

(43) International Publication Date  
20 March 2014 (20.03.2014)

## (51) International Patent Classification:

*A45D 26/00* (2006.01)

## (21) International Application Number:

PCT/IB2013/058459

## (22) International Filing Date:

11 September 2013 (11.09.2013)

## (25) Filing Language:

English

## (26) Publication Language:

English

## (30) Priority Data:

61/701,766 17 September 2012 (17.09.2012) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KN, KP, KR,

KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

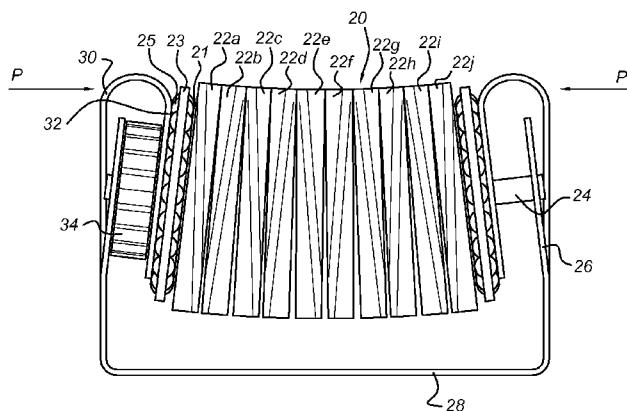
## Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

## Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

## (54) Title: EPILATING DEVICE

*Fig. 2*

## Epilating device

## BACKGROUND OF THE INVENTION

## FIELD OF THE INVENTION

The present invention relates to epilating devices and in particular to an improved epilating head construction having narrow support shoulders.

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## DESCRIPTION OF THE RELATED ART

Epilating devices of many different types are known for the purpose of removing unwanted hair from various regions of a user's body. The principles of operation vary greatly but amongst these devices, a sizeable subgroup operates through the use of 10 rotating tweezer-mechanisms which seize hairs and actively extract them from the skin/follicle. As the tweezer rotates further it releases the hair. In the present context, the term "tweezers" is used to denote an arrangement that is capable of opening and closing to grip and extract a hair or hairs.

One of the earliest devices of this type is the Epilady<sup>TM</sup> device, which uses the 15 rotation of a coil spring to capture and release hairs. Another device is disclosed in EP532106B1. That device uses rotating disks which are pivotable towards each other under the influence of a compression member. The rotating disks form a disk package and are carried by an axle which rotates between bearings carried by bearing support members at either end of the disk package. The compression member comprises roller members located 20 within the bearing support members. The drive mechanism for rotating the disk package is also located in the regions of the bearing support members, which may be referred to as the shoulders of the device.

Although the known devices may operate adequately in most circumstances, for accessing narrow regions, the width of the shoulders can be inconvenient. It would 25 therefore be desirable to produce an epilating device with relatively narrow shoulders. It would also be desirable to produce a device requiring fewer parts.

## BRIEF SUMMARY OF THE INVENTION

According to the invention there is provided an epilating device for removing hairs by pinching, pulling and releasing the hairs, the epilating device comprising a tweezer portion having an axis, first and second ends, and at least one pair of tweezer elements, the 5 tweezer portion being mounted to rotate about the axis during use and defining at least one pinching region at its circumference in which hairs may be pinched, a drive element, arranged to apply rotational motion to rotate the tweezer portion about the axis, first and second support elements for supporting the tweezer portion at its respective ends such that the tweezer portion can rotate with respect to the support elements and for applying a 10 pinching force to the pair of pinching elements in the pinching region, to induce pinching of the hairs at the pinching region, wherein at least the first support element comprises a mounting element for supporting the first end of the tweezer portion, a spring element arranged to generate the pinching force, and a bearing element arranged to transmit the pinching force to the rotating tweezer portion, wherein the mounting element, spring element 15 and bearing element are integrally formed as a single unitary support element. By forming the mounting element, spring element and bearing element as a unitary structure, the device may be reduced in size and its fabrication and structure significantly simplified. In general, the pinching force will be directed to act in a direction parallel to the axis. It will be understood by the skilled person that this need not be exactly parallel and there need only be 20 a component of the spring force acting in the direction parallel to the axis, sufficient to generate the required pinching force. In this context it may also be noted that for a curved axis, the pinching force may be generally parallel to the line joining the ends of the axis.

The unitary support element may be formed of any appropriate material, including moulded plastics and composites. In a preferred embodiment, the mounting 25 element comprises a metal plate provided with a locating structure for supporting the first end of the tweezer portion. The locating structures may be provided by apertures, blind holes, pins or any other suitable structure for locating the tweezer portion according to its required mode of operation. These may also be integrally formed from the same sheet although additional elements may be added as required. Such a support element formed of relatively 30 thin sheet metal can reduce the overall width of the shoulder regions, leading to a slim design that is easy to use in restricted regions. Since the spring element is unitary with the mounting element, the material used should be sufficiently resilient to perform the spring function required by the tweezer portion. In certain embodiments, this may require a spring force of around 10 N and a movement range of 1 mm or more. The skilled person will be well aware

of the variations required in these values and will be able to dimension the spring element and support element accordingly.

