(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 509 755 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
17.09.2014 Bulletin 2014/38

(21) Application number: **10787708.6**

(22) Date of filing: **10.12.2010**

(51) Int Cl.:
B26B 19/06 *(2006.01)* ***B26B 19/28*** *(2006.01)*

(86) International application number:
PCT/EP2010/007541

(87) International publication number:
WO 2011/069673 (16.06.2011 Gazette 2011/24)

(54) **HAIR CLIPPER DEVICE**

HAARSCHNEIDEMASCHINE

DISPOSITIF DE TONDEUSE À CHEVEUX

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **11.12.2009 EP 09015380**

(43) Date of publication of application:
17.10.2012 Bulletin 2012/42

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Description

Technical Field

[0001] The present invention relates to clippers for use in hair-dressing, and particularly to a motorised clipper device for use in trimming hair. Hair clippers of this type are often used in hair salons, as well as in the home or domestic environment, for trimming hair around the collar and/or side-burns of male customers, as well as for trimming facial hair, such as beards and moustaches. Indeed, for people who prefer to wear their hair with a relatively short-cropped or shaved appearance, such clippers may be utilised for trimming over the entire head area.

Background of the Invention

[0002] Conventional hair clipper devices typically comprise a pair of blade members, one of which is driven reciprocally with respect to the other to generate a cutting action there-between. The reciprocating movement of the one blade member is generated by an electric motor, and in particular by a pin member which is connected to a shaft of the motor eccentrically of, but extending parallel to, the rotational axis thereof such that the pin member is received in and engages with the sides of a slot formed in a transmission component attached to the blade member. As such, the pin member transcribes a circular path of motion around the rotational axis as the rotor or shaft of the motor rotates. The interaction between the pin member and the slot of the transmission component is such that essentially only lateral movements of the pin member from the circular path it transcribes are transmitted to the blade member, and this produces the reciprocating motion of the blade member.

[0003] A significant disadvantage of this arrangement, however, is that the pin member essentially makes line contact with the sides of the slot formed in the transmission component. In other words, the contact area between the rounded outer surface of the pin and the inner, substantially flat and parallel sides of the slot is exceptionally small. This extremely small contact area combined with the high motor speeds and the loads on the blade members create significant pressure between the pin member and the transmission component, and this leads to wear and a resulting reduction in the precision of the fit between the pin member and the slot. This, in turn, leads to a deterioration in the cutting performance and noisier operation.

[0004] US 4,065,977 A describes a vibratory drive assembly for use with an electric motor driven hair clipper device, wherein a first blade member and a second blade member are adapted for reciprocating movement, and wherein the motor has a shaft which is connected to one of the blade members via a connecting member at a position which is eccentric to the shaft axis.

[0005] DE 10 65 298 B describes a hair clipper device which includes a separating wall shielding a motor of the device.

[0006] The present invention is directed to the object of providing a new hair clipper device that substantially overcomes or solves the above problems of conventional devices.

Summary of the Invention

[0007] According to one aspect, the present invention provides a hair clipper comprising:

a first blade member;
a second blade member adapted for reciprocating movement relative to the first blade member and which cooperates with the first blade member to generate a cutting action there-between;
a motor for driving the reciprocating movement of the second blade member, wherein the motor has a rotor or shaft which rotates about a rotational axis; and
a connecting member which interconnects the rotor or shaft of the motor and the second blade member, wherein the connecting member extends in a direction transverse to the rotational axis and is connected with the second blade member at a position laterally spaced from the rotational axis, wherein an end region of the connecting member includes a first pivot coupling element, such as an eyelet or a pin, for pivoting connection with the rotor or shaft of the motor, and wherein an opposite end region of the connecting member includes a second pivot coupling element such as an eyelet or a pin, for pivoting connection with the second blade member, wherein the first pivot coupling element comprises a slotted circular bore or a slotted eyelet with a first groove, and wherein the second pivot coupling element comprises a slotted circular bore or a slotted eyelet with a second groove.

[0008] Thus, the connecting member provides a positive coupling between the rotor or shaft of the motor and the second blade member for directly transferring movement from the motor to the second blade member.

[0009] In a preferred form of the invention, the connecting member is substantially rigid for ensuring an efficient transfer of motion from the motor to the second blade member. The connecting member is typically elongate and may be formed as a rod designed to link the motor with the second blade member. The connecting member may, for example, have a length within the range of about 8 mm to 24 mm, preferably in the range of about 10 mm to 20 mm, and more preferably within the range of about 12 mm to 16 mm. The connecting member or rod is desirably connected with the rotor or shaft of the motor at a position eccentric to the rotational axis. In this respect, the connecting member is preferably connected to the rotor or shaft of the motor via an intermediate mem-

ber rigidly mounted on the rotor or shaft of the motor. One end region of the connecting member includes a pivot coupling element, such as an eyelet (e.g. circular bore) or a pin, for pivoting connection with the rotor or shaft of the motor. An opposite end region of the connecting member also includes a pivot coupling element, such as an eyelet (e.g. circular bore) or a pin, for pivoting connection with the second blade member.

