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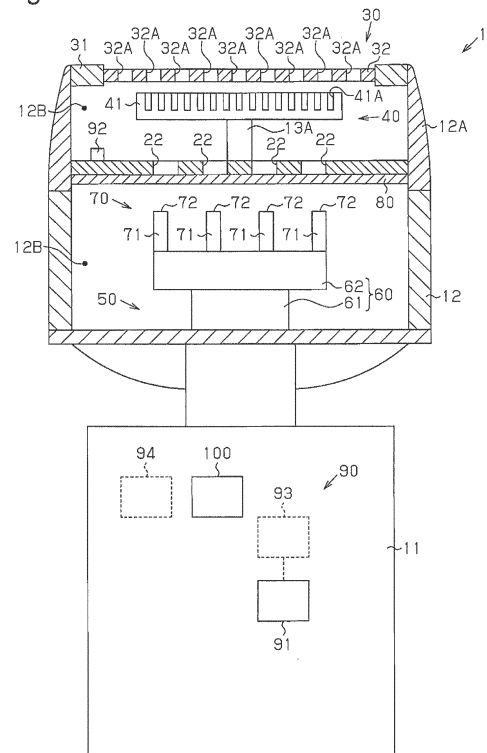
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(54) **ELECTRIC SHAVER**

(57) This electric shaver (1) includes: a head part (12); an outer cutter (32) supported by the head part (12), and having outer cutter holes (32A) for introducing hairs to the interior of the head part (12); an inner cutter (41) accommodated within the head part (12), for cooperating with the outer cutter (32) to cut hairs introduced through the outer cutter holes (32A); and a hair softening part (50). The hair softening part (50) includes a steam generator (60) for generating steam, and a steam ejection passage (71) communicating with the steam generator (60) to allow steam generated in the steam generator (60) to flow therethrough, and having an ejection port (72). The ejection port (72) is situated inside the head part (12), and communicates with the outside of the electric shaver (1) through the outer cutter holes (32A).

Fig.2



Description

[0001] The present invention relates to an electric shaver.

[0002] Patent Document 1 (Japanese Laid-Open Patent Publication No. 2009-261627) discloses one example of a conventional electric shaver. As shown in Fig. 6, an electric shaver 200 of Patent Document 1 includes a shaver body 300 and a steam generator 400. The shaver body 300 includes a head 310, outer blades 320, inner blades (not shown), and a grip 330. The head 310 supports the outer blades 320. The head 310 accommodates the inner blades. The inner blades oscillate relative to the outer blades 320 in the head 310. When the outer blades 320 are pressed against a user's skin 500, the inner blades cut whiskers that are drawn in from outer blade holes of the outer blades 320. The grip 330 supports the head 310.

[0003] The electric shaver 200 includes the steam generator 400 that is separated from the head 310. The steam generator 400 includes a device body 410 and ejection holes 420. The device body 410, which is coupled to the grip 330, generates steam by heating water. The ejection holes 420 are formed at one end of the device body 410. The steam generated by the device body 410 is ejected from the ejection holes 420 toward the user's skin 500. This softens the user's whiskers.

[0004] When the outer blades 320 are pressed against a first skin position of the skin 500, the ejection holes 420 oppose a second skin position, which is separated from the first skin position. When the outer blades 320 are pressed against the first skin position, the ejection holes 420 of the steam generator 400 do not eject steam toward the whiskers at the first skin position. Thus, it is difficult for the electric shaver 200 to soften the whiskers. This problem is not limited to when the hair shaved by the electric shaver 200 is whiskers.

[0005] It is an object of the present invention to provide an electric shaver that is capable of softening hair.

[0006] An electric shaver according to one embodiment of the present invention includes a head, an outer blade, an inner blade, and a hair softening unit. The outer blade is supported by the head. The outer blade includes an outer blade hole that draws hair into the head. The inner blade is accommodated in the head. The inner blade cuts the hair drawn in from the outer blade hole in cooperation with the outer blade. The hair softening unit includes a hair softening fluid generator and an ejection passage. The hair softening fluid generator is arranged inside or outside the electric shaver. The hair softening fluid generator generates hair softening fluid. The ejection passage is in communication with the hair softening fluid generator and includes an ejection hole. The hair softening fluid generated by the hair softening fluid generator flows through the ejection passage, and the ejection hole is located in the head in communication through the outer blade hole with an outside of the electric shaver.

[0007] In this structure, the ejection hole is located in

the head in communication through the outer blade hole with an outside of the electric shaver. Thus, the hair softening fluid generated by the hair softening fluid generator is released into the head through the ejection hole and released to the outside through the outer blade holes. For example, the electric shaver is capable of releasing the hair softening fluid from the outer blade hole of the outer blade to a first skin position when the outer blade is pressed against the first skin position. Accordingly, the electric shaver softens hair at the first position immediately before or when cutting the hair.

[0008] In one example, the electric shaver includes a grip that supports the head, and the hair softening fluid generator is accommodated in the head or in the grip.

