US 20150230580A1

(19) **United States**

(12) **Patent Application Publication**

Hetbrink et al.

(10) **Pub. No.: US 2015/0230580 A1**

(43) **Pub. Date: Aug. 20, 2015**

(54) **EPILATING DEVICE**

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(21) Appl. No.: **14/428,018**

(22) PCT Filed: **Sep. 11, 2013**

(86) PCT No.: **PCT/IB2013/058459**

§ 371 (c)(1),
(2) Date: **Mar. 13, 2015**

Related U.S. Application Data

(60) Provisional application No. 61/701,766, filed on Sep. 17, 2012.

Publication Classification

(51) **Int. Cl.**
A45D 26/00 (2006.01)

(52) **U.S. Cl.**
CPC ***A45D 26/0066*** (2013.01); *A45D 2026/008* (2013.01)

(57) **ABSTRACT**

An epilating device (**1**) removes hair from a user by pinching, pulling and releasing the hairs. The epilating device (**1**) has a tweezer portion (**20**) having an axis and being mounted to rotate about its axis during use, the tweezer portion (**20**) defining at least one pinching region (**18**) at its circumference in which hairs may be grasped by tweezer elements(**22**). A mounting element supports the axis of the tweezer portion such that the tweezer portion can rotate with respect to the mounting element and a spring element (**30**) is arranged to induce a pinching force in the tweezer elements at the pinching region (**18**). The pinching force induces pinching of the hairs at the pinching region (**18**). A bearing element (**23**) is arranged to transmit the pinching force to the rotating tweezer portion (**20**) and a drive element is arranged to apply rotational motion to rotate the tweezer portion about its axis with respect to the mounting element. The mounting element (**20**), spring element (**30**) and bearing element are formed as a single unitary support element.