In one embodiment, the bearing element may comprise a washer, mounted concentrically with respect to the locating structure, and the spring element comprises a 5 spring arm connecting the washer to the support element. The washer may be substantially annular or may be C-shaped, forming only part of a circle. The washer may serve as a bearing surface on which a bearing structure on the side of the tweezer element may bear. In one embodiment, the tweezer element may be provided with ball bearings or the like supported by a bearing cage. The ball bearings can bear against the bearing element, which 10 may be provided with a bearing race if required.

According to one preferred embodiment of the invention the drive element comprises a gear wheel mounted between the mounting element and the bearing element at the first end of the tweezer portion. The gear wheel may be mounted to the tweezer portion for rotation therewith and may be engaged by another gear driven from a suitable drive 15 motor. The gear wheel may be smaller in diameter than the bearing element and locate within the latter, allowing for a more compact design. Most preferably, the gear wheel bears against the mounting element to guide its rotation and prevent wobbling motion that may be transmitted from the tweezer portion.

According to the particular design and mode of operation, the second support 20 element may be symmetrical to the first support element and may comprise an integral bearing element, spring element and mounting element. In this context, symmetrical need not require both support elements to be identical, merely that both provide the above mentioned structures in a similar manner.

In an alternative arrangement, the second support element comprises a flat 25 plate having a locating structure for supporting the second end of the tweezer portion and having a bearing surface. A single spring element may be sufficient to apply the necessary pinching force and movement and the resulting structure may allow for a still narrower shoulder on one side. Such a configuration may be applicable particularly in cases where the drive element is located to engage at only one side of the tweezer portion.

As indicated above, the principle of operation and construction according to 30 the invention is applicable to all forms of tweezer portion that require the support and bearing functions as described. These may include devices with both rotating and fixed axles. Preferably, the tweezer portion is carried on a non-rotating shaft supported from the support

elements. In that case, locating structures to support the shaft may have a non-circular shape corresponding to the shape of the shaft ends.

The invention may also be applicable to devices in which the axis is either straight or curved. In a preferred embodiment, the axis is slightly curved. This may be 5 achieved by the use of a curved shaft, on which the tweezer portion is mounted for rotation.

In a still further preferred embodiment, the tweezer portion comprises a plurality of disks. The disks are preferably rigid, and may be formed of metal or ceramic material. Alternatively, a resilient disk structure may be considered. The disks may be individually rotatable with respect to each other or may be engaged together for rotation as a 10 single body. The skilled person is well aware of the various disk structures that may be employed and the advantages and benefits associated therewith. The first disk of the tweezer portion may be integrally formed with a bearing plate. This may be in the form of a bearing race along which ball bearings may roll to provide the bearing function. In that case, the ball bearings may be supported by a cage to roll between the bearing elements of the support 15 element and the bearing plates on the tweezer portion.

In a further preferred embodiment, two substantially planar bearing surfaces are provided at either side of the tweezer portion and the planar bearing surfaces are angled towards each other at an angle of between 5 degrees and 30 degrees. As the skilled person will understand, this angling of the bearing surfaces leads to the generation of the pinching 20 region, due to the tweezer portion being more compressed as the bearing surfaces approach one another.

In the preferred embodiment of the epilating device a head portion is provided surrounding the support elements and the tweezer portion, and defining an access opening to the pinching region. The head portion may be formed of moulded plastics material or the like 25 and may be otherwise conventional apart from the fact that the shoulder regions can be narrower than similar devices, due to the improved construction as described above.

The epilating device may further comprise a motor portion, comprising a motor and power supply, operatively arranged to engage and drive the drive element. The power supply may be a battery or a mains connection. The motor portion may be in the form 30 of a handle for gripping the device during use and may also be formed of plastics material. In a preferred embodiment, the motor portion may be detachable from the head portion for cleaning purposes, repair or interchangeability.

In one embodiment, the mounting element, the spring element, and the bearing element are integrally formed from a single plate-shaped member having at least one bent

portion. In a most preferred embodiment of the invention, both the first and second support elements are integrally formed from the single plate-shaped member. The first and second support elements may be mutually connected by a base plate, which is integrally formed from the single plate-shaped member and connected to the first and second support elements by

5 respective bent portions of the plate-shaped member. The epilating device may then comprise a tweezer portion and a U-shaped yoke in which the tweezer portion is mounted for rotation, the yoke being formed from a unitary sheet of metal having upstanding support elements for supporting an axle of the tweezer portion and at least one integrally-formed, spring-mounted bearing element for application of an axially directed pinching force to the tweezer portion.

10 The metal yoke may be formed of sheet metal material having sufficient strength to provide the necessary pinching force via the spring element. Preferably, the yoke may be manufactured by stamping and bending from a single sheet. Although the yoke may be a unitary structure, it is not excluded that regions of the yoke could undergo a particular treatment, e.g. heat treatment in order to locally improve their properties.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the invention will be appreciated upon reference to the following drawings of a number of exemplary embodiments, in which:

20 Figure 1 shows an epilating device according to a first embodiment of the present invention in perspective view;

Figure 2 shows a portion of the epilating device of Figure 1;

Figure 3 shows a perspective view of a yoke for the device of Figure 1;

Figure 4 shows a perspective view of a yoke for an epilating device according to a second embodiment of the invention;

25 Figure 5 shows the yoke of Figure 4 assembled to a tweezer portion;

Figure 6 shows a schematic cross-sectional view through an epilating device according to a third embodiment of the invention with a rod-based tweezer system; and

Figure 7 shows an alternative fourth embodiment of the invention having an enlarged opening between the tweezer portion and yoke.