[0009] In one example, the electric shaver includes an inner blade support plate fixed to an interior portion of the head. The inner blade support plate includes support plate holes. The ejection hole is in communication with the outside of the electric shaver through the support plate holes and the outer blade hole.

[0010] In one example, the electric shaver includes a drive unit coupled to the inner blade to oscillate the inner blade relative to the inner blade support plate and the outer blade. The inner blade support plate includes an inner blade movement region, which corresponds to an oscillation stroke of the inner blade in a plan view of the inner blade support plate, and a non-inner blade movement region, which excludes the inner blade movement region. The support plate holes in the inner blade movement region are larger in number than the support plate holes in the non-inner blade movement region.

[0011] In one example, the electric shaver includes a drive unit coupled to the inner blade. The drive unit oscillates the inner blade relative to the inner blade support plate and the outer blade. The inner blade support plate includes an inner blade movement region, which corresponds to an oscillation stroke of the inner blade in a plan view of the inner blade support plate, and a non-inner blade movement region, which excludes the inner blade movement region. The support plate holes are formed only in the inner blade movement region of the inner blade support plate.

[0012] In one example, the hair softening unit includes a water-resistant moisture permeable film, and the water-resistant moisture permeable film is arranged inside the head at least in between the ejection hole and the outer blade hole or on the ejection passage.

[0013] In one example, the hair softening fluid generator includes a steam generator that generates steam serving as the hair softening fluid or a mist generator that generates mist serving as the hair softening fluid.

[0014] In one example, the hair softening fluid generator includes a water reservoir and a heating unit, which heats water stored in the water reservoir, and the hair softening unit includes a temperature regulator that regulates temperature of steam generated when the heating unit heats water.

[0015] In the present invention, it is possible to obtain

an electric shaver that is capable of softening hair.

Fig. 1 is an exploded perspective view showing one embodiment of an electric shaver.

Fig. 2 is a schematic cross-sectional view showing the electric shaver taken along line D2-D2 in Fig. 1. Fig. 3 is a plan view showing an inner blade support plate and inner blades.

Fig. 4 is a block diagram showing an electric circuit of the electric shaver.

Fig. 5 is a schematic cross-sectional view showing a steam generator that generates steam.

Fig. 6 is a side view showing a conventional electric shaver.

[0016] One embodiment of an electric shaver 1 will now be described with reference to Fig. 1.

[0017] The electric shaver 1 includes a shaver body 10, an outer blade unit 30, an inner blade unit 40, and a hair softening unit 50. For example, the electric shaver 1 may be an oscillation-type electric shaver that oscillates the inner blade unit 40 relative to the outer blade unit 30.

[0018] The shaver body 10 includes a grip 11, a head 12, a drive unit 13, a power switch 14, and an inner blade support plate 20. In the following description, the longitudinal direction refers to the longitudinal direction in a front view of the shaver body 10 (refer to Fig. 1). Further, the widthwise and depthwise directions refer to the widthwise and depthwise directions in an upper plan view of the shaver body 10 (refer to Fig. 3).

[0019] The head 12 is coupled to the grip 11. The head 12 includes a head case 12A, which supports the outer blade unit 30. An accommodation cavity 12B is defined in the head case 12A. The head case 12A accommodates the inner blade unit 40.

[0020] The drive unit 13 oscillates/reciprocates the inner blade unit 40 in the widthwise direction. The drive unit 13 includes a drive source (not shown) and a drive shaft 13A. The drive source may be, for example, a linear motor. The drive source may be accommodated in one or both of the grip 11 and the head 12. The drive shaft 13A is coupled to the drive source and the inner blade unit 40. The drive shaft 13A projects into the accommodation cavity 12B. The power switch 14 is arranged, for example, on the front of the grip 11.

[0021] The inner blade support plate 20 includes support plate holes 22. The inner blade support plate 20 supports the inner blade unit 40. The inner blade support plate 20 is arranged in the accommodation cavity 12B. The inner blade support plate 20 is fixed to the inner wall of the head 12. The inner blade support plate 20 includes support plate holes 22.

[0022] The outer blade unit 30 includes an outer blade support 31 and outer blades 32. The outer blade support 31 supports the outer blades 32. The outer blade support 31 is coupled to the head case 12A.

[0023] The outer blades 32 are coupled to the outer blade support 31. The outer blades 32 each include outer

blade holes 32A. Each blade hole 32A is large enough to draw whiskers into the accommodation cavity 12B.

[0024] The inner blade unit 40 oscillates relative to the outer blade unit 30 to cut hair. The inner blade unit 40 includes inner blades 41. The inner blades 41 are coupled to the drive unit 13. The inner blades 41 may each include slit holes 41A.

[0025] The hair softening unit 50 ejects steam toward the user's whiskers through the outer blade holes 32A. The steam may be generated by heating water. The steam generated by the hair softening unit 50 is cooled by the air into fine water droplets on the user's whiskers.

[0026] In the example shown in Fig. 2, the hair softening unit 50 includes a steam generator 60, which serves as a hair softening fluid generator, and an ejector 70.

