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(72) Inventors:  
• **PANG, Cyrus**  
**5656 AE Eindhoven (NL)**  
• **WOO, Cho**  
**5656 AE Eindhoven (NL)**  
• **Wilson, CHO**  
**5656 AE Eindhoven (NL)**

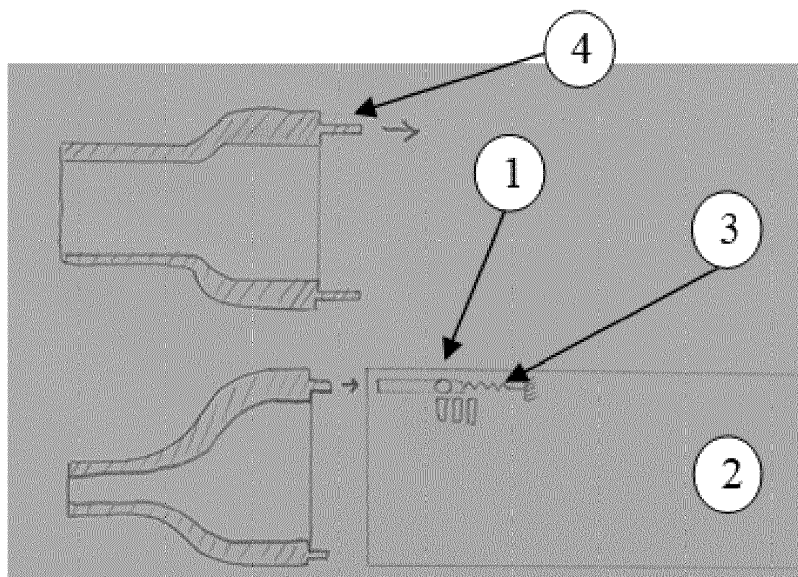
(71) Applicant: **Koninklijke Philips N.V.**  
**5656 AE Eindhoven (NL)**

(74) Representative: **Steenbeek, Leonardus Johannes et al**  
**Philips Intellectual Property & Standards**  
**High Tech Campus 5**  
**5656 AE Eindhoven (NL)**

(54) **HARE CARE DEVICE WITH AT LEAST TWO ATTACHMENTS**

(57) A hair care device comprises a body (2) having an output to supply heated air, and at least two different attachments (4) that can be attached to the output of the body. In accordance with the invention, the body comprises a detector (1) for detecting whether one of the attachments is attached to the body, and if so, which attachment is attached to the body, to provide a detection result, and a controller for controlling the supply of heated air in dependence on the detection result. In an embodiment, each attachment has at least one magnet at predefined positions at an attachment contact area of the

attachment for contacting the body, the at least two attachments having mutually different magnet configurations, and the detector comprises a plurality of Hall effect sensors at predefined positions at a body contact area for contacting a selected one of the attachments. In an alternative embodiment, the attachments (4) are provided with respective protrusions of mutually different sizes, and the detector (1) is arranged for providing a detection result in dependence on the size of the protrusion of the attachment (4) that is attached to the body.



**Fig. 2**

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**Description**

## FIELD OF THE INVENTION

**[0001]** The invention relates to a hair care device with at least two attachments.

## BACKGROUND OF THE INVENTION

**[0002]** In a typical hair dryer or air styler, when an attachment is plugged in, it naturally affects the air flow and heat output. A lot of times the resultant output might not be optimal for that attachment type.

## SUMMARY OF THE INVENTION

**[0003]** It is, inter alia, an object of the invention to provide an improved hair care device. The invention is defined by the independent claims. Advantageous embodiments are defined in the dependent claims.

**[0004]** With the smart attachment detection feature of the invention, the dryer is able to detect the type of attachment that is plugged in, and adjust the speed and heat settings automatically, so that the attachments can provide their optimal performances meeting their defined purposes. Users will no longer need to determine which setting to choose to get the correct output. The outlet air will be changed to a controlled temperature instead of letting the type of attachment to decide what temperature the user will experience.

**[0005]** These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0006]**

Fig. 1 illustrates a first group of embodiments of the invention; and

Figs. 2-4 illustrate a second group of embodiments of the invention.