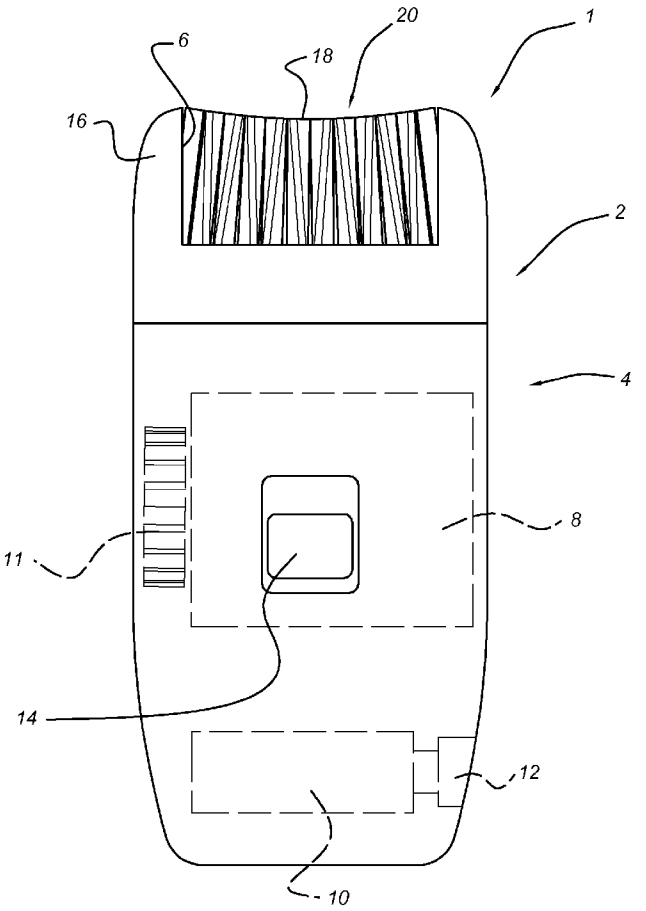

Fig. 1

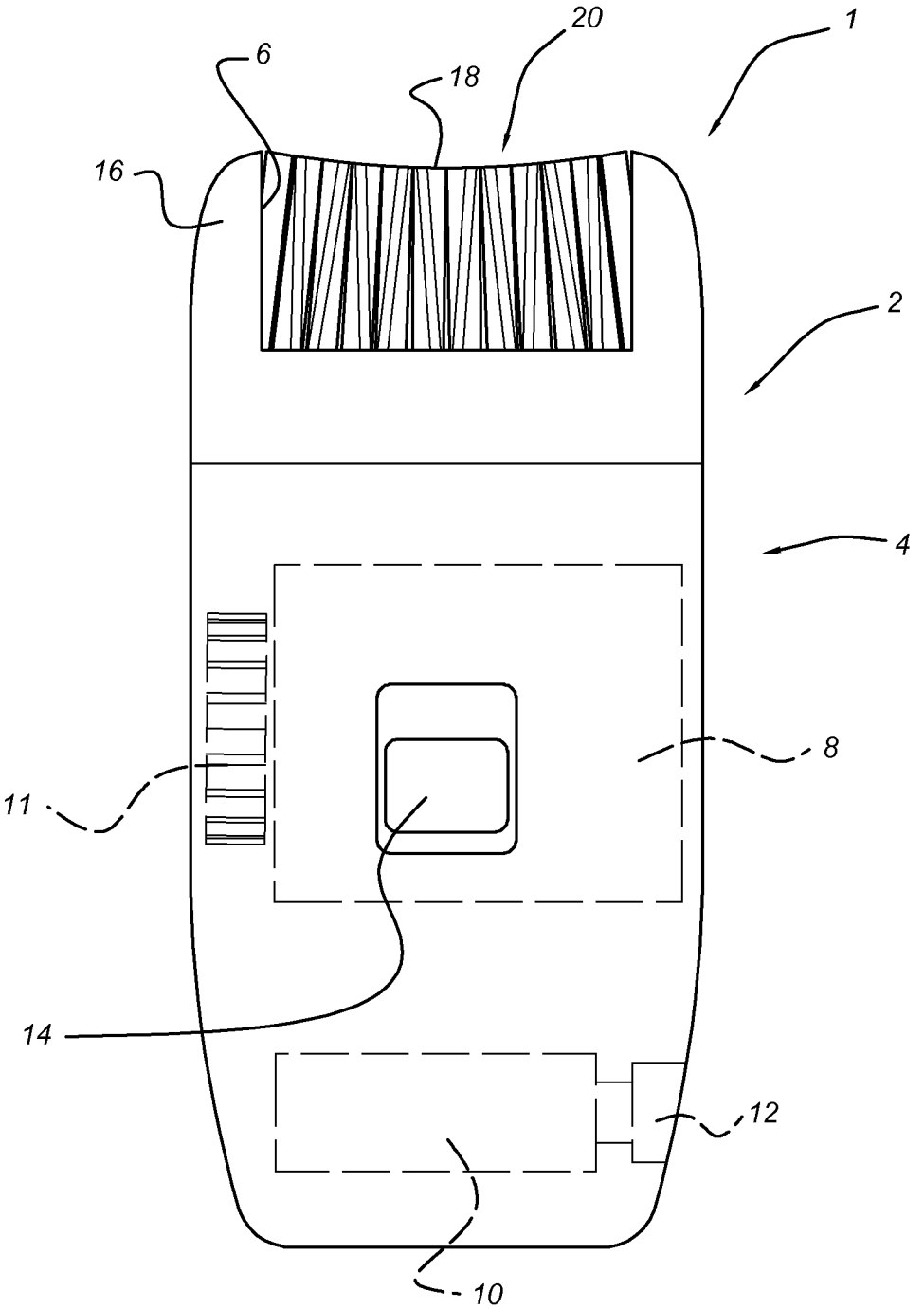

Fig. 2