[0027] The steam generator 60 is arranged in the accommodation cavity 12B of the head 12. The steam generator 60 includes a heater 61 and a tank 62.

[0028] The heater 61 heats the water stored in the tank 62. The heater 61 is closer to the grip 11 in the longitudinal direction than the tank 62. The heater 61 is in contact with the tank 62. The heater 61 corresponds to a heating unit.

[0029] The tank 62 stores water. The tank 62 can be removed from the accommodation cavity 12B and out of the electric shaver 1. The tank 62 corresponds to a water reservoir.

[0030] The ejector 70 functions to eject, toward the longitudinally upper side, the steam generated when the heater 61 heats the tank 62. The ejector 70 includes ejection passages 71 and ejection holes 72. The ejection passages 71 are fixed to the tank 62.

[0031] Steam flows through each ejection passage 71. Each ejection hole 72 may be an opening formed in a distal end of the ejection passage 71. The ejection holes 72 are located in the accommodation cavity 12B. The ejection holes 72 are in communication with an outside of the electric shaver 1 through the support plate holes 22 and the outer blade holes 32A. In the illustrated example, in the head 12, the ejection holes 72 are located below the inner blades 41.

[0032] The hair softening unit 50 may include a water-resistant moisture permeable film 80, a temperature regulator 90, and a steam switch 100. For example, the water-resistant moisture permeable film 80 may be applied to the inner blade support plate 20. In the illustrated example, the water-resistant moisture permeable film 80 is applied to the lower surface of the inner blade support plate 20. The water-resistant moisture permeable film 80 may be a microporous film. The water-resistant moisture permeable film 80 includes micro-holes (not shown). For example, the micro-holes have a diameter of 0.3 μm or less. In this case, liquid droplets (for example, water vapor) having a diameter that is less than 0.3 μm permeate the water-resistant moisture permeable film 80.

[0033] The temperature regulator 90 includes a temperature regulation dial 91, a heat detector 92, a thermostat 93, and a power supply 94. The temperature regu-

lation dial 91 is arranged on the grip 11 (refer to Fig. 1). The temperature regulation dial 91 indicates the temperature of the steam. The temperature regulation dial 91 may be configured to, for example, indicate the temperature from 40°C or greater to less than 70°C.

[0034] The heat detector 92 is fixed to the inner blade support plate 20. The heat detector 92 detects the temperature of the accommodation cavity 12B. The heat detector 92 is electrically connected to the thermostat 93.

[0035] The thermostat 93 may be, for example, a liquid expansion thermostat. The thermostat 93 includes an expansion diaphragm (not shown). The expansion diaphragm expands and contracts in accordance with the temperature detected by the heat detector 92 and switches the electrical connection of the power supply 94 and the heater 61. The expansion diaphragm is connected to the temperature regulation dial 91.

[0036] The power supply 94 supplies power to the heater 61.

[0037] The steam switch 100 electrically connects and disconnects the power supply 94 and the heater 61. The steam switch 100 is arranged on the surface of the grip 11 (refer to Fig. 1).

[0038] The inner blade support plate 20 will now be described in detail with reference to Fig. 3.

[0039] The inner blade support plate 20 includes an inner blade movement region 21A, which corresponds to the oscillation stroke of the inner blades 41 in a plan view of the inner blade support plate 20, and non-inner blade movement regions 21B, which are located outside the inner blade movement region 21A.

[0040] The inner blade movement region 21A is continuous with the non-inner blade movement regions 21B. The non-inner blade movement regions 21B include the two widthwise ends of the inner blade support plate 20.

[0041] The number of support plate holes 22 in the inner blade movement region 21A is larger than the number of support plate holes 22 in the non-inner blade movement regions 21B. In the illustrated example, the inner blade movement region 21A includes twelve support plate holes 22, and the non-inner blade movement regions 21B include four support plate holes 22.

[0042] The electric circuit of the hair softening unit 50 will now be described with reference to Fig. 4.

[0043] The power supply 94 is electrically connected to the steam switch 100. The steam switch 100 is electrically connected to the thermostat 93. The thermostat 93 is electrically connected to the steam switch 100, the temperature regulation dial 91, the heat detector 92, and the heater 61. The heater 61 is electrically connected to the thermostat 93 and the power supply 94.

[0044] The operation of the electric shaver 1 will now be described with reference to Figs. 1 to 5.

[0045] The power switch 14, which is turned on by the user, supplies power to the drive unit 13. As a result, the drive unit 13 oscillates the inner blade unit 40 relative to the outer blade unit 30.

[0046] When the steam switch 100 is turned on, power

is supplied from the power supply 94 to the heater 61. The heater 61 heats the water stored in the tank 62. This generates steam in the tank 62.

[0047] The generated steam flows from the tank 62 through the ejection passages 71 and is released from the ejection holes 72 into the accommodation cavity 12B. The steam released in the accommodation cavity 12B permeates the support plate holes 22 and then rises. The steam that passes through the support plate holes 22 is released to the outside through the outer blade holes 32A.

