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(54) Title: IMPROVED HAIR STRAIGHTENING DEVICE

(57) Abstract: The present invention relates to a hair straightening device to be placed on an air blower, comprising a first straightening element and a second straightening element positioned on either side of an air diffuser 9, each of the two elements comprising an outer comb 1 and an inner comb 2, removably attached so as to allow a sliding movement of one relative to the other, said sliding movement of the two outer 1 or inner 2 combs allowing to grip the hair and to stretch it above the air diffuser 9, the teeth of the outer combs 1 being formed by a succession of arches 3 whose holes define two tunnels 4 that make space for the inner combs 2 in such a way as to allow an arrangement of said inner combs 2 beneath said outer combs 1 within said tunnels 4 and to allow said sliding movement of the inner combs 2 relative to the outer combs 1 in order to displace the teeth 5 of said inner combs 2 relative to the planes formed by the arches 3 of the outer combs 1.



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IMPROVED HAIR STRAIGHTENING DEVICEField of the invention

[0001] The present invention relates to the area of  
5 the mechanical treatment of hair, and in particular an  
improved straightening device intended to be used with an  
air blower, and in particular with a hair dryer.

State of the art

10 [0002] Most devices for straightening frizzy or  
curly hair rely on the principle of passing the hair  
between grips or rollers. The majority of these devices are  
also provided with a heating means such as electrical  
resistors heating a bar or even producing hot air or steam.

15 [0003] A first straightening device was proposed by  
the inventor in the context of Document WO 03/026457. This  
device comprised at least three combs that formed a  
gripping element suitable for exerting a tension on the  
hair whilst at the same time heating it in order to  
20 straighten it. However, this device requires the use of a  
push button that positions the movable comb in line with  
the two other combs, allowing the insertion of hair.

[0004] Most hair straightening devices of the state  
of the art that are suitable for being attached to an air  
25 blower, in particular to a hot air blower such as a hair  
dryer or a blowing brush, are faced with the problem of air  
diffusion, and thus with the problem of overheating the  
head of the air diffuser in the sense that straightening  
devices generally represent an obstacle to the normal  
30 airflow upon exit from the blower. Straightening the hair  
is much more difficult if the airflow is impeded. The  
straightening mechanism that is usually used is that the  
hydrogen bonds in the keratin are weakened when the hair is  
wet, then these same bonds are re-established at different

places when the hair is dried. Keratin also has disulphide bonds that are only attacked when the hair is chemically treated (ammonia). This type of treatment is however much more aggressive to the hair (perms).

5 [0005] The present invention intends in particular to solve the problem of straightening the hair with a geometrical design of the straightening device that leaves greater freedom to the generated airflow by positioning air-diffusion grilles on either side of two hair  
10 straightening elements.

#### Aims of the invention

[0006] The present invention aims to provide an hair straightening device that is improved compared with the  
15 state of the art, and in particular a device comprising two straightening elements positioned on either side of an air-diffuser element that allows an improved air distribution and a better control of the air temperature through the straightening device. The new device will also have to  
20 allow to stretch the hair lock above the air diffuser so as to optimally combine the mechanical straightening by pinching and the thermal straightening by the applying tension to the hair lock above the air diffuser. The attached figures allow immediate understanding of the  
25 operating mode of the device of the invention.

#### Summary of the invention

[0007] The present invention discloses a device for straightening hair, to placed on an air blower, comprising  
30 a first straightening element and a second straightening element positioned on either side of an air diffuser, each of both elements having an outer comb and an inner comb, removably attached to allow a sliding movement of each one relative to the other, said sliding movement of both inner

or outer combs allowing to grip the hair and to stretch it above the air diffuser, the teeth of the outer combs being formed by a succession of arches whose holes define two tunnels that make space for the inner combs in such a way  
5 as to allow the arrangement of said inner combs beneath said outer combs within said tunnels and to allow said sliding movement of the inner combs relative to the outer combs in order to displace the teeth of said inner combs relative to the planes formed by the arches of the outer  
10 combs.

[0008] According to particular embodiments, the invention comprises one or several of the following features:

- the external profiles of the teeth of the inner combs  
15 are more or less equal to the holes of the arches of the outer combs, leaving a slight gap to allow the inner comb to move freely;
- the teeth of the inner combs have bevelled profiles that allow to insert the hair lock more easily;
- 20 - the teeth of the inner combs also have profiles in the form of an arch, the hole allowing the air to circulate even more;
- the pitch of the outer combs is essentially identical to that of the inner combs, without which there would be no  
25 fit between the holes of the inner and outer combs when the lock is inserted in the teeth of the combs;
- the device comprises an elastic means for maintaining the inner combs in position relative to the outer combs in order to exert some "pinching" force on the hair;
- 30 - the position-maintaining means is a spring or a pair of springs;
- the spring is provided with a means for regulating the force of said spring in order to adjust the "pinching"

force exerted on the lock when it passes through the straightening combs;

- the means for regulating the force of said spring is an adjusting screw;
- 5 - the adjusting screw for the spring force is linked to the regulation of the power and/or of the airflow rate of the air blower in order to adjust the power to the difficulty of straightening the hair locks;
- the device comprises a system for detecting the presence
- 10 of said device on the air blower allowing to regulate the heating power of said air blower and to take into account possible overheating due to partial interruption of the airflow by the straightening device;
- the system for detecting the presence of said device on
- 15 an air blower comprises electrical detection circuits and a sensor;
- the device also comprises untangling and shining combs on either side of the first and second straightening elements;
- 20 - the air diffuser is a metal grille;
- the air blower comprises indicators for power, spring pressure and airflow rate.