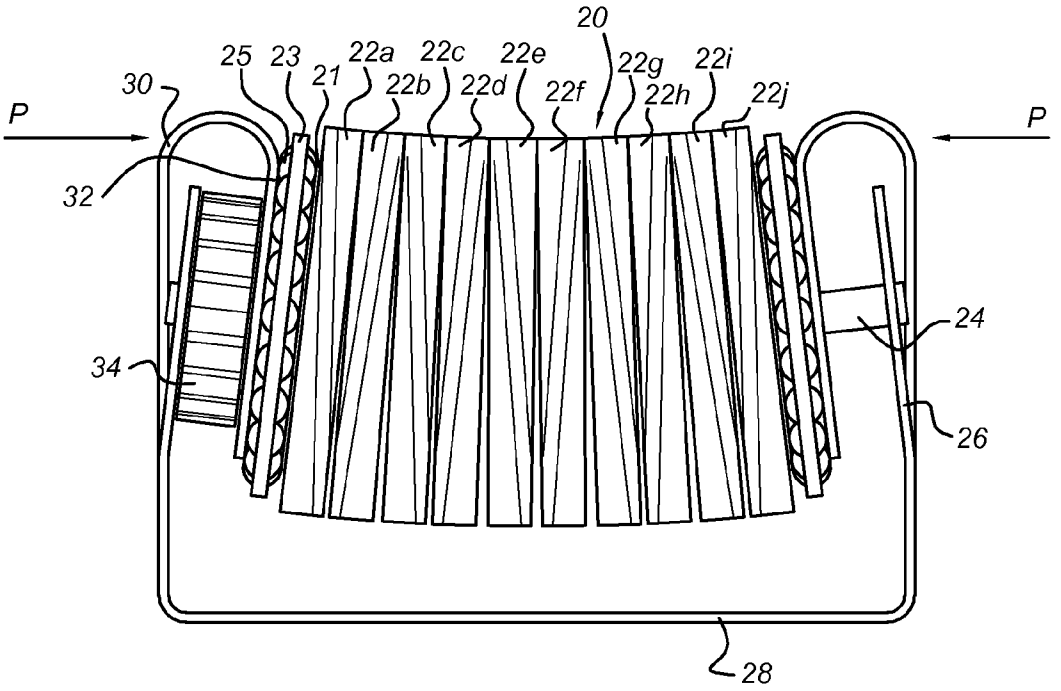
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Fig. 3