[0048] The heat detector 92 detects the temperature of the accommodation cavity 12B. The expansion diaphragm expands as the temperature of the accommodation cavity 12B increases. When the temperature of the accommodation cavity 12B exceeds the temperature set by the temperature regulation dial 91, the expansion diaphragm electrically disconnects the heater 61 from the power supply 94. This interrupts the supply of power from the power supply 94 to the heater 61. Thus, heating performed by the heater 61 is interrupted. The amount of steam generated from the tank 62 gradually decreases, and the generation of steam eventually stops. This gradually decreases the temperature of the accommodation cavity 12B. As the temperature of the accommodation cavity 12B decreases, the expansion diaphragm contracts. When the temperature of the accommodation cavity 12B decreases to the temperature set by the temperature regulation dial 91, the expansion diaphragm electrically connects the power supply 94 to the heater 61. Accordingly, the heater 61 heats the water in the tank 62 so that steam is generated from the tank 62.

[0049] The electric shaver 1 has the advantages described below.

(1) The ejection holes 72 of the electric shaver 1 are arranged in the head 12 and are in communication with an outside of the electric shaver 1 through the outer blade holes 32A. The steam generated by the steam generator 60 is ejected into the head 12 (accommodation cavity 12B) through the ejection holes 72 and out of the electric shaver 1 through the outer blade holes 32A. The electric shaver 1 is capable of releasing steam from the outer blade holes 32A of the outer blade 32 to a first skin position when the outer blade 32 is pressed against the first skin position. Accordingly, the electric shaver 1 softens hair at the first position with steam immediately before or when cutting the hair.

(2) The electric shaver 1 includes the steam generator 60. The temperature of the steam generator 60 may become high depending on the temperature set by the temperature regulation dial 91. The steam generator 60 of the electric shaver 1 is accommodated in the accommodation cavity 12B and is not exposed to the outside from the shaver body 10. Thus, the electric shaver 1 limits situations in which the high-temperature steam generator 60 comes into

contact with the user's skin.

(3) The electric shaver 1 includes the inner blade support plate 20. The inner blade support plate 20 includes the support plate holes 22. The ejection holes 72 are in communication with the outside of the electric shaver 1 through the support plate holes 22 and the outer blade holes 32A. Thus, the steam ejected from the ejection holes 72 flows through the support plate holes 22 and moves to the outer blade holes 32A.

The inner blade support plate 20 of the electric shaver 1 includes the support plate holes 22. The electric shaver 1 decreases situations in which the support plate holes 22 are all blocked by cut whiskers as compared to a referential example that includes a single support plate hole 22. This prevents or reduces situations in which steam cannot pass through the inner blade support plate 20 and rise toward the outer blade holes 32A.

(4) During use of the electric shaver 1, when the user tilts the shaver body 10, the steam generated by the steam generator 60 may collect on the inner wall of the head case 12A. This may decrease the amount of steam released from the outer blade holes 32A. In the present embodiment, the support plate holes 22 are formed in the inner blade movement region 21A and the non-inner blade movement regions 21B of the inner blade support plate 20. This limits reductions in the amount of steam released from the outer blade holes 32A out of the electric shaver 1 even when the shaver body 10 is tilted during use of the electric shaver 1.

(5) The hair softening unit 50 includes the water-resistant moisture permeable film 80 located between the ejection holes 72 and the outer blade holes 32A. In one example, the water-resistant moisture permeable film 80 is applied to the lower surface of the inner blade support plate 20. This prevents or limits situations in which water from the tank 62 leaks out of the electric shaver 1 through the outer blade holes 32A.

(6) The temperature regulator 90 regulates the heating temperature of the heater 61. Accordingly, the electric shaver 1 is capable of ejecting, toward the user's skin, steam at a temperature in accordance with the user's preference.

[0050] The embodiment may be modified as described below.

[0051] The hair softening unit 50 may be arranged in the grip 11 or outside the shaver body 10. For example, the ejection passages 71 may be arranged so that the steam generator 60 in the grip 11 is in communication with the ejection holes 72 in the head 12.

[0052] The steam generator 60, which serves as a hair softening fluid generator, generates steam that serves as hair softening fluid. However, the hair softening fluid generator may generate hair softening fluid that is not

steam. For example, the hair softening fluid generator may include a mist generator that generates mist having a larger molecular weight than steam.

[0053] The tank 62 of the present embodiment may store liquid other than water such as liquid alcohol. In this case, the hair softening fluid generator may be configured to generate alcohol vapor or alcohol mist.

[0054] The ejector 70 is arranged outside the steam generator 60. Instead, the ejector 70 may be arranged, for example, in the steam generator 60.

[0055] The ejection holes 72 do not have to be arranged below the inner blade support plate 20 in the longitudinal direction of the electric shaver 1. For example, the ejection holes 72 may be arranged above the inner blade support plate 20 in the longitudinal direction of the electric shaver 1.