#### Brief description of the figures

25 [0009] Figure 1 shows the essential elements of the present invention, namely the first and second straightening elements positioned on either side of an air diffuser, each of the straightening elements being provided with a tunnel-shaped comb with a movable comb that can move

30 inside this tunnel by means of a spring.

[0010] Figure 2 shows the mechanism for regulating the spring of the movable comb.

[0011] Figure 3 shows sections A-A' and B-B' with both a top view and a side view of the tunnel comb with the

movable comb moving inside the tunnel comb; the top view of section B-B' shows the straightening of the hair when the movable comb is moved in the direction of the arrow.

[0012] Figure 4 shows in section A-A' the insertion  
5 of the hair locks to be smoothed in the straightening device.

[0013] Figures 4, 5 and 6 respectively show the mechanism for inserting in the device the hair or locks to be smoothed followed by the straightening of these same  
10 locks.

[0014] Figure 7 shows a possible use of the device of the invention on a hair dryer.

[0015] Figure 8 shows an overview of the straightening mechanism where we tried to show the way in  
15 which a hair lock passes through the straightening device. The figure clearly shows the tension on the hair lock between the two straightening elements.

[0016] Figure 9 shows an electronic element for preventing the overheating of the device as in the  
20 invention, incorporated into a system for regulating the heating power or the airflow rate, depending on the pressure exerted by the spring.

[0017] Figure 10 shows the position of the sensors and that of the electrical circuits on the hair dryer and  
25 on the straightening device.

#### Detailed description of the invention

[0018] The device in the present invention may be applied to any air blower, such as for instance a specially  
30 adapted blowing brush or a traditional hair dryer.

[0019] The device of the invention comprises two straightening elements positioned on either side of an air diffuser that will be called "first straightening element"  
16 and "second straightening element" 17. Each of the

straightening elements 16 and 17 comprises two essential elements: these are two combs, overlapping each other, that will be called "inner comb 2" and "outer comb 1". The outer comb 1 is in the shape of a series of aligned arches 3 with  
5 a hollow part formed by the holes of the successive arches and forming a tunnel 4 in which the inner comb 2 is located, both being movably arranged relative to each other. The word "arch" is to be understood in the architectural sense according to the Larousse dictionary  
10 definition.

[0020] The inner comb 2 has a shape that is similar to the hole formed by the arches 3 of the outer comb 1. The one being movable relative to the other. The essential elements, i.e. the inner comb 2 and the outer comb 1  
15 positioned on either side of an air diffuser (grille) of this straightening device are visible in Fig. 1 where they are separately shown so that the elements can be distinguished in detail. The inner comb 2 itself may also be hollow and thus be arch-shaped. This arch shape of the  
20 inner comb allows to further lighten the structure and to improve the diffusion of air through the straightening elements, which is an essential aim of the invention.

[0021] The outer comb 1 forming the tunnel 4 could also move relative to the inner comb 2, which may remain  
25 fixed. The important point is to generate the movement of one element relative to the other in order to grip the hair when the locks are inserted between the inner and outer combs and thus to create some pinching effect. However, the embodiment in which the outer comb is movable is not shown  
30 so that the figures are not unnecessarily complicated.

[0022] The resistance provided by the springs 6 to move the inner combs 2 relative to the outer combs 1 may be regulated by means of a screw 7 shown in Fig. 1 & 2.

[0023] The hair straightening mechanism relies on using the device in the closed position, i.e. where the bevelled teeth 5 are misaligned relative to the plane formed by the arches 3, and on inserting the hair locks, which themselves adjust the position of the movable comb with the force provided by the spring 6 of the adjusting screw 7 being the only resistance. This force is adjustable (see Fig. 2). In other words, by pulling the hair locks through the teeth of the device, the user causes the adjustment of the teeth relative to each other as a function of the tension applied to said locks, this being so for both straightening elements 16 and 17. The resistance that both straightening elements 16 and 17 exert upon the passage of the hair lock allows to stretch it above the air diffuser 9 positioned between the two elements 16 and 17, which further improves the straightening effect.

[0024] In normal operation, in addition to being gripped (pinched) by the two elements, the hair lock is also stretched between both straightening elements. The positioning of the air diffuser thus allows the air to reach the stretched lock, further contributing to the straightening effect since it is dried in a stretched position. Thus, this provides the combined benefit of drying in a stretched position and of mechanical pinching between the inner 2 and outer 1 combs of the straightening elements.

[0025] The present invention also tackles the temperature regulation and therefore the power of the air blower and/or the intensity of the hot air flow by incorporating in a preferred embodiment of the invention a regulation system allowing to link the power of the air blower and/or the airflow to the pressure of the spring.

[0026] It is generally acknowledged that the frizzier the hair, the higher the pressure of the spring determining the pinching force (causing the bending of the hair between the inner and outer combs) must be and the higher the heating power must be. This heating power can be regulated by adjusting the heating power of the air blower or by adjusting the airflow, or both. In order to give the user a visual control means, an indicator 13 for power/spring pressure/airflow rate may be provided on the air blower used.

[0027] The present invention therefore proposes a hair straightening device that, once placed on an air blower, becomes a true intelligent system since it automatically adapts to the user's needs.