## DESCRIPTION OF EMBODIMENTS

**[0007]** Fig. 1 illustrates a first group of embodiments of the invention. Fig. 1 shows an example of an air outlet side of a body of a hair dryer in accordance with the invention. In this example, at the bottom of the air outlet side, 3 Hall effect sensors are present, represented by black squares. If the hair dryer has 3 different attachments, each having 1 magnet at respective positions facing mutually different ones of the 3 Hall effect sensors in the body, a processor in the body is able to determine which attachment has been attached to the body of the hair dryer, as only the one Hall effect sensor in proximity with the magnet on the attached attachment will indicate the presence of a magnet.

**[0008]** Alternatively, in a variation of the configuration shown in Fig. 1, the body has only 2 Hall effect sensors (e.g. the middle Hall effect sensor has been left out). In such a configuration, the processor in the body is able to detect which one of 2 different attachments is attached to the body in the same way as described in the previous paragraph. However, it is even possible to detect a third attachment, if that third attachment has 2 magnets at respective positions facing the 2 Hall effect sensors on the body. The processor in the body would then conclude that the third attachment is attached to the body if both Hall effect sensors indicate that they are in close proximity with a magnet.

**[0009]** Figs. 2-4 illustrate a second group of embodiments of the invention.

**[0010]** Like the first group of embodiments described in relation to Fig. 1, the second group of embodiments of the invention provides a hair dryer that is able to detect and distinguish between different attachments when they are plugged into the air outlet, and adjust the heater power and motor speed of the hair dryer to achieve different desired performance for that attachment type. To achieve this function, a linear position sensor can be used to detect the depth of the insertion of different attachments, and generate a unique output signal according to the type of attachment that is plugged in, and trigger a pre-set heater and motor output.

**[0011]** A hair dryer having a function to detect and distinguish between different types of attachment that is plugged into the air outlet, and generate a different pre-set output can be achieved by having a linear position sensor mounted towards the air outlet, to detect the depth of the insertion of different attachments. Separate from how the attachment is secured to the air outlet of the hair dryer, a feature independent from the securing mechanism on the attachment can be used to trigger the linear position sensor mounted on the hair dryer. This feature can be a section or continuous ring of a rib protruded out from the attachment towards the body of the hair dryer. The height of this rib has to be different for each type of attachment. For example, a diffuser attachment used for slowly drying curly hair can have a short rib height, and when plugged into the air outlet, the linear position sensor will be physically pushed to position 1, and a corresponding signal will be sent to the circuit or processor that controls the heater and the motor, changing their outputs to high heat low speed for match with the diffuser's function. On a second type of attachment, for example a thin nozzle, it can have a taller rib height, and when plugged into the hair dryer, it will push the linear position sensor to a position 2, and similarly, the sensor will send a corresponding signal to the circuit which will change the heater and speed setting to match with what is optimal for that attachment type.

**[0012]** The smart attachment design uses a linear position sensor 1 mounted on the body 2 of the hair dryer, which uses a spring loaded mechanism 3 to sense the depth of insertion of the different attachments. Each at-

tachment also has a protruded feature 4 of different height, which is used to push onto the linear position sensor on the hair dryer side 1. The linear position sensor comprises of a spring-loaded plunger 5 that sticks out from the main sensor body 6. The linear displacement of the plunger correlates to the rib height protruded from each attachment 4. The linear displacement can be determined by different methods:

- Continuous position sensing: Using a linear potentiometer (variable resistor) can turn the different positions of the plunger into different resistance values. The resistance value can then feed into the circuit and be converted to a digital signal and trigger a different heater and motor output.
- Discrete position sensing:
  - Using multiple Hall effect sensors and one triggering magnet 7. When a first type of attachment with a short protruded rib is plugged into the dryer and pushed onto the plunger, the magnet will move to activate Hall effect sensor #1, and it will signal the heater and motor circuit to output setting #1. When a second type of attachment B with a medium-size protruded rib is plugged into the dryer, the magnet will move to active Hall effect sensor #2, and it will signal the heater and motor circuit to output setting #2, and so forth.
  - Using multiple triggering magnets 8 mounted on the plunger in a linear pattern along the moving direction of the plunger, each with a space in between, as shown in Fig. 4. When a first type of attachment is plugged in, it will move the first magnet over the Hall effect sensor, thus the Hall effect sensor only sees 1 pulse. When a third type of attachment with a long rib is plugged in, it will push the plunger to move a longer distance, thus making the first, second, and third magnets to pass through the Hall effect sensor, thus the Hall effect sensor will see 3 pulses, thus this unique signal will activate a different settings for the heater and motor.
  - Using multiple mechanical switches and one triggering finger, as shown in the bottom configuration of Fig. 3.
  - Using one mechanical switch and multiple triggering fingers 8, which could also be as shown in Fig. 4 (the protrusions on the plunger now being fingers activating the switch rather than magnets moving along a Hall effect sensor, as described above).
  - Using multiple optical sensors and one triggering flag.
  - Using one optical sensor and multiple triggering flags.

**[0013]** In summary, a hair care device comprises a body having an output to supply heated air, and at least

two different attachments that can be attached to the output of the body. In accordance with the invention, the body comprises a detector for detecting whether one of the attachments is attached to the body, and if so, which attachment is attached to the body, to provide a detection result, and a controller for controlling the supply of heated air in dependence on the detection result.

**[0014]** In an embodiment, each attachment has at least one magnet at predefined positions at an attachment contact area of the attachment for contacting the body, the at least two attachments having mutually different magnet configurations, and the detector comprises a plurality of Hall effect sensors at predefined positions at a body contact area for contacting a selected one of the attachments. In one implementation thereof, each attachment has a single magnet, and the detector comprises for each of the attachments a separate Hall effect sensor at a location at the body contact area that - after the attachment has been attached to the body - faces the location on the attachment where the attachment's magnet is positioned. In an alternative implementation, a first attachment has one magnet at a first position, a second attachment has one magnet at a second position different from the first position, a third attachment has magnets at the first and second positions, and the detector has first and second Hall effect sensors at respective positions facing the first and second positions.

**[0015]** In an alternative embodiment, the attachments are provided with respective protrusions of mutually different sizes, and the detector is arranged for providing a detection result in dependence on the size of the protrusion of the attachment that is attached to the body.

**[0016]** The invention can be applied to hair dryers and air stylers. The various different attachments could include a nozzle for a focused airflow, a retractable bristle brush for tangle-free waves and curls, a paddle straightening brush for naturally straight looks, a thermobrush for smoothing and for waves, and a volumizer for volume at the roots. It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word "comprising" does not exclude the presence of elements or steps other than those listed in a claim. The word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The controller may be implemented by means of hardware comprising several distinct elements, and/or by means of a suitably programmed processor. In the device claim enumerating several means, several of these means may be embodied by one and the same item of hardware. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

## Claims

1. A hair care device comprising:
  - a body (2) having an output to supply heated air; 5
  - and
  - at least two different attachments (4) that can be attached to the output of the body (2);

**characterized in that** the body (2) comprises: 10

  - a detector (1) for detecting whether one of the attachments is attached to the body, and if so, which attachment is attached to the body, to provide a detection result; and 15
  - a controller for controlling the supply of heated air in dependence on the detection result.
2. A hair care device as claimed in claim 1, wherein each attachment has at least one magnet at predefined positions at an attachment contact area of the attachment for contacting the body, the at least two attachments having mutually different magnet configurations; and 20
- the detector comprises a plurality of Hall effect sensors at predefined positions at a body contact area for contacting a selected one of the attachments. 25
3. A hair care device as claimed in claim 2, wherein each attachment has a single magnet, and the detector comprises for each of the attachments a separate Hall effect sensor at a location at the body contact area that - after the attachment has been attached to the body - faces the location on the attachment where the attachment's magnet is positioned. 30 35
4. A hair care device as claimed in claim 2, wherein a first attachment has one magnet at a first position, a second attachment has one magnet at a second position different from the first position, a third attachment has magnets at the first and second positions, and the detector has first and second Hall effect sensors at respective positions facing the first and second positions. 40 45
5. A hair care device as claimed in claim 1, wherein the attachments (4) are provided with respective protrusions of mutually different sizes, and the detector (1) is arranged for providing a detection result in dependence on the size of the protrusion of the attachment (4) that is attached to the body (2). 50