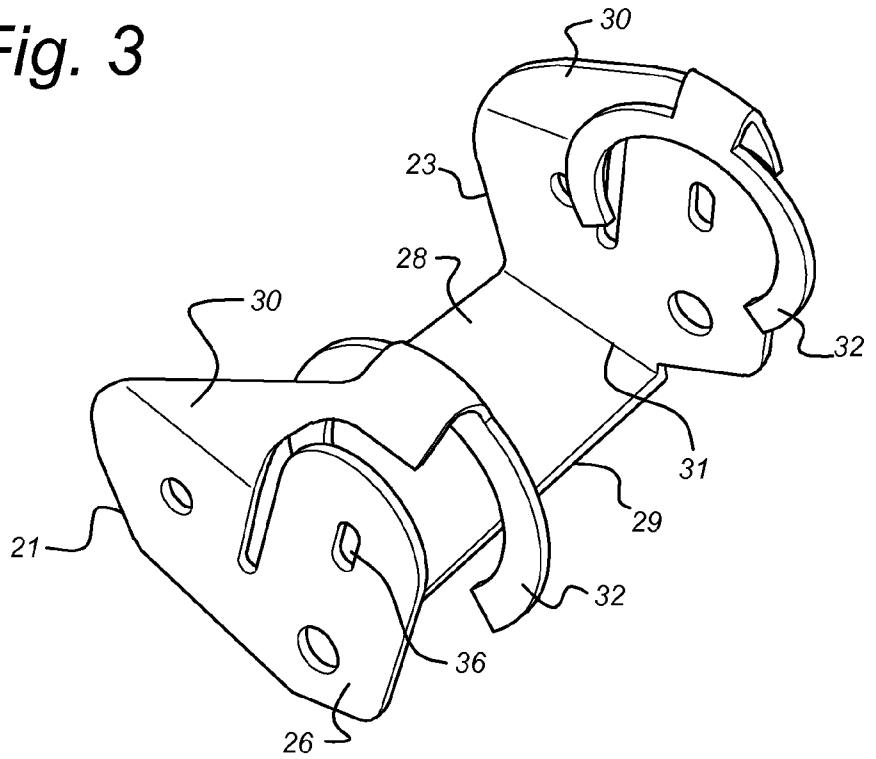
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Fig. 4