15 [0028] **Key**

1. Outer comb
2. Inner comb
3. Arches formed by the teeth of the outer combs
4. Tunnels formed by the aligned arches of the outer comb teeth
5. Bevelled tooth of the inner comb
6. Adjustable spring
7. Adjusting screw
8. Electronic element
9. Air diffuser
10. Safety probe
11. Straightening device
12. Untangling and shining comb
13. Indicator for power/spring pressure/airflow rate
14. Electrical detection circuits
15. Sensor

CLAIMS

1. Hair straightening device to be placed on an air blower, comprising a first straightening element and a second straightening element positioned on either side of an air diffuser (9), each of both elements comprising an outer comb (1) and an inner comb (2), removably attached so as to allow a sliding movement of one relative to the other, said sliding movement of the two outer (1) or inner (2) combs allowing to grip the hair and to stretch it above the air diffuser (9), the teeth of the outer combs (1) being formed by a succession of arches (3) whose holes define two tunnels (4) that make space for the inner combs (2) in such a way as to allow an arrangement of said inner combs (2) beneath said outer combs (1) within said tunnels (4) and to allow said sliding movement of the inner combs (2) relative to the outer combs (1) in order to displace the teeth (5) of said inner combs (2) relative to the planes formed by the arches (3) of the outer combs (1).

2. Device as in Claim 1, wherein the external profiles of the teeth (5) of the inner combs (2) are essentially equal to the holes of the arches (3) of the outer combs (1).

3. Device as in Claim 1, wherein the teeth (5) of the inner combs (2) have bevelled profiles.

4. Device as in Claim 1, wherein the teeth (5) of the inner combs (2) also have arch-shaped profiles.

5. Device as in Claim 1, wherein the pitch of the outer combs (1) is essentially identical to the pitch of the inner combs (2).

6. Device as in Claim 1 comprising an elastic means for maintaining the inner combs (2) in position relative to the outer combs (1).

7. Device as in Claim 6, wherein the position-maintaining means is a spring (6).

8. Device as in Claim 7, wherein the spring is provided with a means for regulating the force of said spring.

9. Device as in Claim 8, wherein the means for  
5 regulating the force of said spring is an adjusting screw (7).

10. Device as in Claim 8 or 9, wherein the adjusting screw for the force of the spring is linked to the regulation of the power and/or of the airflow of the  
10 air blower.

11. Device as in Claim 1 comprising a system for detecting the presence of said device on the air blower allowing to regulate the heating power of said air blower.

12. Device as in claim 11, wherein the system  
15 for detecting the presence of said device on an air blower comprises an electrical detection circuit (14) and a sensor (15).

13. Device as in Claim 1, also comprising an untangling and shining comb on each side of the first and  
20 second straightening elements.

14. Device as in Claim 1, wherein said air diffuser (9) is a metal grille.

15. Device as in Claim 1, wherein said air blower comprise an indicator (13) for power, spring  
25 pressure and airflow rate.