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#### DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

Figure 1 shows a perspective view of an epilating device 1 according to a first embodiment of the invention. The epilating device 1 comprises a head portion 2 and a motor portion 4, which engage together. The head portion 2 has an access opening 6 in its forward

surface providing access to a pinching region 18 of a tweezer portion 20, which will be described in further detail below. The opening 6 is delimited on either side by shoulders 16. The tweezer portion 20 and the shoulders 16 together define the overall width of the epilating device.

5 The motor portion 4 houses a motor 8 having an output gear 11 and a rechargeable power supply 10, which can be charged through a jack 12. An on-off switch 14 is provided on the front face. The motor portion 4 has an ergonomic form for use as a handle.

10 Figure 2 shows in front elevation a portion of the epilating device 1 with the head portion 2 removed. As can be seen in Figure 2, the tweezer portion 20 comprises a plurality of disks 22A – 22J mounted together on a shaft 24. On either end of the tweezer portion 20 is mounted a bearing cage 23, carrying ball bearings 25. The first disk 22A and the last disk 22J each have a bearing plate 21 against which the ball bearings 25 may rotate.

15 The shaft 24 is supported at its ends from mounting elements formed by upstanding legs 26 of a metal frame or yoke 28. In this embodiment, the shaft 24 does not rotate with respect to the yoke 28. This is achieved by a form fit connection between these parts. Integrally formed with the yoke 28 is a pair of spring arms 30 which carry washers 32 at their ends. The washers 32 act as bearing elements to engage with the ball bearings 25 and bear against them due to a force of the spring arms 30. This force presses the disks 22 together with a pinching force P at the pinching region 18. Each of the disks 22 is free to 20 rotate around the axle 24. Nevertheless, due to their form and to the pinching force P, the disks 22 rotate together as a disk packet. The skilled person will be aware that this is merely one embodiment and that other alternative mechanisms could be used to similar effect. The first disk 22A is connected to a drive element in the form of a toothed cog 34 which extends along the shaft 24 beyond the washer 32 to a position between the washer 32 and the leg 26. 25 In use, the cog 34 is driven from the output gear 11 of the motor 10 through a number of intermediate stage gears (not shown). The cog 34 in turn drives the tweezer portion 20 in rotation about the shaft 24. Further details of the operation of the tweezer portion 20 can be found in WO2006/117755A1 the contents of which are incorporated herein by reference in their entirety.

30 Figure 3 shows the yoke 28 in perspective view without the tweezer portion 20. As can be seen, the yoke 28 is formed of a single plate-shaped member, e.g. a piece of sheet metal, that has been cut and bent or folded to form first and second support elements 21, 23 mutually connected by a base plate 29 and respective bent portions 31 of the same single plate-shaped member. The spring arms 30 and washers 32 are formed as part of the

first and second support elements 21, 23 respectively by further folds and cuts. Also visible in this view are locating holes 36 which retain the ends of the shaft 24 against axial and rotational movement. As a result of the invention, the manufacture of the epilating device is considerably simplified, since the three functions of supporting the axle, application of a 5 pinching force and providing a bearing may be combined into a single component.

Additionally, this is achieved while maintaining a relatively narrow shoulder on either side of the tweezer portion.

Figure 4 discloses a yoke 128 according to a second asymmetric embodiment of the invention in perspective view. Similar features to the first embodiment are denoted by 10 like references preceded by 100. According to the embodiment of Figure 4, the yoke 128 is provided with a washer 132 and spring arm 130 at one side only. At the other side of the yoke 128, the upstanding leg 126 is generally flat and provided with a locating hole 136 for receiving the shaft of a tweezer portion. In this embodiment, the upstanding leg 126 should have sufficient strength to provide the spring force P but the resilience or movement may 15 primarily be provided from one side by the spring arm 130. The portion of the leg 126 around the locating hole 136 serves as a bearing surface in the same manner as the washer 132.

Figure 5 shows in perspective view an epilating device 101 according to the second embodiment of the invention with the yoke 128 supporting a tweezer portion 120. The tweezer portion 120 is otherwise identical to that of the first embodiment of Figure 2 and 20 is not described further here. As can be seen, the cog 134 is located at the side of the yoke 128 corresponding to the washer 132 and spring arm 130. At the other end of the tweezer portion 120, the pinching force P is provided directly by the upstanding arm 126 at a position corresponding to the pinching region at which hairs will be gripped during use. The overall width of the shoulder construction is thus narrower still than in the first embodiment

25 Figure 6 shows a schematic cross-sectional view through an epilating device 201 according to a third embodiment of the invention which operates with a rod-based tweezer system. In this embodiment, similar features to the first and second embodiments are denoted by the same reference numerals preceded by 200.

According to Figure 6, a yoke 228 supports a tweezer portion 220. The yoke 30 228 is asymmetric and otherwise identical to that of the second embodiment of Figure 4, comprising a washer 232 and spring arm 230 at one side only. At the other side of the yoke 228, the upstanding leg 226 is generally flat and provided with a locating hole 236 for receiving a shaft 224 of the tweezer portion 220. The washer 232 and upstanding leg 226 are angled with respect to each other towards a pinching region 218.