[0010] Thus, in a preferred form of the invention, the connecting member is pivotally coupled with the rotor or shaft of the motor and/or is pivotally coupled with the second blade member. The pivot coupling between the connecting member and the rotor or shaft of the motor, on the one hand, and/or between the connecting member and the second blade member, on the other hand, provides for pivoting movement about respective pivot axes. Each pivot coupling or connection desirably provides surface contact with the connecting member. In this way, the present invention is able to avoid the line contact required in the prior art arrangements for generating the reciprocating movement of the blade member. The pivot couplings between the connecting member and the motor shaft and/or the second blade member preferably comprise a journal-type bearing or pin-and-eyelet type coupling.

[0011] In a preferred form of the invention, the first blade member is stationary within the clipper device. As such, the second blade member is also referred to herein as the movable blade member, it being configured to move relative to the first, stationary blade member. The second blade member is preferably positioned on or adjacent to the first blade member and is adapted to move relative to the first blade member in a cutting plane. Preferably, either or both of the first blade member and the second blade member is/are substantially flat. In a preferred form of the invention, the reciprocating movement of the second blade member relative to the first blade member is a substantially linear displacement within the range of about 2 mm to about 6 mm, and preferably within the range of about 3 mm to about 4 mm.

[0012] In a preferred form of the invention, the first blade member and the second blade member together define a substantially linear cutting region. In use, this cutting region typically forms a leading or front edge of the clipper device during a hair cutting operation. The rotational axis of the motor is preferably located rearwardly of the cutting region. In other words, the rotational axis of the motor desirably intersects the cutting plane rearward of the cutting region with respect to an in-use orientation in which the cutting region forms the leading or front edge of the clipper device. The cutting plane is furthermore preferably intersected by the rotational axis of the motor at a non-perpendicular angle, particularly preferably at an angle within the range of about 30° to about 60°. This inclined or pitched orientation of the rotational axis, and thus of the motor and drive shaft, produces a configuration which, during hand-held use of the clipper device, is ergonomically advantageous.

[0013] In a preferred form of the invention, the connecting member is connected with the second blade member such that rotation of the motor generates a force component that acts to bias or maintain the second blade member into contact or engagement with the first blade member. In this regard, when viewed along the rotational axis of the motor, the connecting member is desirably connected to the second blade member at a position laterally spaced to a side of the rotational axis at which the direction of rotation of the rotor or shaft around the axis is towards the cutting region. Preferably, a line extended between points of maximum lateral displacement of the eccentric connection of the connecting member to the motor shaft defines a line which also extends to the position at which the connecting member is connected with the second blade member. This line, which also passes through the rotational axis of the motor, typically runs substantially parallel to the substantially linear cutting region.

Brief Description of the Drawings

[0014] The above and further features and advantages of the present invention will be more clearly understood from the following detailed description of preferred embodiments of the invention with reference to the accompanying drawing figures, in which like reference characters identify like features, and in which:

Fig. 1 is a side view of the main operating parts of a hair clipper device according to a prior art arrangement;

Fig. 2 is a sectioned side view of the main operating parts of a hair clipper device as shown in Fig. 1, with the section taken along the rotational axis;

Fig. 3 is a sectioned top view of the main operating parts of a hair clipper device as shown in Fig. 1, with the section taken parallel to the rotational axis;

Fig. 4 is a partially sectioned view of the main operating parts of a prior art hair clipper device as shown in Fig. 2 and taken in the direction of arrows IV-IV;

Fig. 5 is a side view of the main operating parts of a hair clipper device according to a preferred embodiment of the present invention;

Fig. 6 is a sectioned side view of the main operating parts of the hair clipper device as shown in Fig. 5, with the section taken along the rotational axis;

Figs. 7 to 10 are partially sectioned views of the main operating parts of the hair clipper device of the invention taken along the rotational axis in the direction of the arrows A-A in Fig. 6 at different positions of angular rotation of the motor;

Fig. 11 is a top view of a connecting member for a hair clipper device according to a preferred embodiment of the invention;

Fig. 12 is a partially sectioned view of the part of the hair clipper of the invention corresponding to the view in Fig. 9, with the motor at the same position of angular rotation and illustrating the force components acting on the movable cutting blade; and

Fig. 13 is a partially sectioned view of the part of the hair clipper of the invention corresponding to the view in Fig. 7, with the motor at the same position of angular rotation and illustrating the force components acting on the movable cutting blade;

Fig. 14 is a top view of a connecting member for a hair clipper device according to a further preferred embodiment of the invention, wherein each of the circular bores or eyelets of the connecting member is realized as a slotted circular bore.