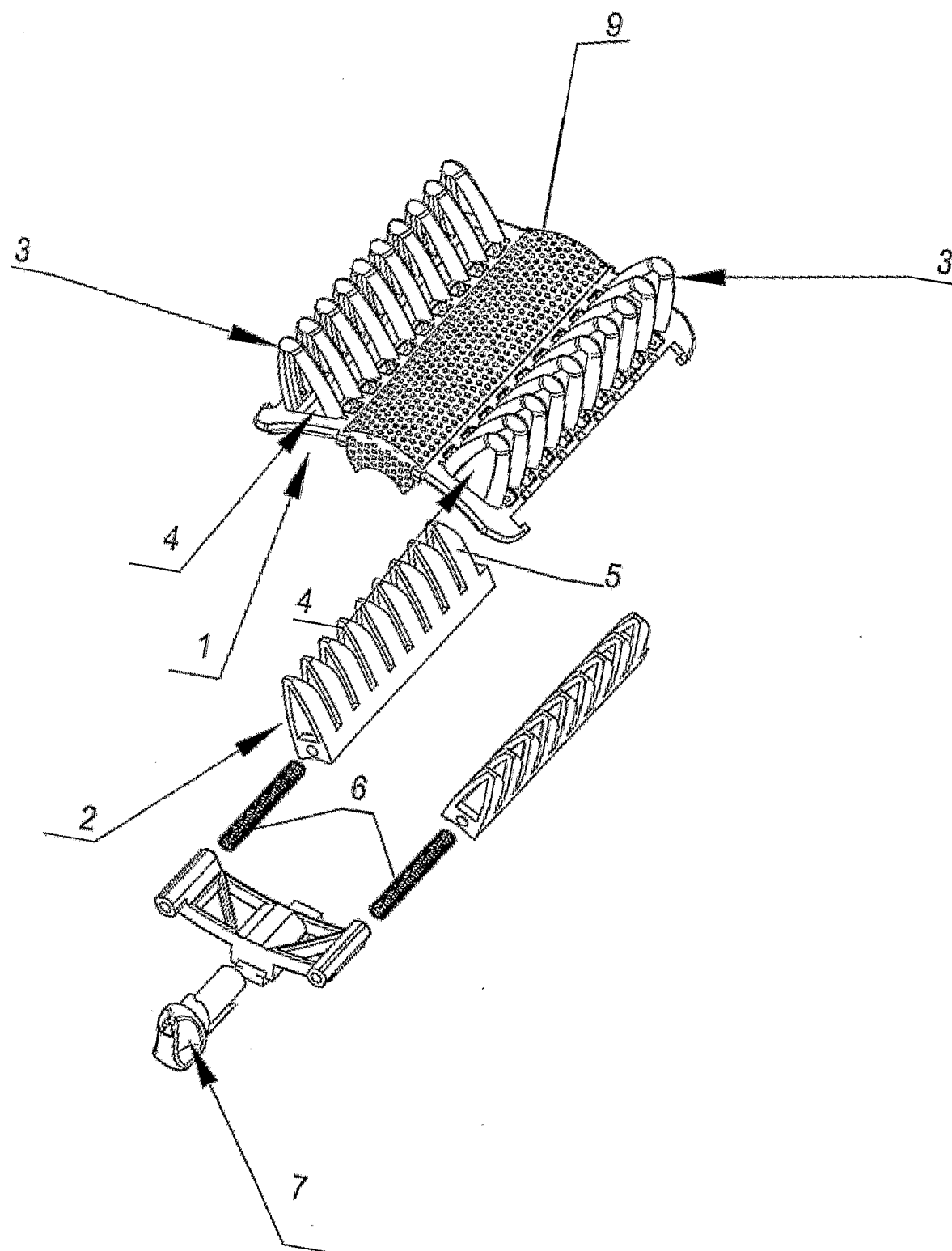


Fig. 1

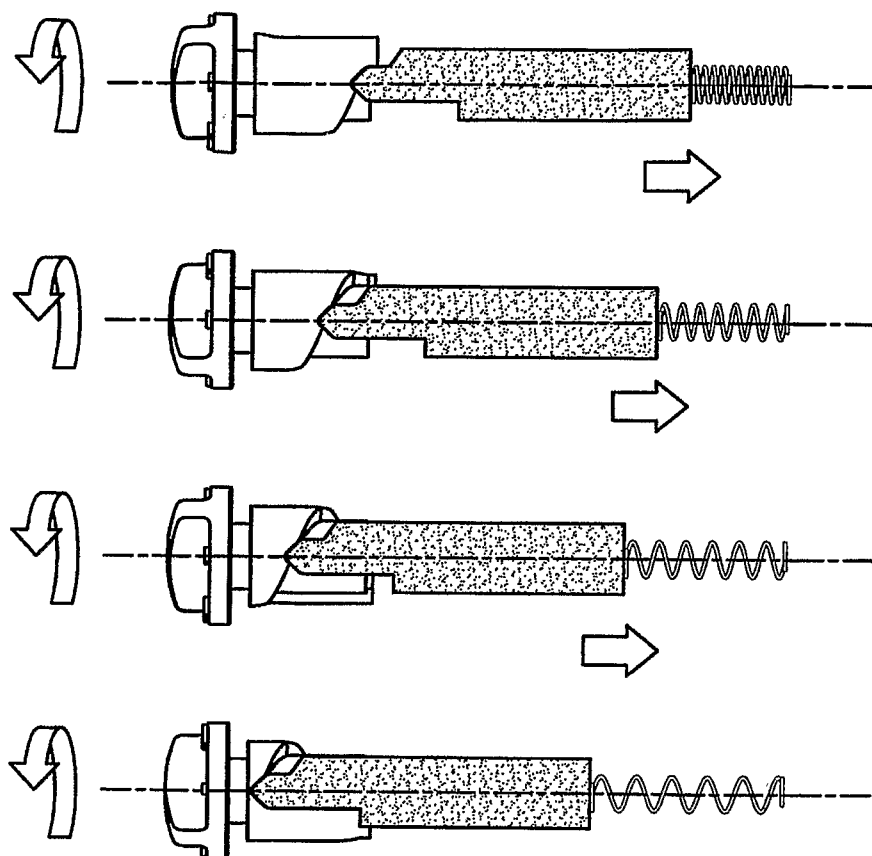


Fig. 2

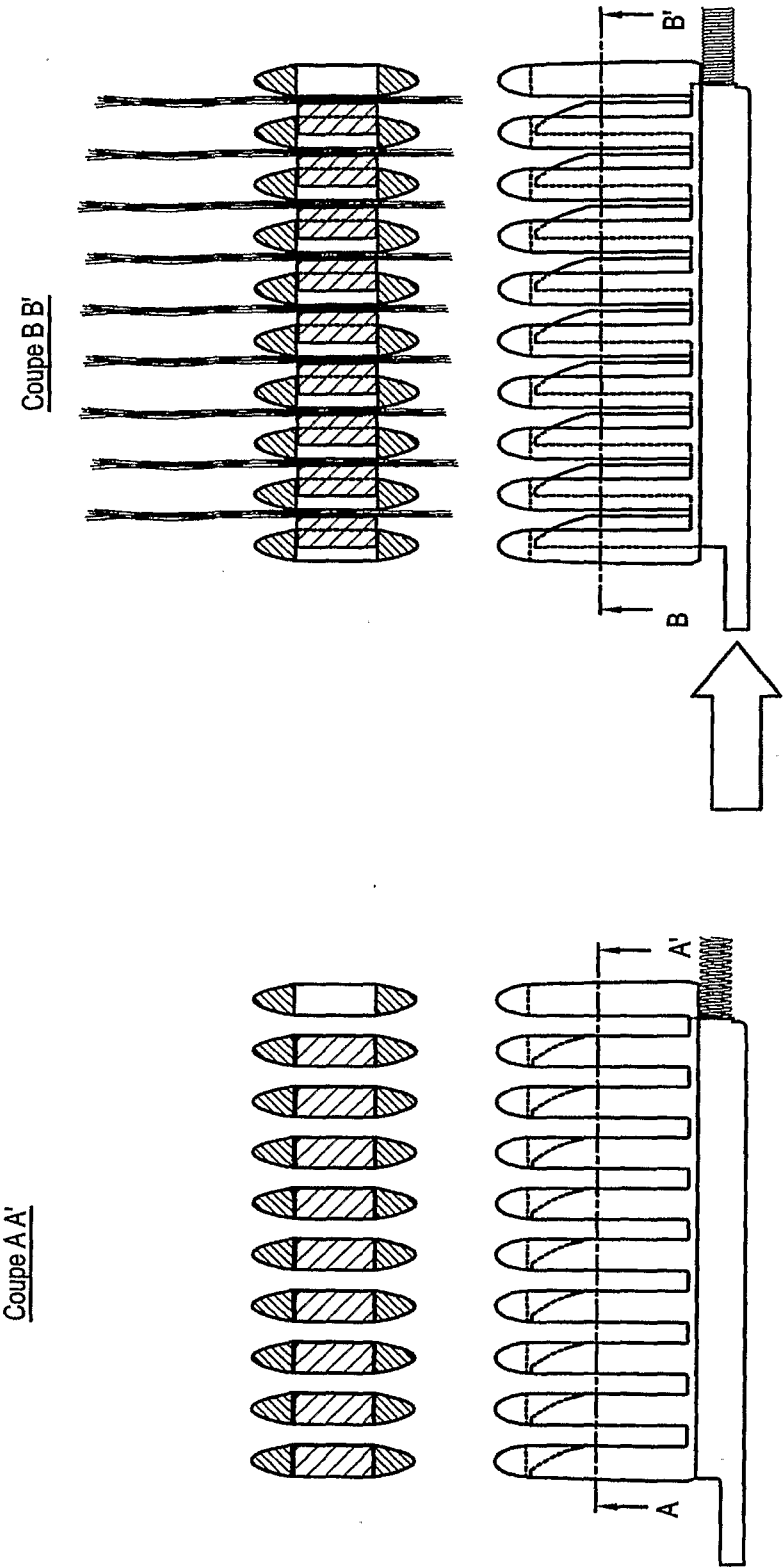
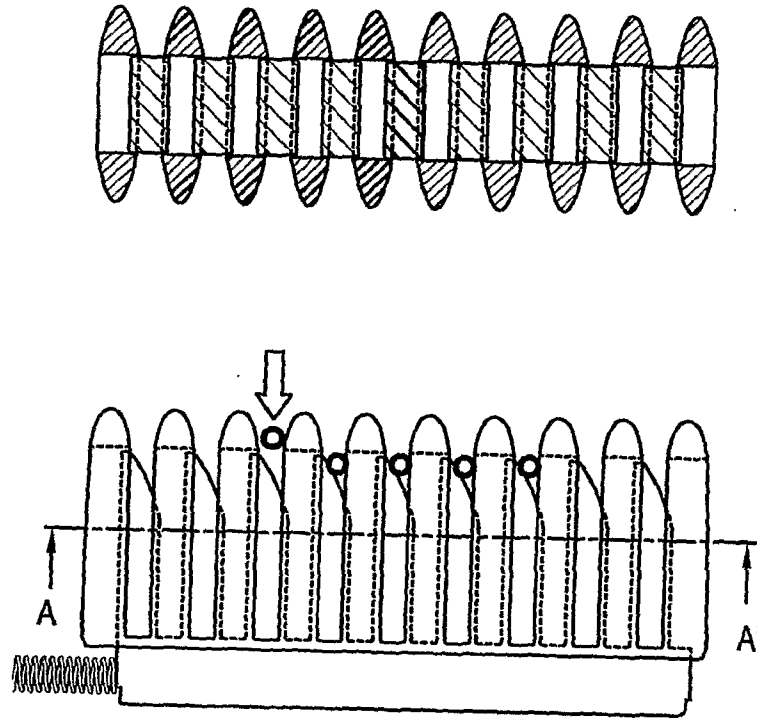