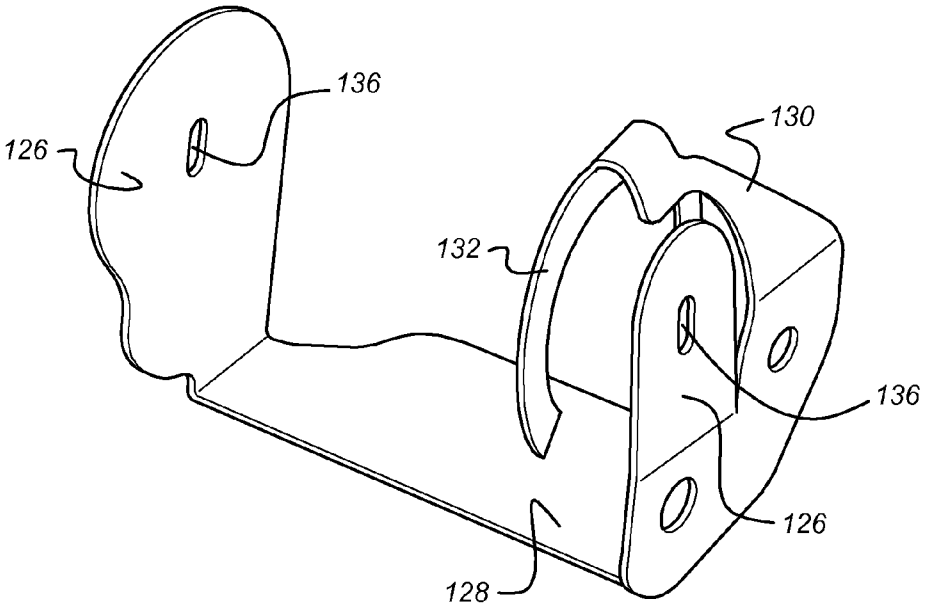


Fig. 5

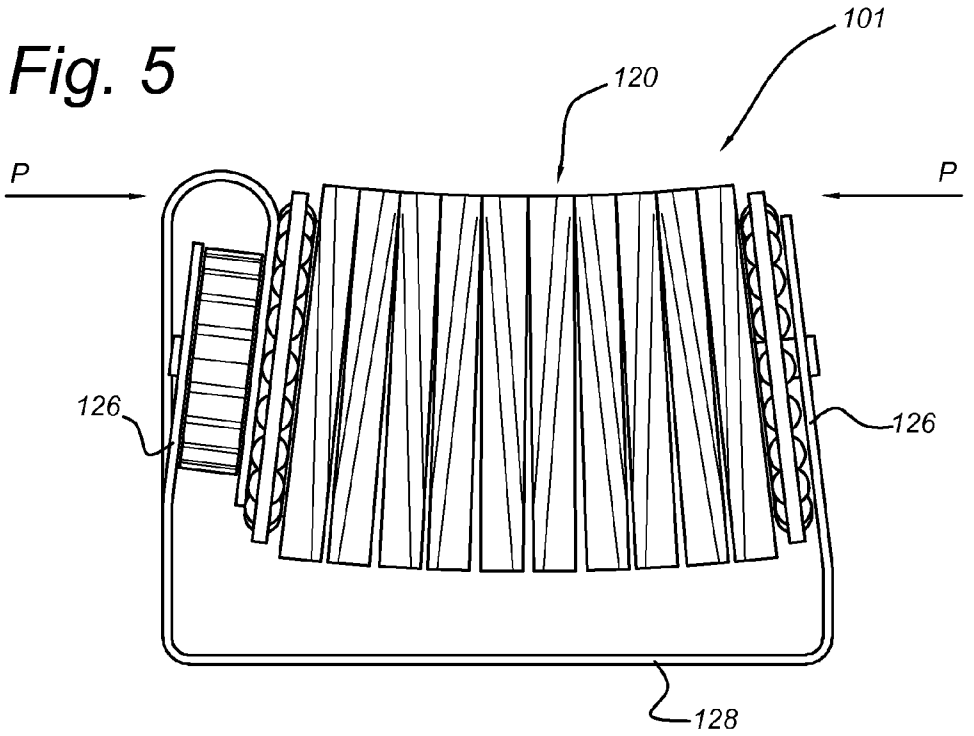
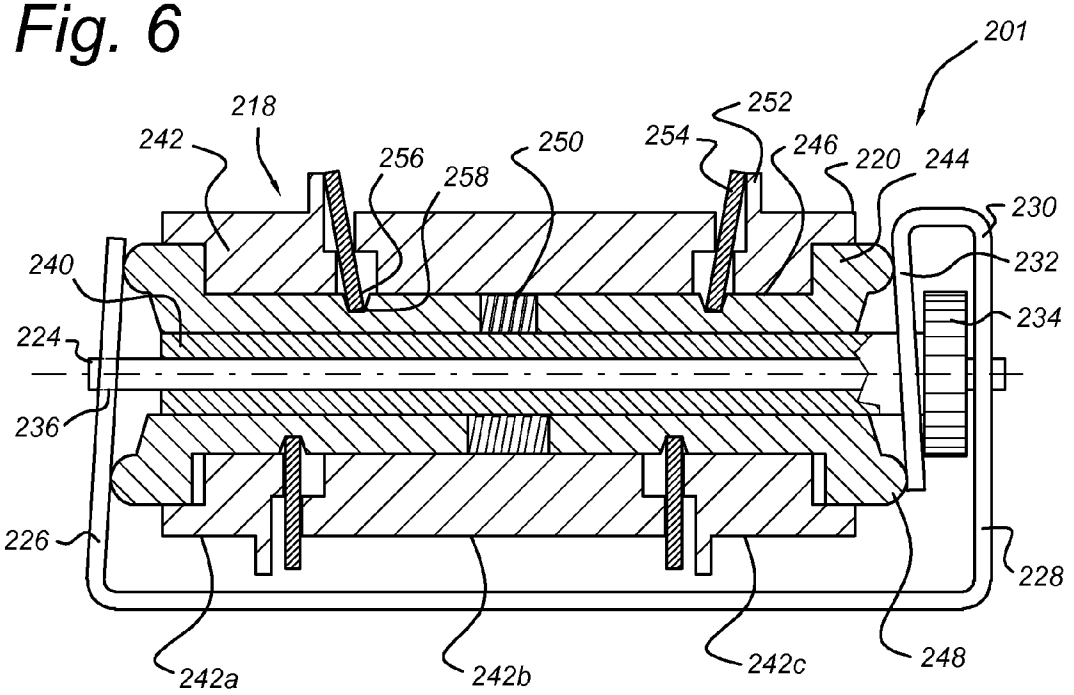