In this embodiment, the tweezer portion 220 comprises an inner body 240 and an outer body 242 arranged to rotate together about the shaft 224 under the action of a cog 234. Actuating rods 244 extend through channels 246 within the inner body 240 and have cam surfaces 248 at their outermost extremities. Return springs 250 within the channels 246 5 bias the rods outwards such that the cam surfaces engage with washers 232 and upstanding leg 226 respectively. The outer body 242 is formed in three sections 242 A, B, C. The skilled person will recognize that further sections may also be provided. Sections 242A and 242C comprise fixed tweezer elements 252 at their outer circumference. Pivotal tweezer elements 254 are held between adjacent sections 242 A,B,C and are engageable with the 10 fixed tweezer elements 252. The pivotal tweezer elements 254 have inner ends 256 which engage with notches 258 formed in the rods 244.

The tweezer portion 220 according to the embodiment of Figure 6 is generally as described in EP 2008543 A1, and may operate as described therein. The contents of that disclosure are hereby incorporated by reference in their entirety. Accordingly, during 15 operation of the epilating device 201, the cog 234 causes rotation of the inner body 240 about the shaft 224. As the inner body 240 rotates, the cam surfaces 248 are biased inwards as they approach the pinching region 218. This bias causes inwards displacement of the actuating rods 244, which movement is transferred to the pivotal tweezer elements 254 by engagement of the inner ends 256 with notches 258. The pivotal tweezer elements 254 thus 20 engage with the fixed tweezer elements 252 to pinch hairs and, as the tweezer portion 220 rotates further, to pull them out.

Figure 7 shows in front elevation a portion of an epilating device according to a fourth embodiment of the invention. The embodiment of Figure 7 corresponds generally to that of Figure 2, and like elements are given like references preceded by 300. As in the first 25 embodiment, the tweezer portion 320 is mounted by shaft 324 from upstanding legs 326 of metal frame or yoke 328. In this embodiment, an enlarged space or opening is provided between the yoke 328 and the tweezer portion 320. This opening may be advantageous in allowing better access to the tweezer portion and improved cleaning.

Thus, the invention has been described by reference to certain embodiments 30 discussed above. It will be recognized that these embodiments are susceptible to various modifications and alternative forms well known to those of skill in the art. In particular, the construction of the tweezer portion may be distinct from the schematically illustrated design.

Many modifications in addition to those described above may be made to the structures and techniques described herein without departing from the spirit and scope of the

invention. Accordingly, although specific embodiments have been described, these are examples only and are not limiting upon the scope of the invention.

## CLAIMS:

1. An epilating device for removing hairs from skin by pinching, pulling and releasing the hairs, comprising:

5 a tweezer portion having an axis, first and second ends, and at least one pair of tweezer elements, the tweezer portion being mounted to rotate about the axis during use and defining at least one pinching region at its circumference in which hairs may be pinched;

10 a drive element, arranged to apply rotational motion to rotate the tweezer portion about the axis;

15 first and second support elements for supporting the tweezer portion at its respective ends such that the tweezer portion can rotate with respect to the support elements and for applying a pinching force to the pair of tweezer elements in the pinching region, to induce pinching of the hairs at the pinching region, wherein at least the first support element comprises:

20 a mounting element, for supporting the first end of the tweezer portion;

a spring element, arranged to generate the pinching force; and

25 a bearing element, arranged to transmit the pinching force to the rotating tweezer portion;

wherein the mounting element, spring element and bearing element are integrally formed as a single unitary support element.

2. The device according to claim 1, wherein the mounting element comprises a metal plate provided with a locating structure for supporting the first end of the tweezer portion.

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3. The device according to claim 2, wherein the bearing element comprises a washer, mounted concentrically with respect to the locating structure, and the spring element comprises an arm connecting the washer to the mounting element.

4. The device according to any preceding claim, wherein the drive element comprises a gear wheel mounted between the mounting element and the bearing element at the first end of the tweezer portion.

5 5. The device according to any preceding claim, wherein the second support element is symmetrical to the first support element and comprises an integral bearing element, spring element and mounting element.

10 6. The device according to any of claims 1 to 4, wherein the second support element comprises a flat plate having a locating structure for supporting the second end of the tweezer portion and having a bearing surface.

7. The device according to any preceding claim, wherein the tweezer portion is carried on a non-rotating shaft supported from the support elements.

15 8. The device according to any preceding claim, wherein the axis is curved.

9. The device according to any preceding claim, wherein the tweezer portion comprises a plurality of disks with tweezer elements formed between adjacent disks.

20 10. The device according to claim 9, wherein a first disk of the tweezer portion is provided with a bearing plate.

25 11. The device according to any preceding claim, comprising substantially planar bearing surfaces at either side of the tweezer portion and the planar bearing surfaces are angled towards each other at an angle of between 5 degrees and 30 degrees.