[0056] The electric shaver 1 of the embodiment is not limited to an oscillation/reciprocation-type electric shaver. For example, the electric shaver 1 may be a rotary electric shaver.

[0057] The electric shaver 1 of the embodiment may cut hair other than whiskers.

[0058] The number of the outer blades 32 is not limited to five. The number of the outer blades 32 may be one to four. Alternatively, the number of the outer blades 32 may be six or more.

[0059] The ejection holes 72 do not have to be directed upward as shown in the illustrated example. The ejection holes 72 may be directed diagonally upward or sideward.

[0060] The accommodation cavity 12B of the head 12 does not have to be divided into an upper chamber and a lower chamber as shown in the illustrated example. Further, the accommodation cavity 12B does not have to be partitioned.

[0061] The water-resistant moisture permeable film 80 may be arranged on the ejection passages 71.

[0062] Some of the modified examples may be combined with each other as long as technical contradictions do not occur.

[0063] The subject matter of the present invention may be included in fewer features than all of the disclosed features of the specific embodiments. Accordingly, the claims are incorporated in the detailed description and each claim may assert itself as separate embodiment. The scope of the present invention and equivalence of the present invention are to be understood with reference to the appended claims.

Claims

1. An electric shaver comprising:

a head;
an outer blade supported by the head, wherein the outer blade includes an outer blade hole that draws hair into the head;
an inner blade accommodated in the head,

wherein the inner blade is configured to cut the hair drawn in from the outer blade hole in cooperation with the outer blade; and
a hair softening unit including:

a hair softening fluid generator arranged inside or outside the electric shaver, wherein the hair softening fluid generator is configured to generate hair softening fluid; and an ejection passage that is in communication with the hair softening fluid generator and includes an ejection hole, wherein the hair softening fluid generated by the hair softening fluid generator flows through the ejection passage, and the ejection hole is located in the head in communication through the outer blade hole with an outside of the electric shaver.

2. The electric shaver according to claim 1, wherein the electric shaver includes a grip that supports the head, and
the hair softening fluid generator is accommodated in the head or in the grip.
3. The electric shaver according to claim 1 or 2, further comprising an inner blade support plate fixed to an interior portion of the head, wherein the inner blade support plate includes support plate holes, wherein the ejection hole is in communication with the outside of the electric shaver through the support plate holes and the outer blade hole.
4. The electric shaver according to claim 3, further comprising a drive unit coupled to the inner blade to oscillate the inner blade relative to the inner blade support plate and the outer blade, wherein the inner blade support plate includes an inner blade movement region, which corresponds to an oscillation stroke of the inner blade in a plan view of the inner blade support plate, and a non-inner blade movement region, which excludes the inner blade movement region, and
the support plate holes in the inner blade movement region are larger in number than the support plate holes in the non-inner blade movement region.
5. The electric shaver according to claim 3, further comprising a drive unit coupled to the inner blade, wherein the drive unit oscillates the inner blade relative to the inner blade support plate and the outer blade, wherein the inner blade support plate includes an inner blade movement region, which corresponds to an oscillation stroke of the inner blade in a plan view of the inner blade support plate, and a non-inner blade movement region, which excludes the inner blade movement region, and

only the inner blade movement region of the inner blade support plate includes the support plate holes.

6. The electric shaver according to any one of claims 1 to 5, wherein the hair softening unit includes a water-resistant moisture permeable film, and the water-resistant moisture permeable film is arranged inside the head at least in between the ejection hole and the outer blade hole or on the ejection passage.
7. The electric shaver according to any one of claims 1 to 6, wherein the hair softening fluid generator includes a steam generator that generates steam serving as the hair softening fluid or a mist generator that generates mist serving as the hair softening fluid.
8. The electric shaver according to any one of claims 1 to 7, wherein the hair softening fluid generator includes a water reservoir and a heating unit, which heats water stored in the water reservoir, wherein the hair softening unit includes a temperature regulator that regulates temperature of steam generated when the heating unit heats water.