Fig. 6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242c
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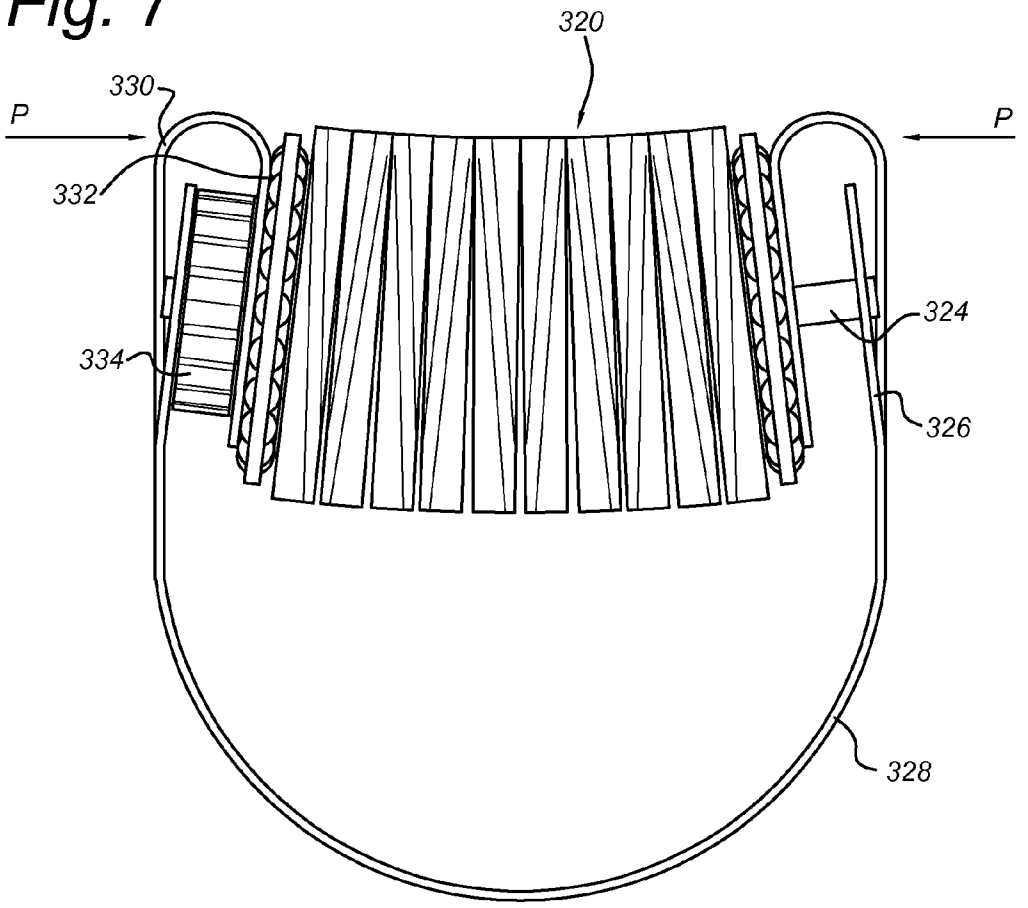
Fig. 7


320
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EPILATING DEVICE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to epilating devices and in particular to an improved epilating head construction having narrow support shoulders.

[0003] 2. Description of the Related Art

[0004] 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 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.

[0005] One of the earliest devices of this type is the Epilady™ device, which uses the 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 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.

[0006] Although the known devices may operate adequately in most circumstances, for accessing narrow regions, the width of the shoulders can be inconvenient. It would 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

[0007] 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 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 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 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 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.

[0008] The unitary support element may be formed of any appropriate material, including moulded plastics and composites. In a preferred embodiment, the mounting 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 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.

[0009] In one embodiment, the bearing element may comprise a washer, mounted concentrically with respect to the locating structure, and the spring element comprises a 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 may be provided with a bearing race if required.

[0010] 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 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.

[0011] According to the particular design and mode of operation, the second support 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.

[0012] In an alternative arrangement, 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. 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.

[0013] As indicated above, the principle of operation and construction according to 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.

[0014] 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 achieved by the use of a curved shaft, on which the tweezer portion is mounted for rotation.