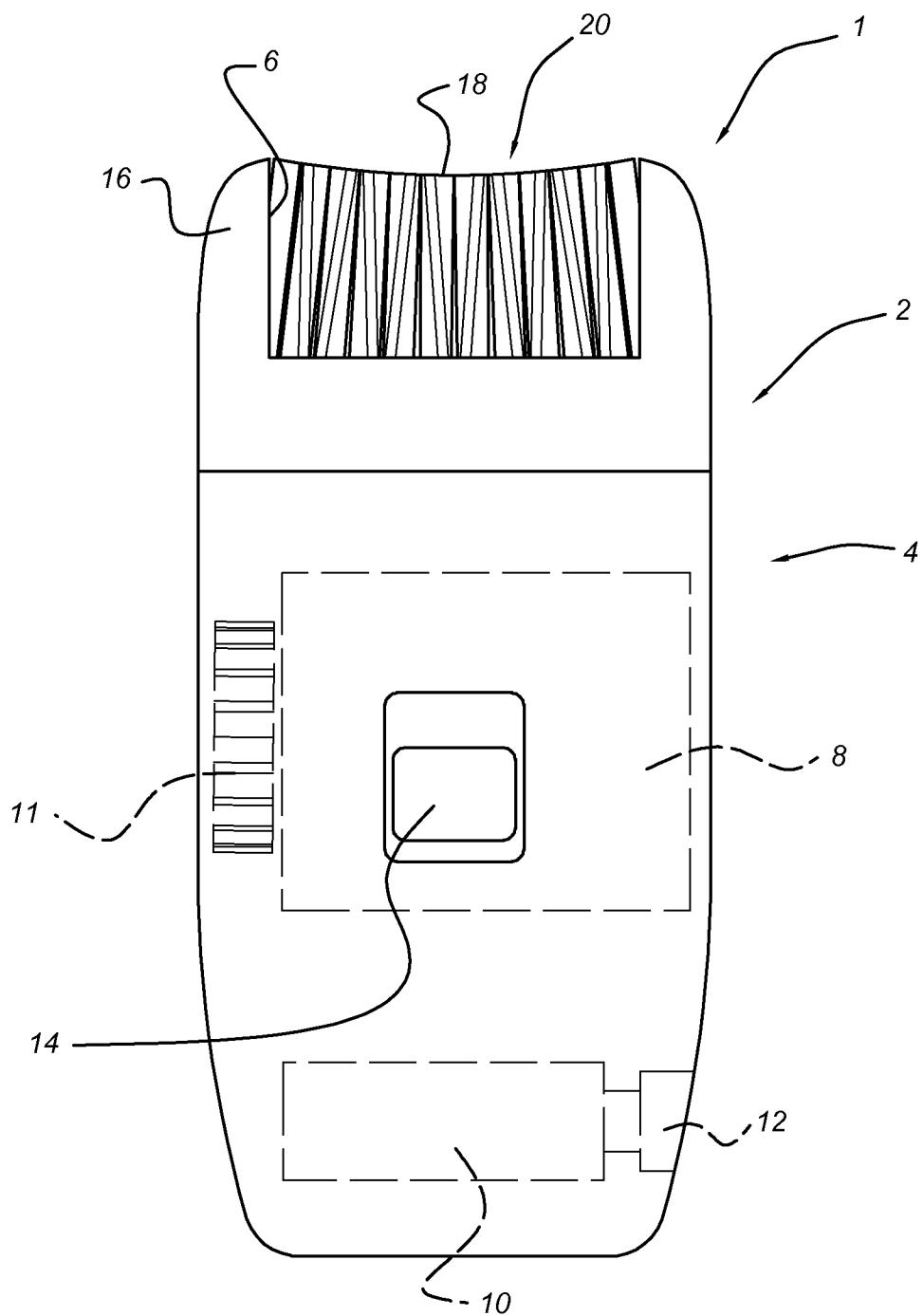
30 12. The device according to any preceding claim, further comprising a head portion surrounding the support elements and tweezer portion and defining an access opening to the pinching region.

