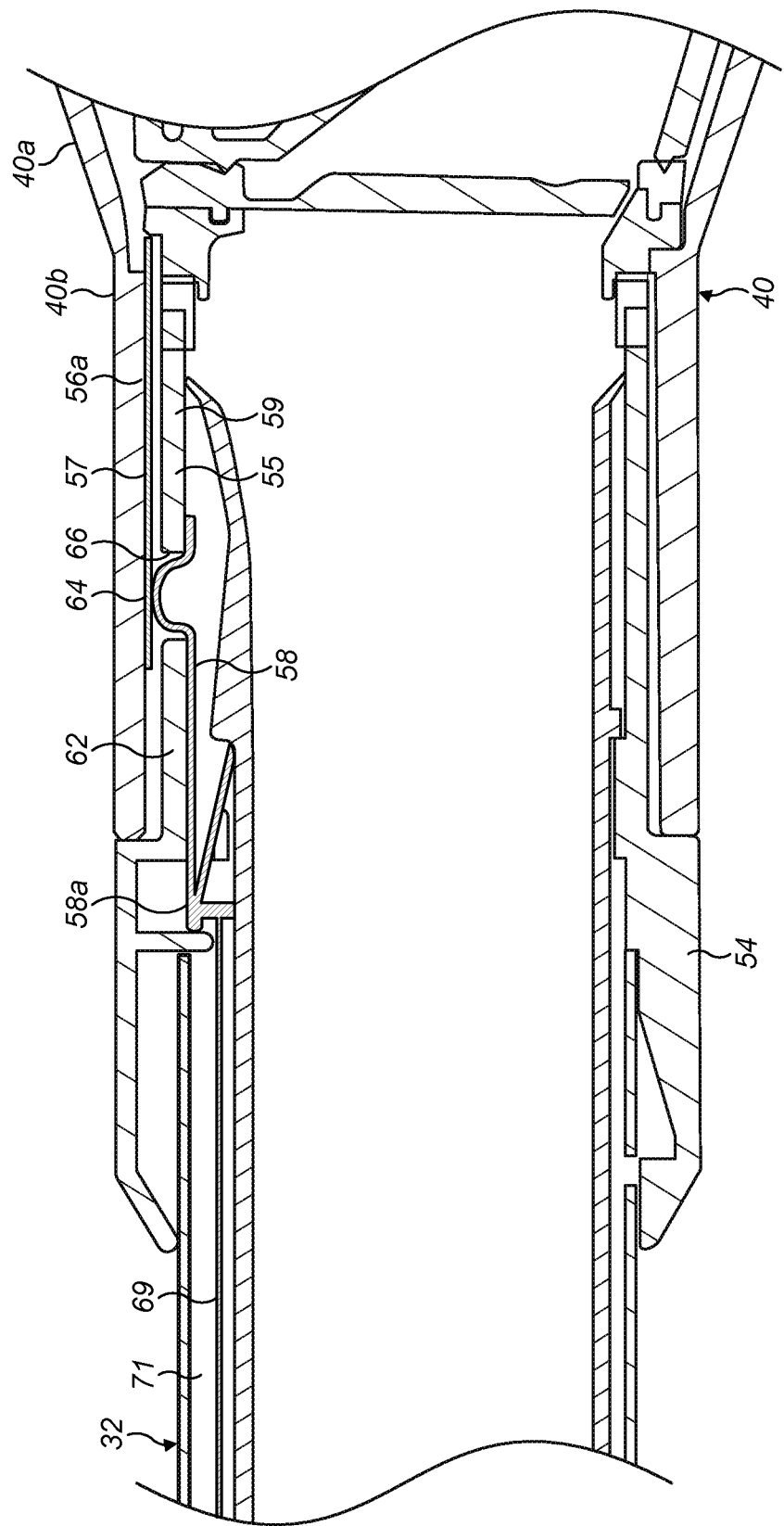


FIG. 8

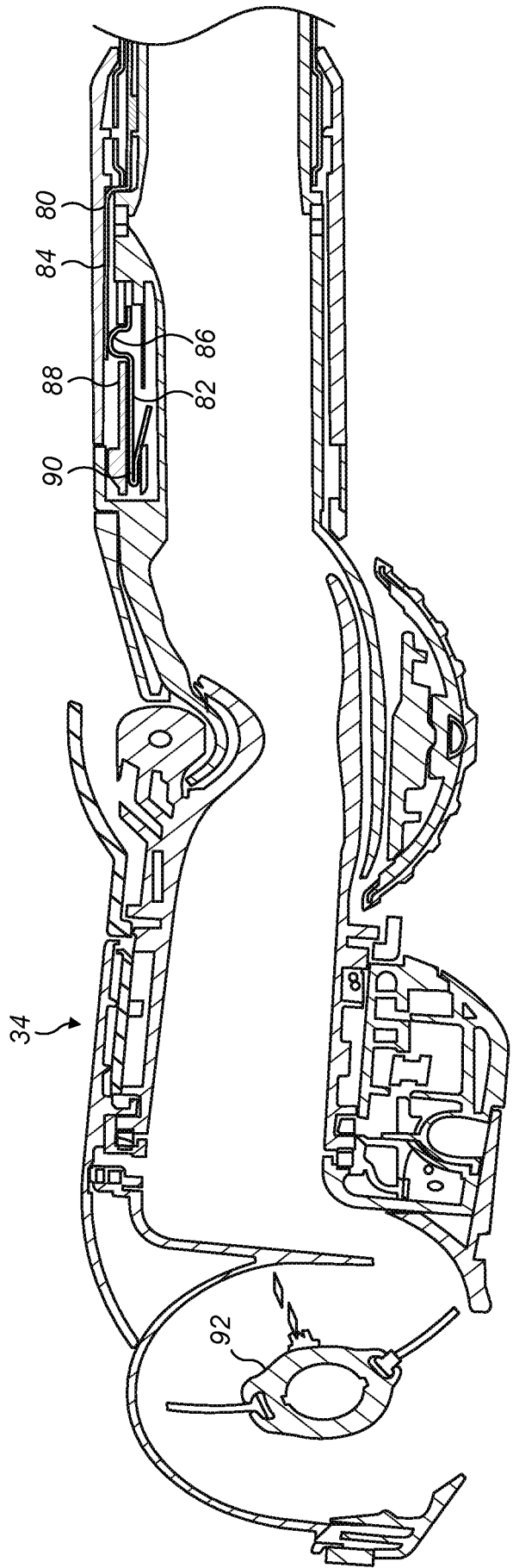


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2014/051160

A. CLASSIFICATION OF SUBJECT MATTER

INV. A47L9/24

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03/013333 A1 (ARCELIK AS [TR]; KAYALAR GOEKCE [TR]; DIZMEN SINAN [TR]) 20 February 2003 (2003-02-20)	1-6,8-11
A	page 2 - page 5; figures 2a,2b,3 -----	7,12,13
X	US 4 854 887 A (BLANDIN JEAN-CLAUDE [FR]) 8 August 1989 (1989-08-08)	1,2,4,6, 9,11
A	column 5, line 20 - column 10, line 20; figures 3-12 -----	3,5,7,8, 10,12,13
X	WO 96/25083 A1 (PHILIPS ELECTRONICS NV [NL]; PHILIPS NORDEN AB [SE]) 22 August 1996 (1996-08-22)	1,2,4,7, 9,11,12
A	abstract; figures 2,3 -----	3,5,6,8, 10,13
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

27 May 2014

Date of mailing of the international search report

12/06/2014

Name and mailing address of the ISA/

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Authorized officer

Blumenberg, Claus

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2014/051160

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 3 546 656 A (PRITULSKY JAMES) 8 December 1970 (1970-12-08) the whole document -----	1,3,4,6, 7,9,11 2,5,8, 10,12,13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2014/051160

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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