Fig. 3

Coupe A A'



Coupe centrale

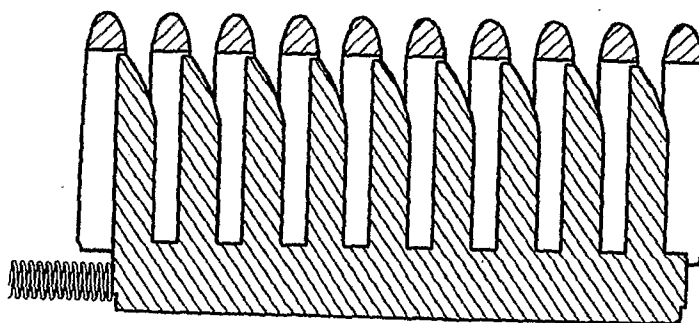
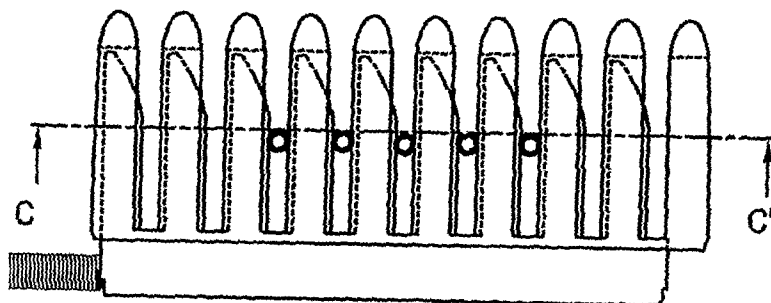
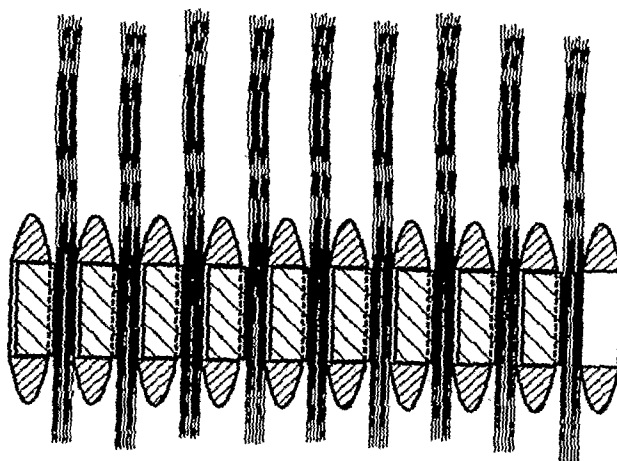