Detailed Description of the Preferred Embodiments

[0015] With reference firstly to Figs. 1 to 4 of the drawings, a conventional hair clipper device P according to a prior art arrangement will be briefly described. The main parts of the hair clipper device P shown in Fig. 1 and Fig. 2 of the drawings include a drive means 1 and a cutting head 2, both of which are mounted on a frame or in a casing 3 of the device P, which frame or casing 3 is shown in a broken outline in Fig. 1. As will be appreciated by an ordinary practitioner, the frame or casing 3 of the hair clipper device P is typically configured to be hand-held by a user during a hair trimming operation.

[0016] The drive means 1 comprises an electric motor 4, which is securely mounted within the casing 3 and may be designed for either battery-powered operation or for cable-connected power supply. The rotor of the motor 4 has a drive shaft 5 which is driven in rotation about a central rotational axis 6. The cutting head 2 of the hair clipper P is mounted at a distal end of the casing 3 and comprises a first, stationary blade member 7 fixed relative to the casing 3 and a second, moveable blade member 8 positioned on the first blade member 7 and designed for reciprocating movement in a lateral or transverse direction relative to the first blade member 7 such that the two blade members 7, 8 cooperate to generate a cutting action there-between. In this regard, the first blade member 7 has a substantially flat or plate-like configuration and the second blade member 8 is mounted on an upper surface of the first blade member. As can be seen in Fig. 3 of the drawings, each of the blade members 7, 8 comprises a plurality of parallel teeth or prongs 9 forming a comb structure along a front or leading edge region 11 of the cutting head 2. When the teeth or prongs 9 of the second blade member 8 move back-and-forth (i.e. reciprocate) in a lateral direction relative to the teeth or prongs 9 of the first blade member 7, a shearing action effects cutting of any hair projecting between the comb elements of the blade members 7, 8.

[0017] The reciprocating movement of the second blade member 8 relative to the first blade member 7 is generated by a transmission mechanism between the electric motor 4 and the movable blade member 8. As briefly explained at the outset, a circular stud or pin member 12 is connected to the shaft 5 of the motor 4 eccentrically or offset from the rotational axis 6 and extends parallel to the rotational axis 6 towards the second blade member. A transmission component 13 provided on the second blade member 8 includes a slot 14 which is dimensioned to snugly receive the circular stud or pin member 12 between facing parallel side surfaces of that slot 14. This is particularly evident from Figs. 3 and 4 of the drawings, which illustrate the stud or pin 12 and the slot 14 being dimensioned such that the stud or pin 12 contacts the sides of the slot 14 in the transverse or lateral direction, with the slot 14 being open in the vertical or upward and downward directions.

[0018] Due to the eccentric fixture of the stud or pin member 12 to the motor shaft 5, the pin member 12 transcribes a circular path of motion around the axis 6 as the shaft rotates. Thus, the stud or pin interacts with the slot 14 in the transmission component in such a way that the lateral or sideways movements of the pin member 12 are directly transmitted to the second blade member 8 whereas movements of the pin 12 in the vertical or upward and downward directions occur within the slot without any meaningful transmission to the blade member 8 in those directions. Also assisting in this regard are a pair of spring elements 15 which bias the second blade member 8 into contact with the first blade member 7 and inhibit movement of the second blade member 8 in anything but a lateral direction.

[0019] For optimal transmission of movement from the stud or pin member 12 to the second blade member 8, the fit of the stud or pin member 12 within the slot 14 should be quite precise. That is, there should essentially be no "play" in the lateral directions while still allowing relative movement between the pin 12 and the slot 14 in the vertical or upward and downward directions; i.e. the slot 14 should not grip the sides of the pin 12. As noted at the outset, however, one of the problems with this prior art arrangement of Figs. 1 to 4 is that the circular stud or pin member 12 makes essentially line contact with the sides of the slot 14 formed in the transmission component 13. As a result, the contact area between the curved outer surface of the stud or pin 12 and the inner, parallel sides of the slot 14 is exceptionally small. In use, this extremely small contact area leads to a high pressures exerted between the two components and, as a result, to wear. As the components wear, the precision of the fit between the pin 12 and the sides of the slot 14 deteriorates, creating a small amount of play between the pin and the sides of the slot which, in turn, results in a reduction in the cutting performance as well as noise and further de-

terioration of the component parts.