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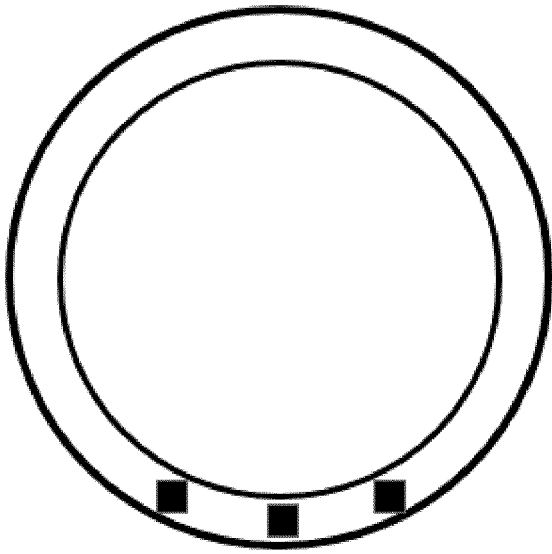


Fig. 1

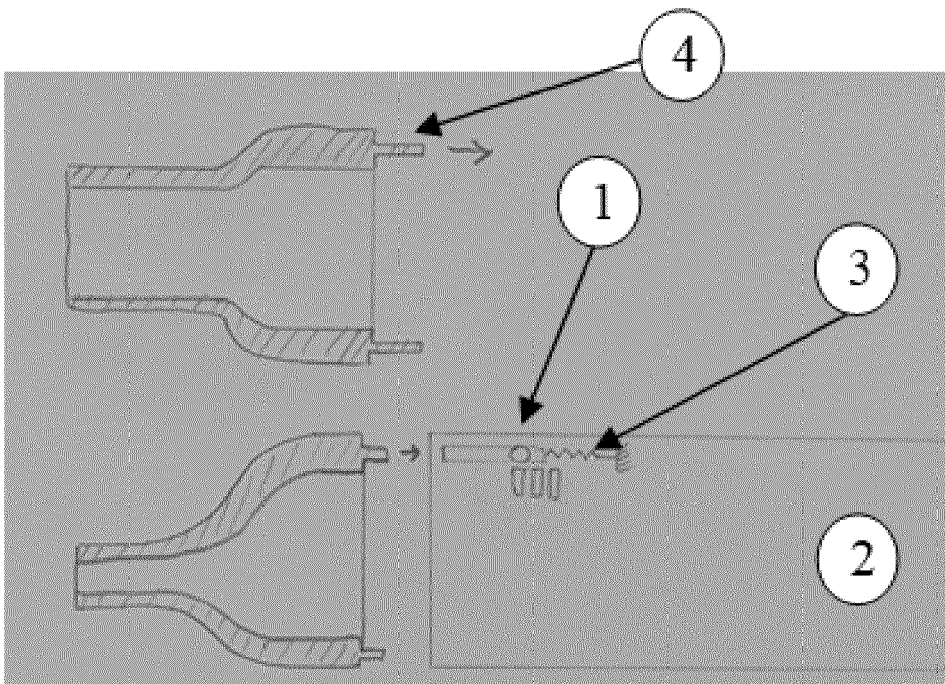


Fig. 2

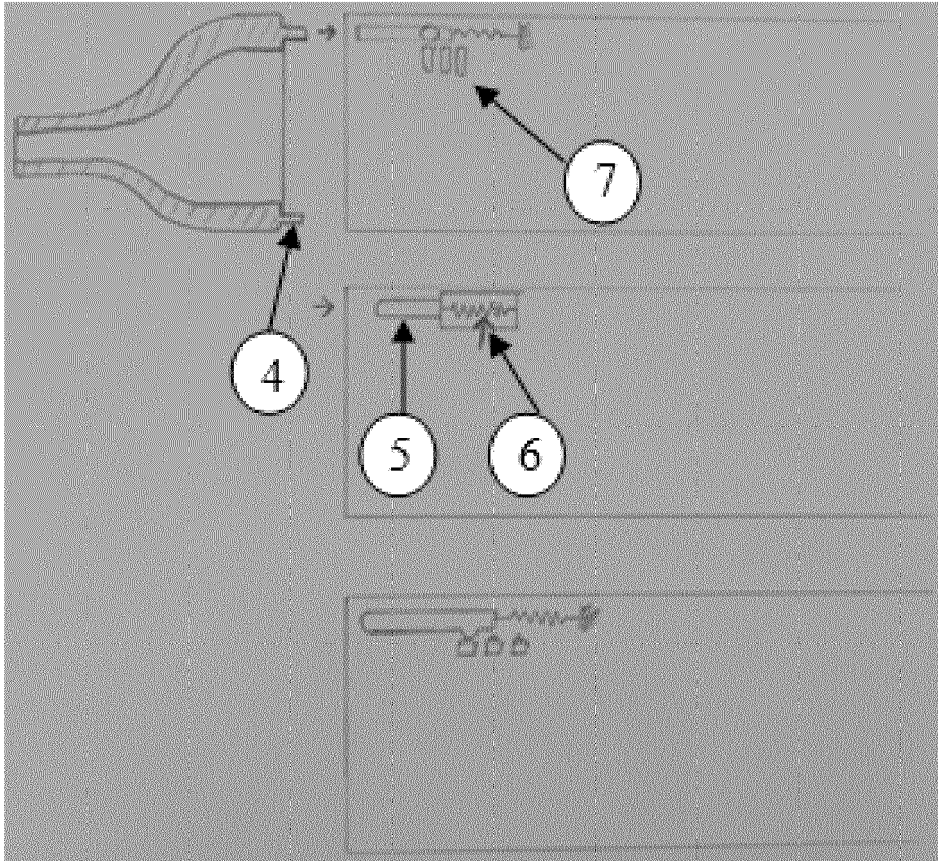


Fig. 3

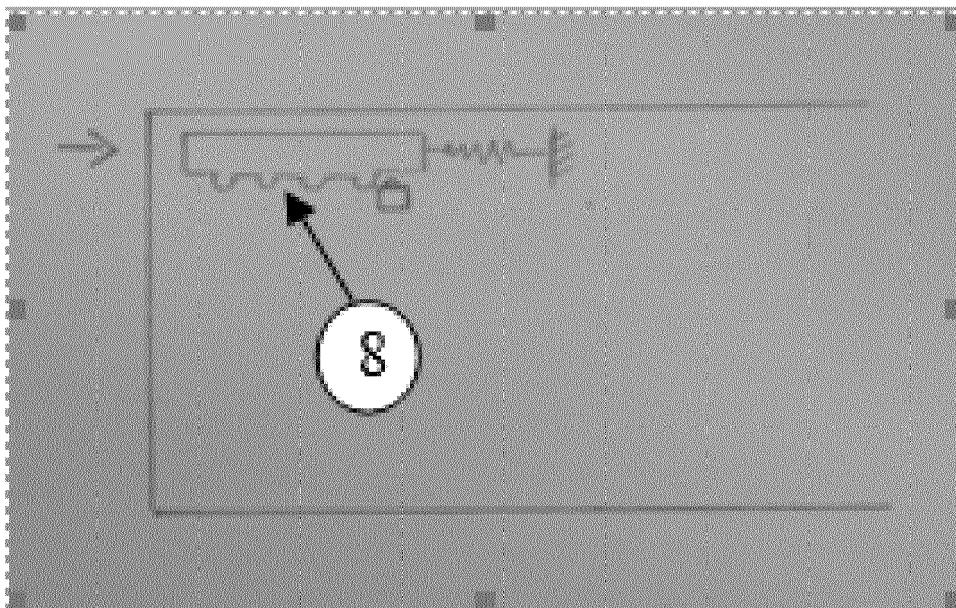


Fig. 4



EUROPEAN SEARCH REPORT

Application Number  
EP 17 17 5366

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 October 2017	Examiner Ionescu, C
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 17 17 5366

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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25-10-2017

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