Fig. 4

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Coupe C C'



Coupe centrale

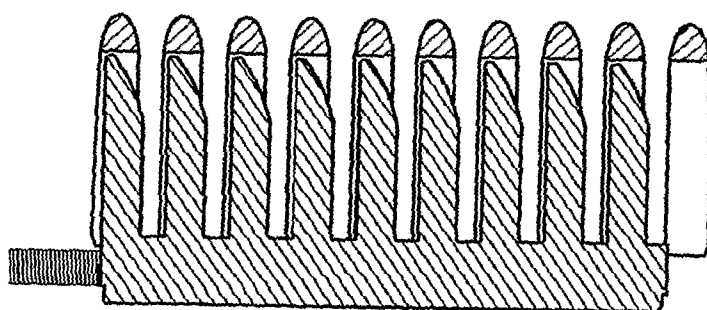
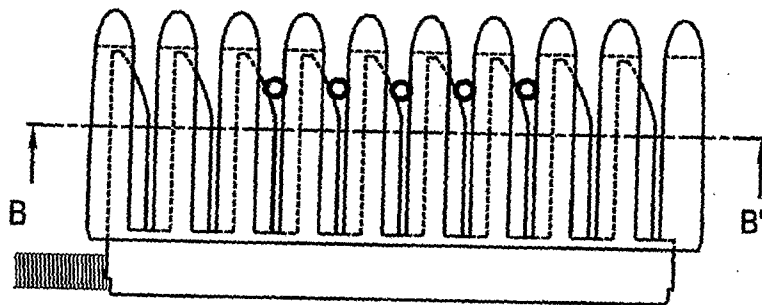
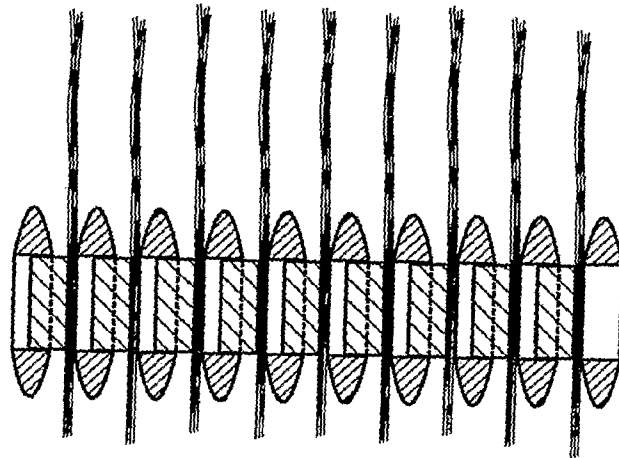


Fig. 5

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Coupe B B'