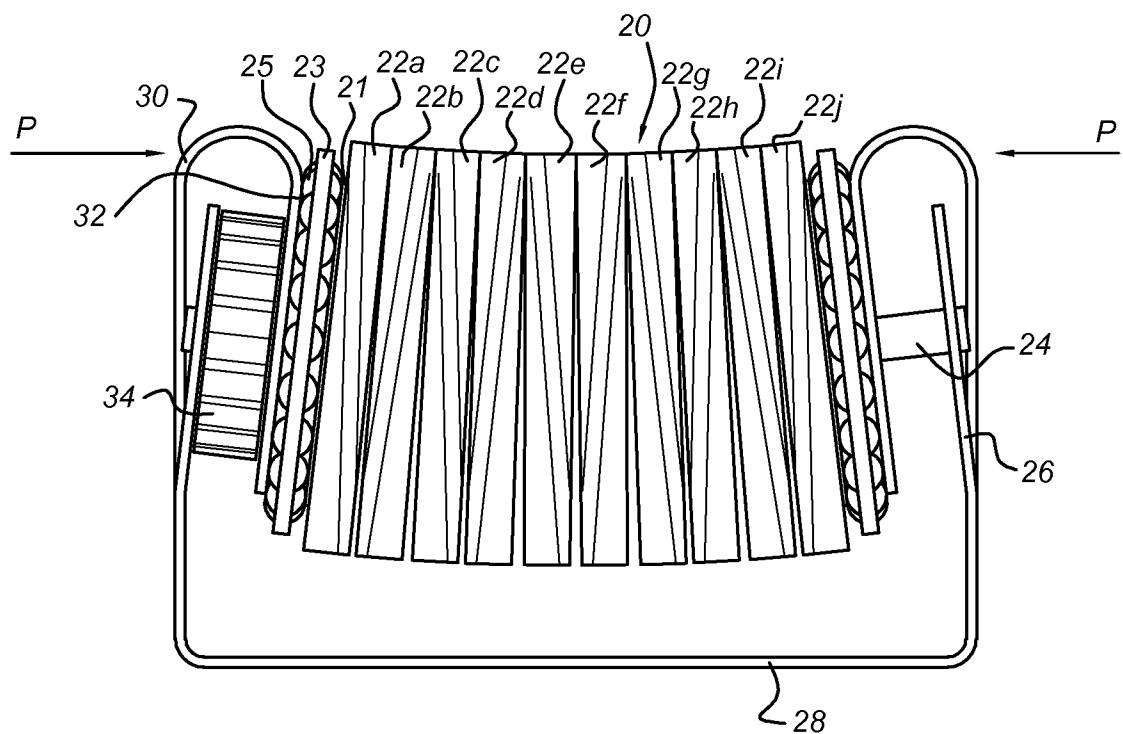
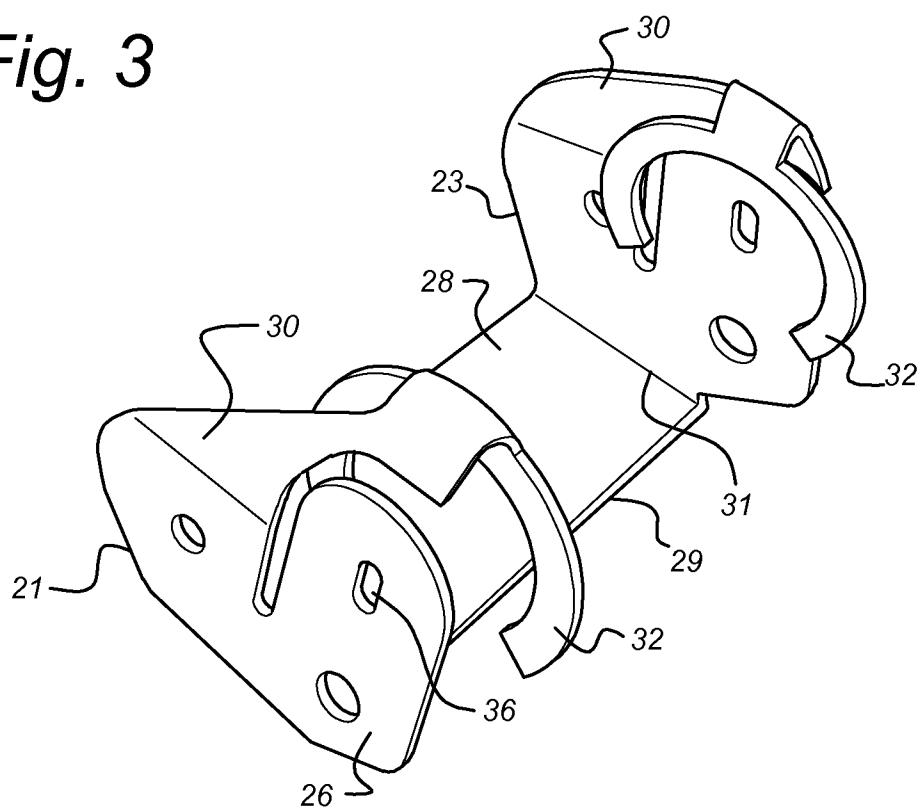
13. The device according to any preceding claim, wherein the mounting element, the spring element, and the bearing element are integrally formed from a single plate-shaped member having at least one bent portion.

14. The device according to claim 13, wherein the second support element is integrally formed from the single plate-shaped member.

5 15. The device according to claim 14, wherein the first and second support elements are mutually connected by a base plate, which is integrally formed from the single plate-shaped member and connected to the first and second support elements by respective bent portions of the plate-shaped member.

10 16. The device according to any of the claims 1-12, wherein the first and second support elements are integrally formed from a unitary piece of material having a base connecting the first and second support elements together.