Fig.1

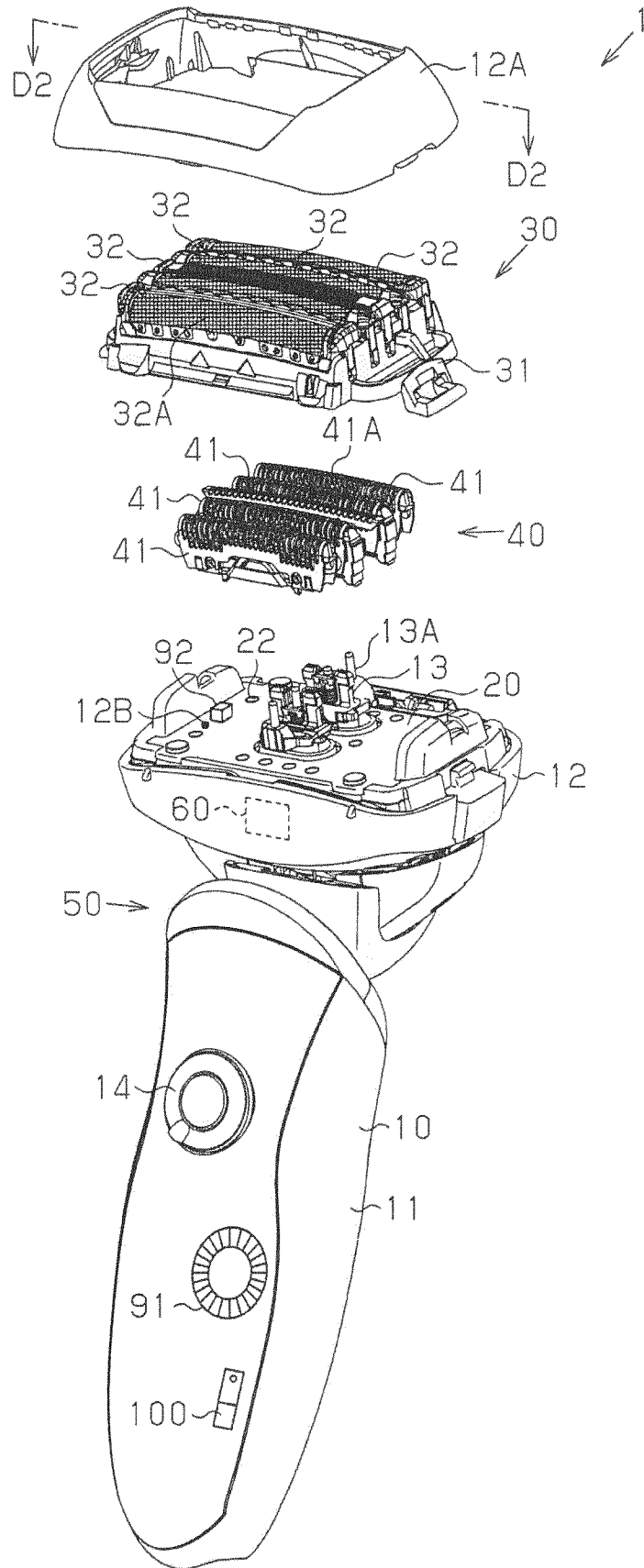


Fig.2

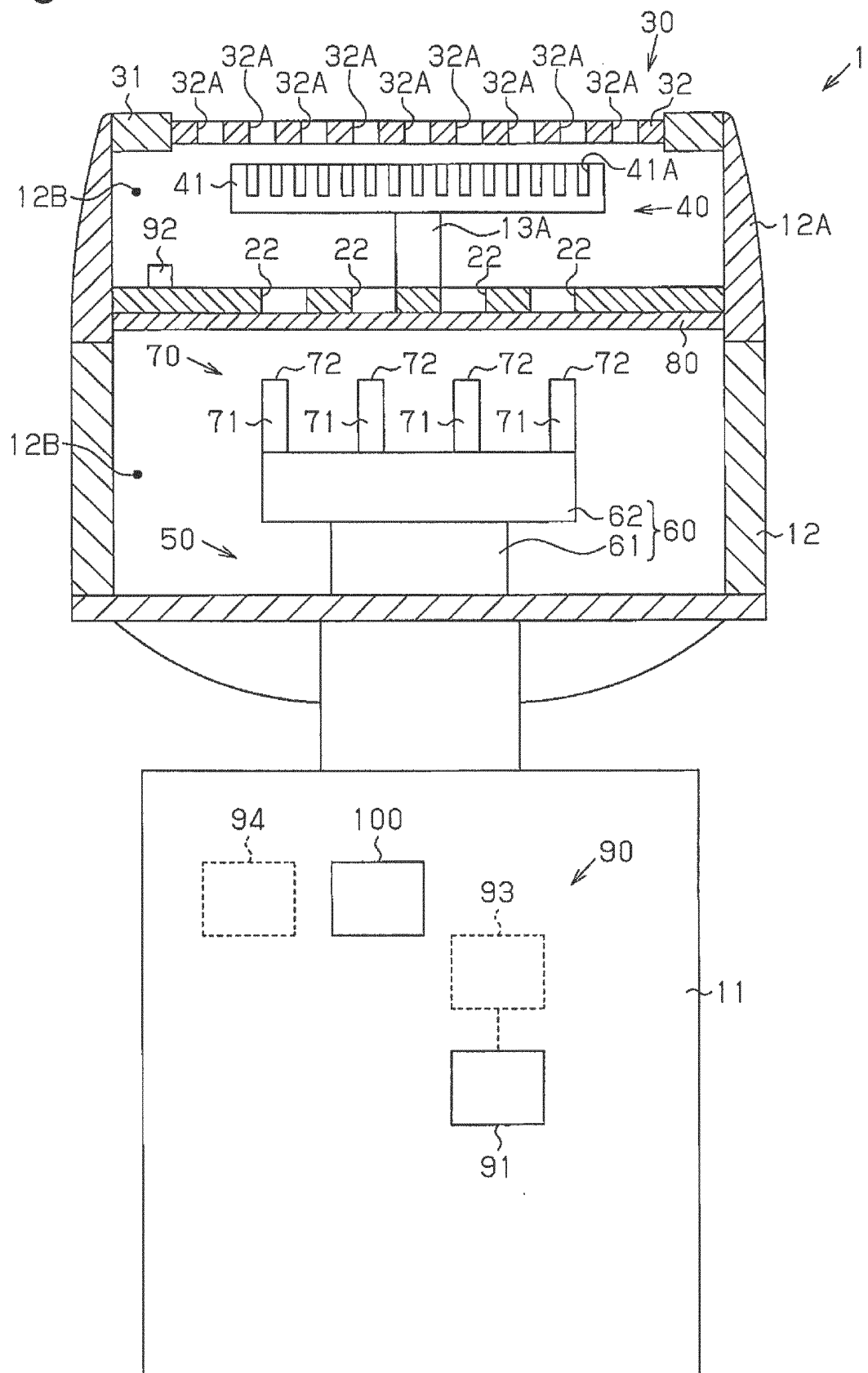


Fig.3

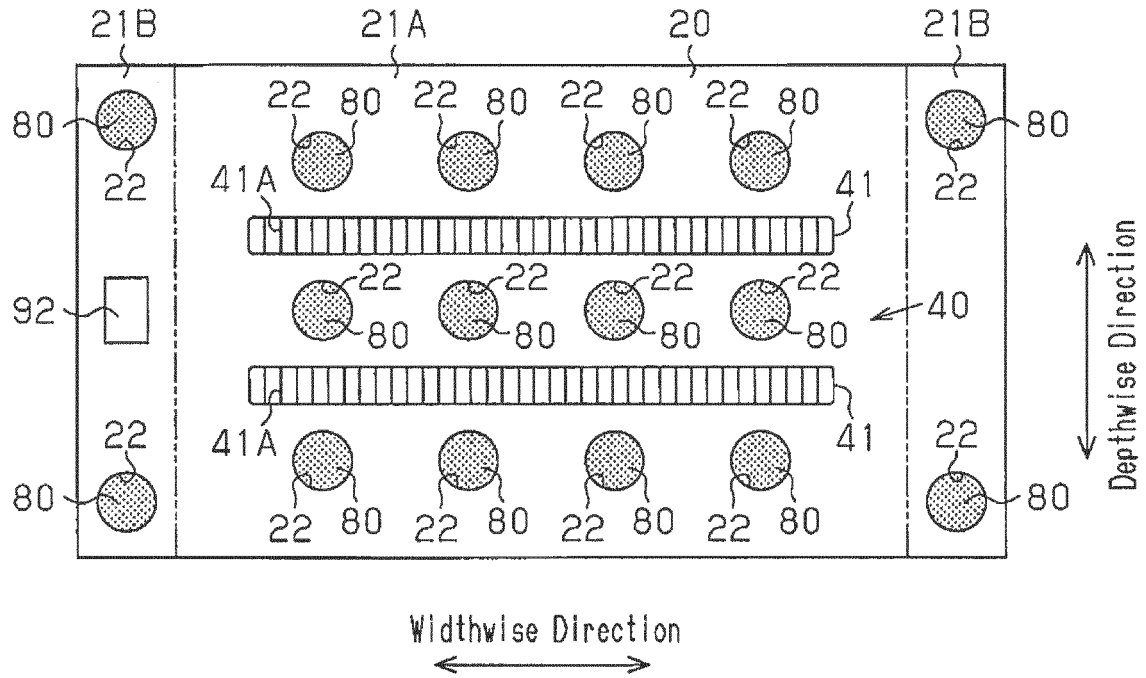


Fig.4

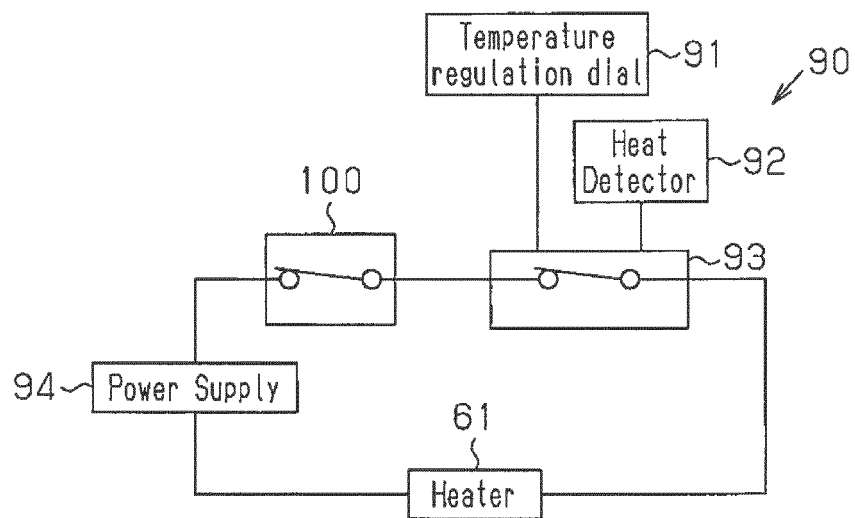


Fig.5

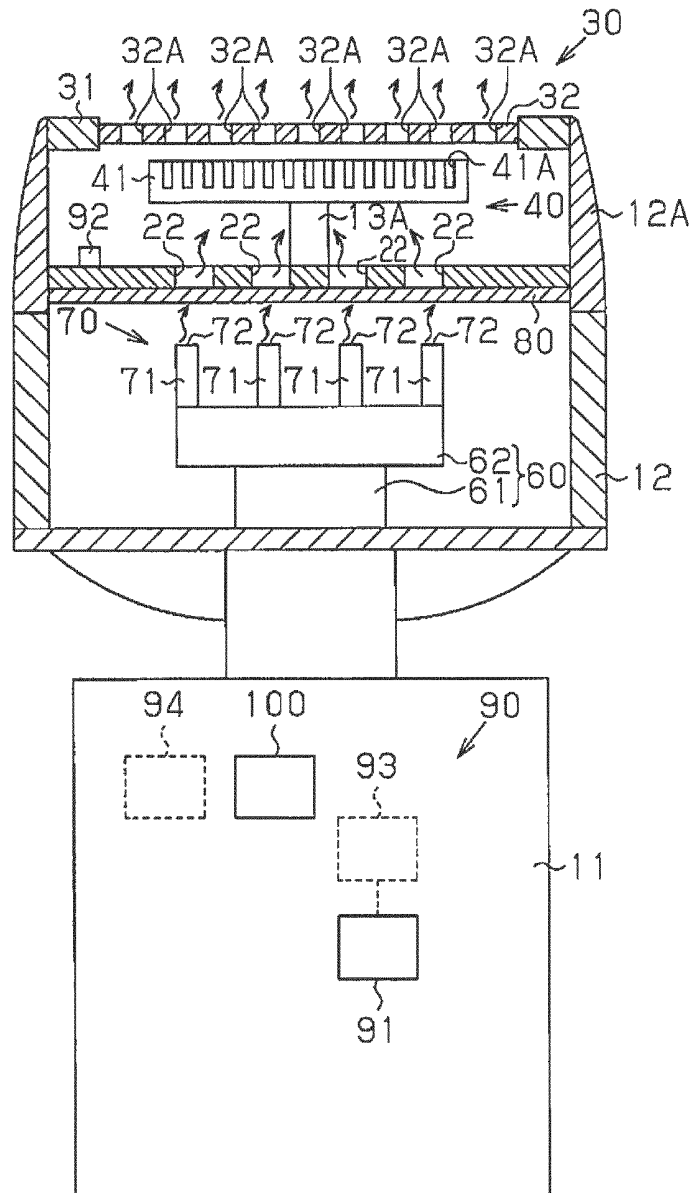
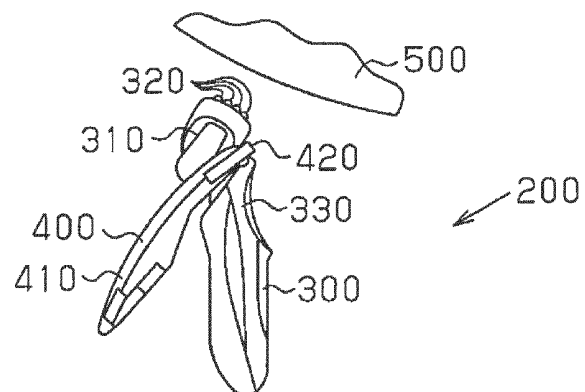


Fig.6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/001983

A. CLASSIFICATION OF SUBJECT MATTER

B26B19/42(2006.01)i, B26B19/04(2006.01)i

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)

B26B19/42, B26B19/04, B26B19/40

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2014

Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 1703785 A1 (Vollrath, Guenter Rudolf, 8500 Nuernberg), 09 March 1972 (09.03.1972), entire text; all drawings (Family: none)	1-8
A	WO 2007/037246 A1 (Matsushita Electric Works, Ltd.), 05 April 2007 (05.04.2007), paragraphs [0030] to [0043]; fig. 2 to 4 (Family: none)	1-8
A	JP 2003-525174 A (Braun GmbH), 26 August 2003 (26.08.2003), paragraphs [0019] to [0025]; all drawings & US 2001/0055510 A1 & WO 2000/048796 A1 & DE 19907224 A1 & CN 1334765 A	1-8

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

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Date of the actual completion of the international search
13 June, 2014 (13.06.14)Date of mailing of the international search report
24 June, 2014 (24.06.14)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/001983

C (Continuation). 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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A	JP 2009-261627 A (Panasonic Electric Works Co., Ltd.), 12 November 2009 (12.11.2009), entire text; all drawings (Family: none)	1-8

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REFERENCES CITED IN THE DESCRIPTION

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