[0015] 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 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 element and the bearing plates on the tweezer portion.

[0016] 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 region, due to the tweezer portion being more compressed as the bearing surfaces approach one another.

[0017] 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 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.

[0018] 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 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.

[0019] 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 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. 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.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The features and advantages of the invention will be appreciated upon reference to the following drawings of a number of exemplary embodiments, in which:

[0021] FIG. **1** shows an epilating device according to a first embodiment of the present invention in perspective view;

[0022] FIG. **2** shows a portion of the epilating device of FIG. **1**;

[0023] FIG. **3** shows a perspective view of a yoke for the device of FIG. **1**;

[0024] FIG. **4** shows a perspective view of a yoke for an epilating device according to a second embodiment of the invention;

[0025] FIG. **5** shows the yoke of FIG. **4** assembled to a tweezer portion;

[0026] FIG. **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

[0027] FIG. **7** shows an alternative fourth embodiment of the invention having an enlarged opening between the tweezer portion and yoke.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0028] FIG. **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.

[0029] 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.

[0030] FIG. **2** shows in front elevation a portion of the epilating device **1** with the head portion **2** removed. As can be seen in FIG. **2**, the tweezer portion **20** comprises a plurality of

disks **22**A-**22**J 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 **22**A and the last disk **22**J each have a bearing plate **21** against which the ball bearings **25** may rotate.

[0031] 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 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 **22**A 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**. 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.

[0032] FIG. **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 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.

[0033] FIG. **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 like references preceded by **100**. According to the embodiment of FIG. **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 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**.

[0034] FIG. **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 FIG. **2** and 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

[0035] FIG. **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**.

[0036] According to FIG. **6**, a yoke **228** supports a tweezer portion **220**. The yoke **228** is asymmetric and otherwise identical to that of the second embodiment of FIG. **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**.

[0037] 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** 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 **242**A and **242**C comprise fixed tweezer elements **252** at their outer circumference. Pivotable tweezer elements **254** are held between adjacent sections **242** A,B,C and are engageable with the fixed tweezer elements **252**. The pivotable tweezer elements **254** have inner ends **256** which engage with notches **258** formed in the rods **244**.

[0038] The tweezer portion **220** according to the embodiment of FIG. **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 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 pivotable tweezer elements **254** by engagement of the inner ends **256** with notches **258**. The pivotable tweezer elements **254** thus engage with the fixed tweezer elements **252** to pinch hairs and, as the tweezer portion **220** rotates further, to pull them out.

[0039] FIG. **7** shows in front elevation a portion of an epilating device according to a fourth embodiment of the invention. The embodiment of FIG. **7** corresponds generally to that of FIG. **2**, and like elements are given like references preceded by **300**. As in the first 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.

[0040] Thus, the invention has been described by reference to certain embodiments 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.

[0041] 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.

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

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;

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 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:

a mounting element, for supporting the first end of the tweezer portion, wherein the mounting element comprises a metal plate provided with a locating structure 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 and bearing element are integrally formed as a single unitary support element from a single plate-shaped member having at least one bent portion.

2. (canceled)

3. The device according to claim **1**, 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 claim **1**, 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. The device according to claim **1**, wherein the second support element is symmetrical to the first support element and comprises an integral bearing element, spring element and mounting element.

6. The device according to claim **1**, 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 claim **1**, wherein the tweezer portion is carried on a non-rotating shaft supported from the support elements.

8. The device according to claim **1**, wherein the axis is curved.

9. The device according to claim **1**, wherein the tweezer portion comprises a plurality of disks with tweezer elements formed between adjacent disks.

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

11. The device according to claim **1**, 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.

12. The device according to claim **1**, further comprising a head portion surrounding the support elements and tweezer portion and defining an access opening to the pinching region.

13. (canceled)

14. The device according to claim **1**, wherein the second support element is integrally formed from the single plate-shaped member.

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.

16. (canceled)

* * * * *