*Fig. 1*

*Fig. 2**Fig. 3*

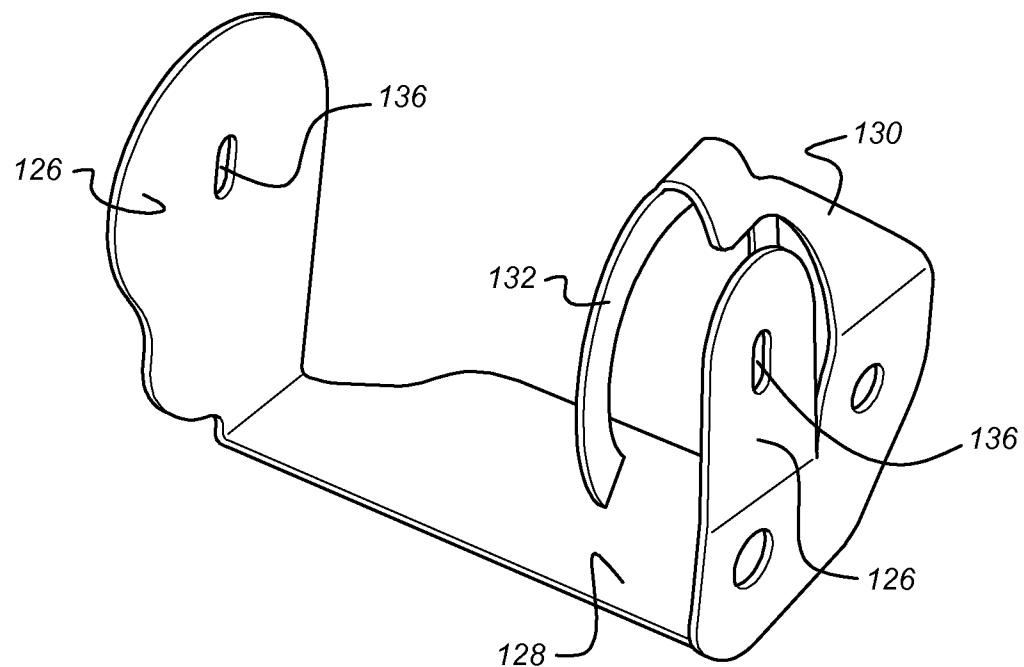
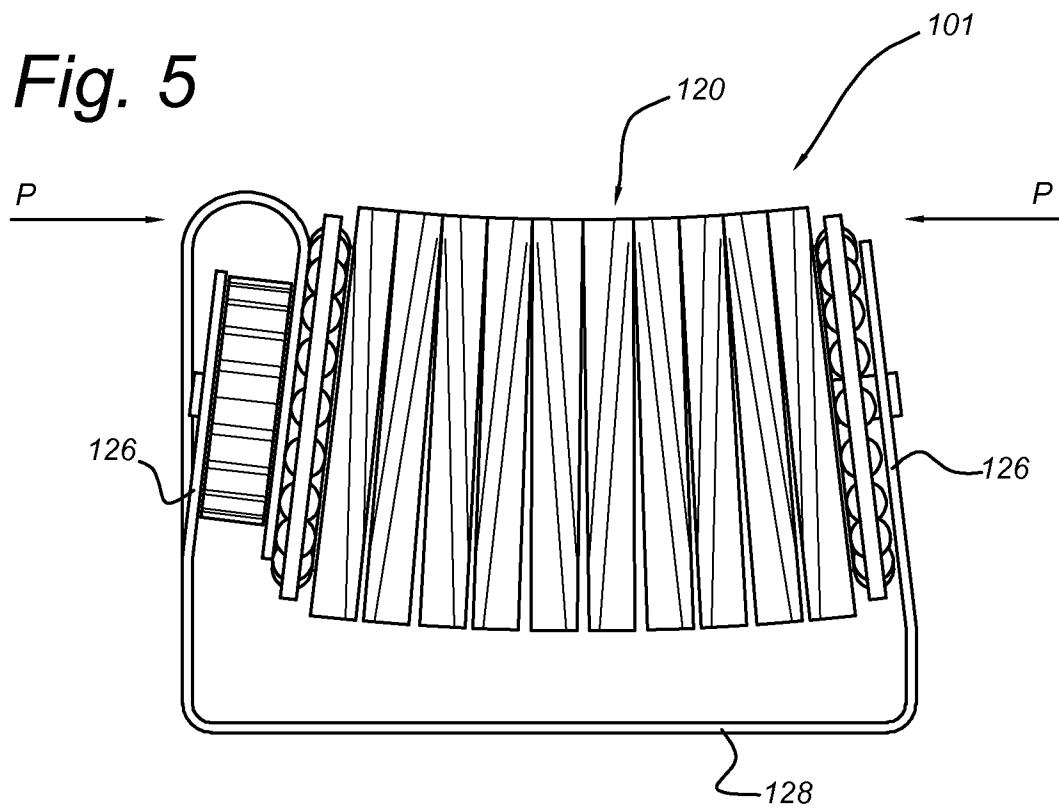
*Fig. 4**Fig. 5*