[0020] To overcome the above problems, the inventors have developed a new hair clipper device 10 having an improved transmission mechanism, as will now be described with reference to Figs. 5 to 13 of the drawings. Referring firstly to Figs. 5 and 6 of the drawings, it will be seen that the hair clipper device 10 according to the invention has various parts in common with the prior art hair clipper device P described with reference to Figs. 1 to 4. In this respect, it will be noted that the corresponding features of the clipper device 10 are identified by the same reference characters. For example, the main parts of the hair clipper device 10 shown in Figs. 5 and 6 again include a drive means 1 and a cutting head 2, both of which are mounted in/on a frame or casing 3 of the device 10, with that casing 3 again being shown in broken outline in Fig. 5. As before, the drive means 1 comprises an electric motor 4 securely mounted within the casing 3 and designed for either battery-powered operation or for a cable-connected power supply. The motor 4 has a drive shaft 5 which is driven in rotation about a central rotational axis 6.

[0021] The cutting head 2 of the hair clipper 10 is mounted at a distal end of the casing 3 and comprises a first, stationary blade member 7 fixed relative to the casing 3 and a second, moveable blade member 8 positioned on the first blade member 7 and designed for reciprocating movement in a lateral or transverse direction relative to the first blade member 7. In this way, the two blade members 7, 8 cooperate to generate a cutting or shearing action there-between in a cutting plane C. That is, the first, stationary blade member 7 has a generally flat or plate-like form and the second blade member 8 is mounted on an upper surface of the first blade member 7. As can be seen in Fig. 3 of the drawings, each of the blade members 7, 8 comprises a plurality of parallel teeth or prongs 9 forming a comb structure along a front or leading edge region 11 of the cutting head 2. When the teeth or prongs 9 of the second blade member 8 move reciprocatingly (i.e. back-and-forth) in a lateral direction relative to the teeth or prongs 9 of the first blade member 7, a shearing action in the cutting plane C effects cutting of any hair projecting between the comb elements of the blade members 7, 8 in the cutting region 11.

[0022] According to the present invention, the reciprocating movement of the second blade member 8 relative to the first blade member 7 is generated by a transmission mechanism 30 between the electric motor 4 and the moveable blade member 8. The transmission mechanism 30 comprises a connecting member 31 in the form of a substantially rigid connecting rod, which interconnects the rotor or shaft 5 of the motor 4 and the second blade member 8. In this regard, the connecting rod 31 is pivotally connected with the shaft 5 eccentric of, or offset from, the rotational axis 6. Furthermore, the connecting rod 31 extends in a direction transverse to the rotational axis 6 and is connected to the second blade member 8 at a position that is laterally spaced from the rotational axis 6. The interconnection and the physical positioning of the connecting member 31 within the hair clipper device 10 of the invention are illustrated in Figs. 7 to 10 of the drawings, while the shape or configuration of the connecting rod 31 is specifically illustrated in Fig. 11.

[0023] With reference to Fig. 11, the connecting rod 31 is elongate and has a length L in the range of about 10 mm to about 20 mm, more preferably in a range of about 12 mm to 16 mm. According to a preferred embodiment, the connecting rod 31 is made of a suitable plastic material, e.g. of a polymeric material. At each end region of the connecting rod 31, a respective pivot coupling element 32, 33 is provided for pivoting connection with a complementary element on the shaft 5 of the motor and on the second blade member 8, respectively. In this embodiment, for example, the pivot coupling element 32 at the end region of the connecting rod 31 for connection to the shaft 5 comprises a circular bore or eyelet, which may be in the form of a circular journal bearing or a short cylindrical sleeve for receiving a respective pin element 34 projecting from the shaft 5 of the motor 4. The coupling element 33 at the other, opposite end of the connecting rod 31 may also comprise an eyelet for complementary pivoting connection with a circular pin member 35 formed on and upstanding from the second blade member 8.

[0024] The coupling element 32 defines a first pivot axis through the centre of the eyelet of the coupling element 32, and the coupling element 33 defines a second pivot axis through the centre of the eyelet of the coupling element 33. Thus, each coupling element 32, 33 defines a pivot axis through a respective centre of the eyelet and is configured for surface contact with the complementary pin element 34, 35. According to a preferred embodiment, the first pivot axis of the coupling element 32 and the second pivot axis of the coupling element 33 are parallel to one another. Further preferably, both the first pivot axis of the coupling element 32 and the second pivot axis of the coupling element 33 are perpendicular to a plane, with the movements of the connecting member 31 being performed within said plane.