Coupe centrale

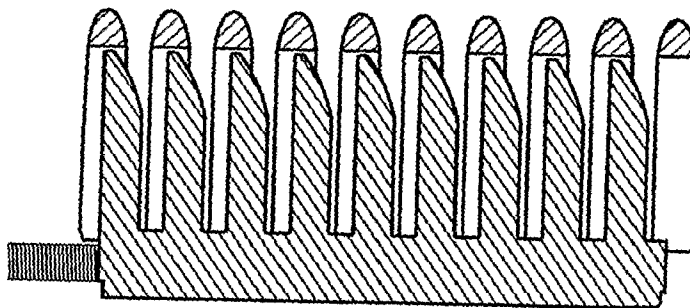


Fig. 6

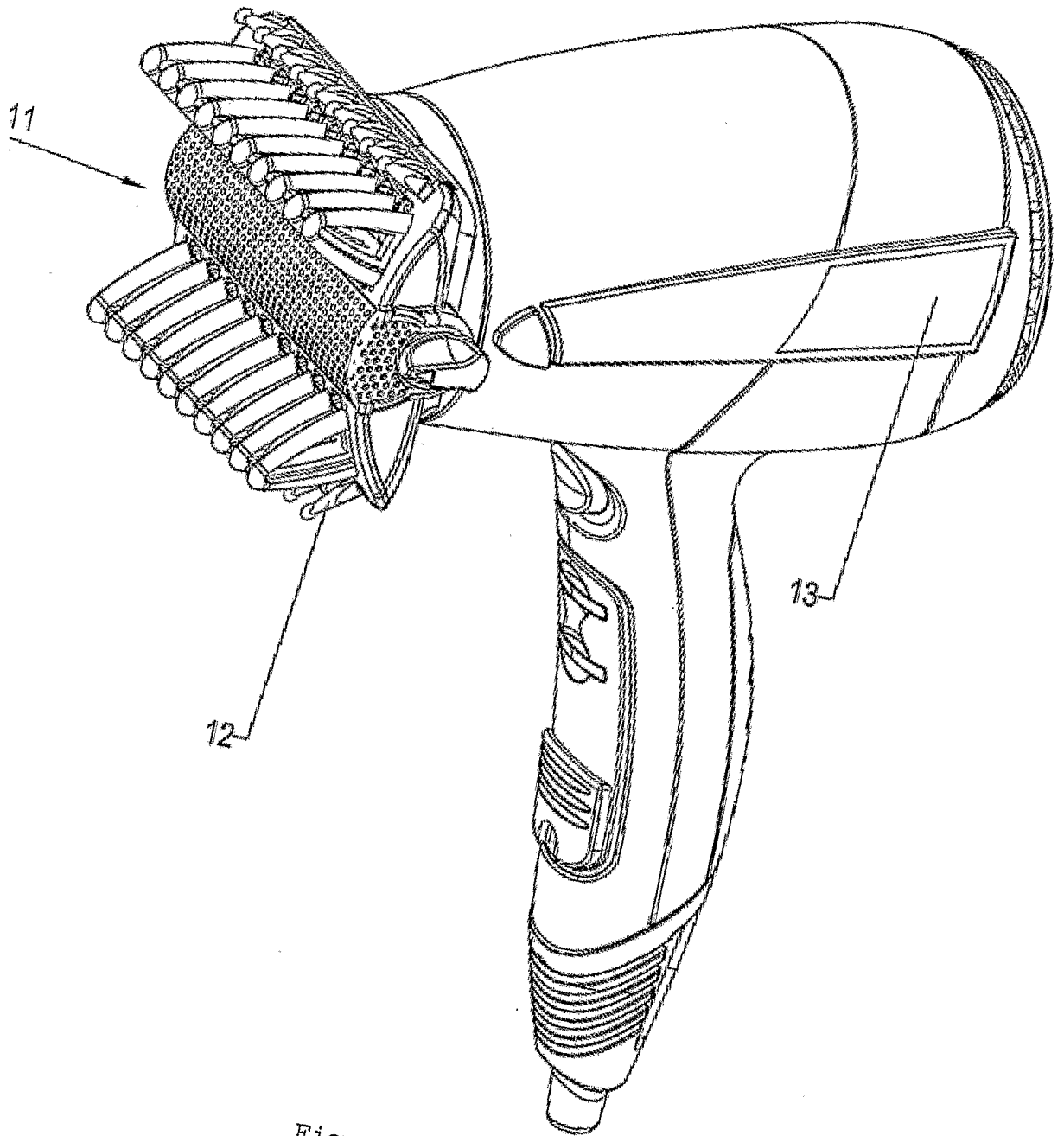


Fig. 7

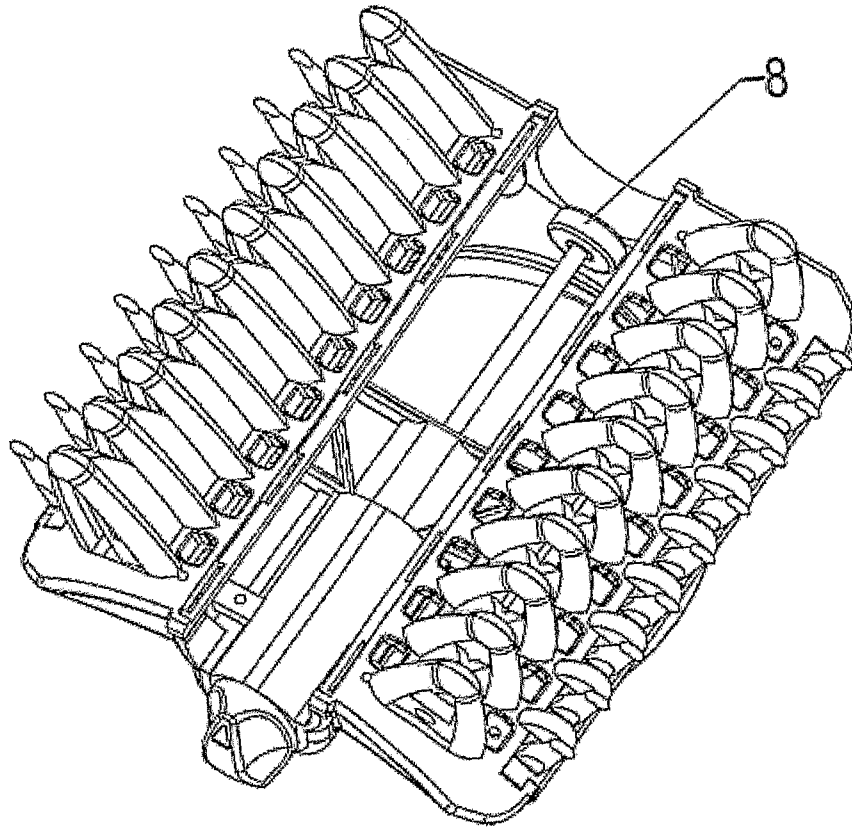


Fig. 8

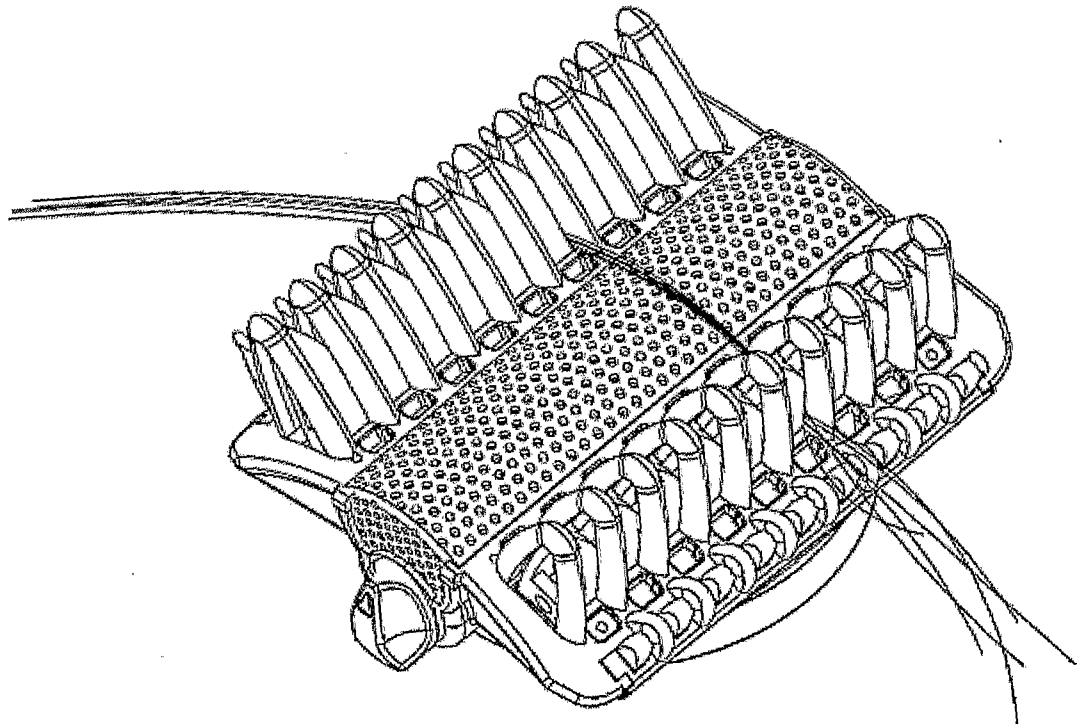


Fig. 9

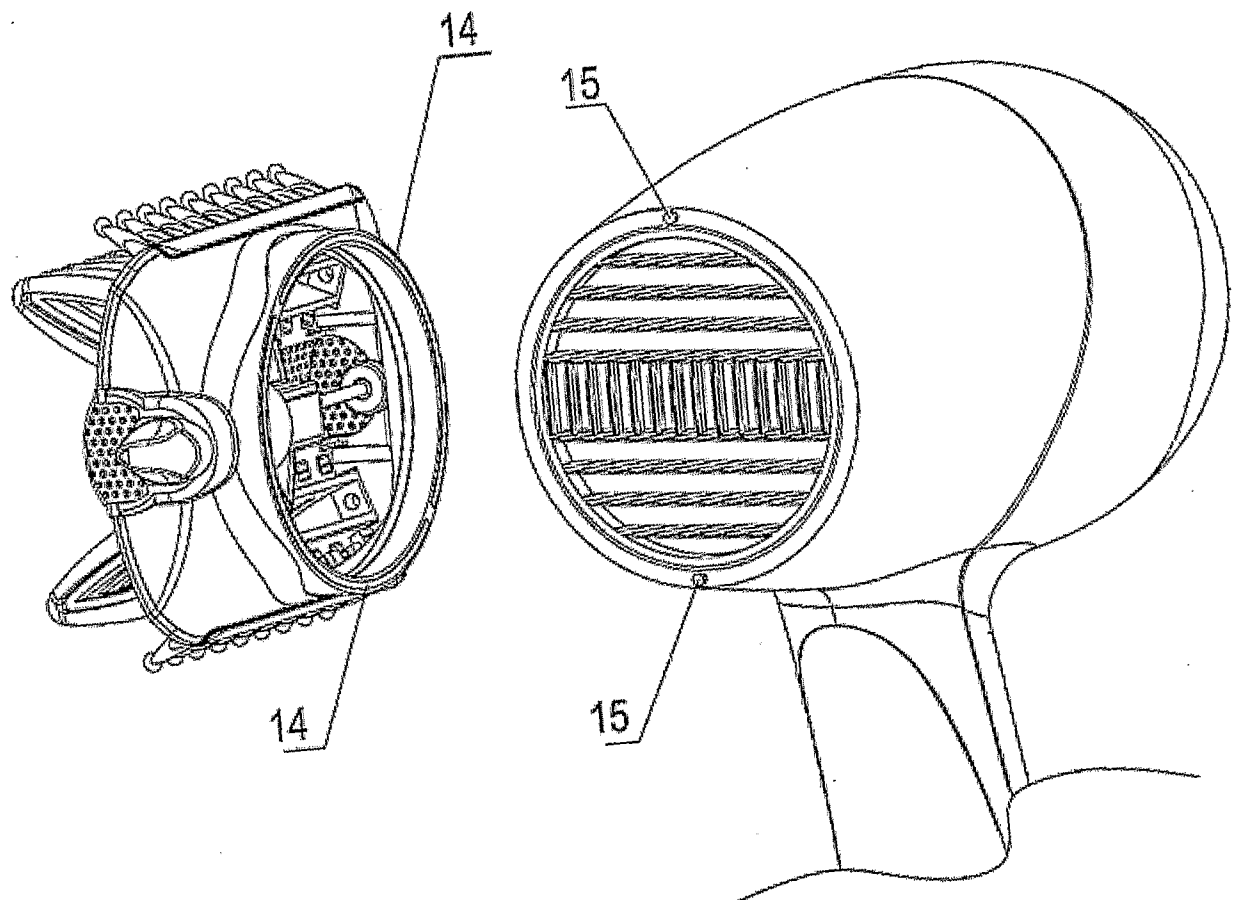


Fig. 10

## INTERNATIONAL SEARCH REPORT

International application No

PCT/BE2006/000107

A. CLASSIFICATION OF SUBJECT MATTER  
INV. A45D2/00

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)  
A45D

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 practical, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                | Relevant to claim No. |
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/BE2006/000107

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