Fig. 6

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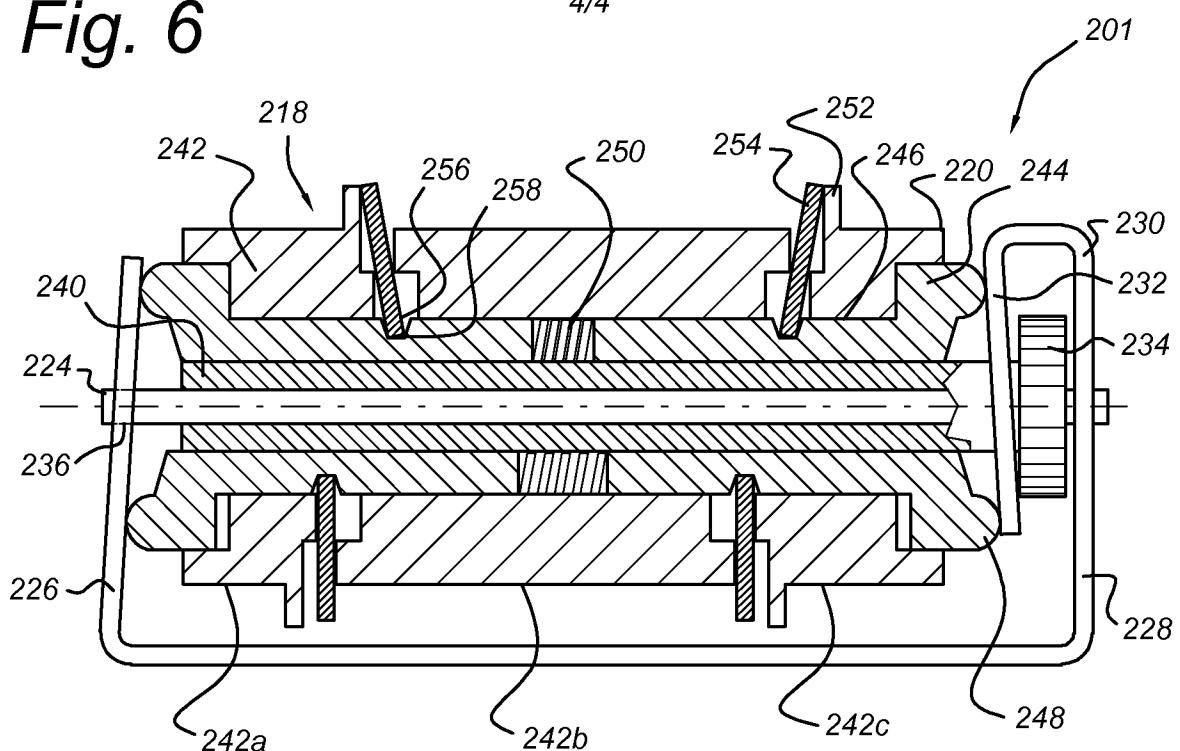
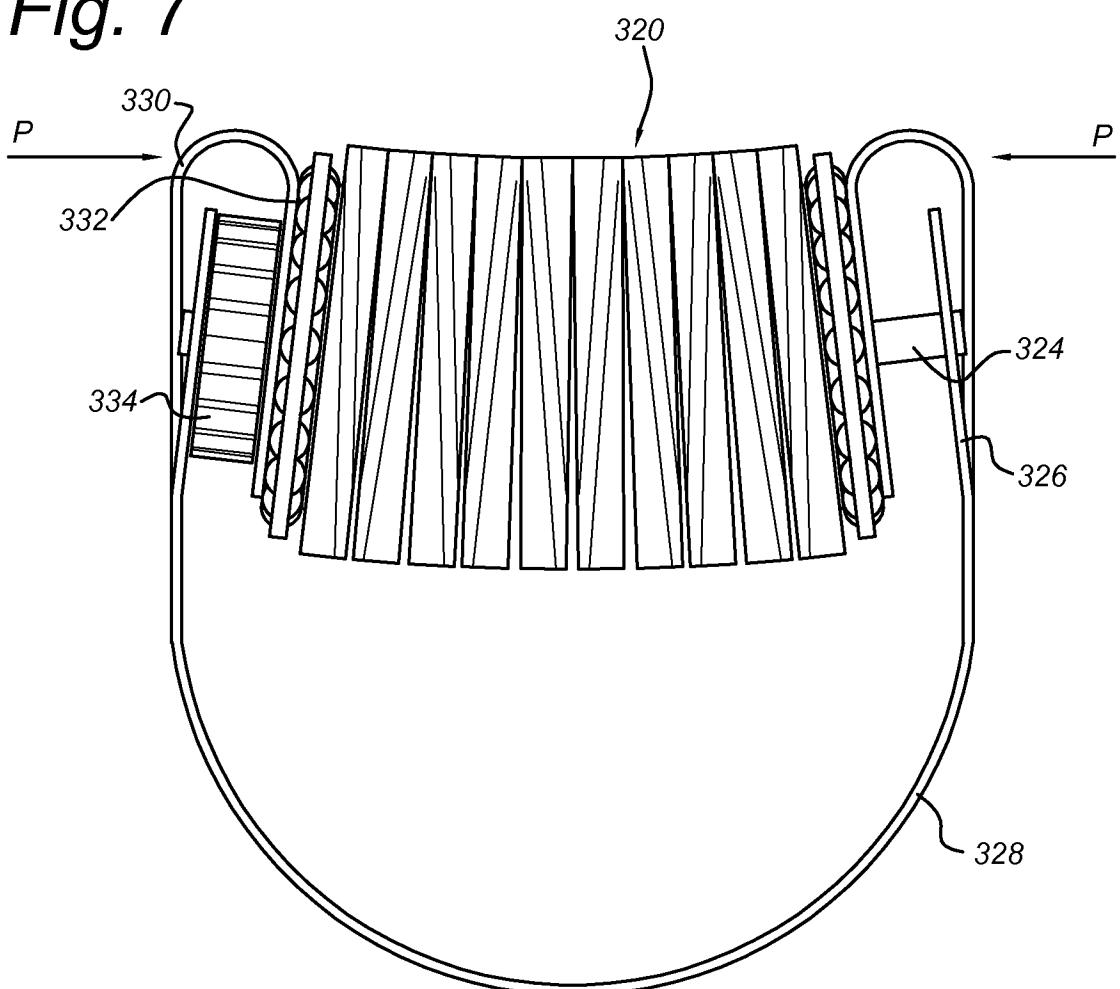


Fig. 7



# INTERNATIONAL SEARCH REPORT

International application No  
PCT/IB2013/058459

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. A45D26/00  
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)

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 practicable, 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.
A	US 2010/076458 A1 (GAO YONG [CN]) 25 March 2010 (2010-03-25) paragraphs [0028] - [0034] figures -----	1-16



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

7 January 2014

Date of mailing of the international search report

14/01/2014

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No

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Patent document cited in search report	Publication date	Patent family member(s)			Publication date
US 2010076458	A1 25-03-2010	CN US WO	201079113 Y 2010076458 A1 2009003355 A1		02-07-2008 25-03-2010 08-01-2009