[0025] Although in this embodiment the pivot coupling element 32, 33 at each end of the elongate connecting rod 31 is formed as a circular eyelet, sleeve or journal for receiving a complementary pin element 34, 35, it will be appreciated that the connecting rod 31 may alternatively comprise coupling elements 32, 33 in the form of projecting pins for receipt in corresponding circular pivot bearing recesses formed in the shaft 5 and/or in the second blade member 8, respectively.

[0026] With reference now to Figs. 7 to 10 of the drawings, it will be seen that the pivoting connection between the connecting rod 31 and the shaft 5 of the motor occurs via an intermediate member 36, which is partially disc-shaped and is rigidly attached to the lower end of the motor shaft 5 In other words, the pin element 34 projects from the partially disc-shaped member 36 attached at the end of the shaft 5 and the pivot coupling element or eyelet 32 of the connecting rod 31 forms the pivot con-

nection with the pin element 34 eccentric to, or offset from, the rotational axis 6. The partial disc-shaped member 36 may serve to assist in dynamically balancing of the shaft 5 during operation of the clipper device 10.

[0027] As is clear from Figs. 7 to 10, where the views are taken along the rotational axis 6, the pivoting connection between the connecting rod 31 and the motor shaft 5 is eccentric or offset from the rotational axis 6. This can be seen by observing the offset or space between the eyelet 32 and the pin element 34, on the one hand, and the intersection of axes 6, X, Y, on the other hand. As the skilled person will appreciate, this offset or eccentricity generates and dictates the degree or extent of the lateral reciprocating movement, i.e. the length of the stroke of the second blade 8 back-and-forth relative to the first blade 7. The direction of rotation of the motor shaft 5 is indicated by an arrow in each of the Figs. 7 to 10, and each of the drawings shows a relative position of the shaft 5 and the connecting rod 31 at consecutive 90° intervals in four steps throughout one complete rotation of the motor. As will be appreciated, the eccentric pivot connection 32, 34 between the connecting rod 31 and the shaft 5 transcribes a circular path around the rotational axis 6 and the diameter of this circular path dictates the extent of reciprocating movement in the lateral direction. That is, the pivoting connections provided by the connecting rod 31 between the shaft 5 and the blade member 8 transform the eccentric circular motion at the pin element 34 into a reciprocating movement of the second blade member 8 in the lateral or sideways direction. The full extent or stroke of the reciprocating movement of the second blade member 8 in the lateral or sideways direction occurs between the positions shown in Fig. 8 (maximum displacement to the right-hand side) and in Fig. 10 (maximum displacement to the left-hand side). In this embodiment, the reciprocating movement of the second blade member 8 relative to the first blade member 7 comprises a substantially linear displacement in the range of about 2 mm to about 6 mm, and particularly in the range of about 3 mm to about 4 mm. The two spring elements 15, which are also visible in Figs. 7 to 10, assist to ensure that the movement of the second blade member 8 relative to the first blade member 7 is essentially only in the transverse direction.

[0028] As is apparent from the drawings, the motor 4 of the clipper device 10 is typically arranged in the casing 3 such that the rotational axis 6 is pitched or inclined at a non-perpendicular angle α to the cutting plane C of the cutting head 2 and such that the rotational axis 6 intersects the cutting plane C rearward of the front or leading cutting region 11. This arrangement has ergonomic advantages for the user. As will be explained in more detail below, the positioning of the pivoting connection 33, 35 between the connecting rod 31 and the movable blade member 8 can be selected such that a force component generated by the transmission mechanism 30 serves to bias the second, movable blade member 8 into contact or engagement with the first blade member 7.

[0029] As will be appreciated from Figs. 7 to 10, the connecting rod 31 is connected to the second blade member 8 in substantial lateral alignment with the rotational axis 6. That is, a line between the points of maximum lateral displacement (i.e. in Fig. 8 and Fig. 10) of the eccentric coupling 32, 34 of the connecting rod 31 to the motor shaft defines a line which also extends to the position of the pivot coupling 33, 35 of the connecting rod 31 with the second blade member 8. This line, which corresponds to the axis X in Figs. 8 and 10, also extends through the rotational axis 6 and runs substantially parallel to the cutting region 11.

[0030] Further, it will be noted by a skilled person that the connecting rod 31 is connected with the second blade member 8 at a position 35 that is laterally spaced to that side of the rotational axis 6 at which the direction of rotation of the motor 4 around the axis 6 is towards the cutting region 11 of the cutting head 2. In other words, when viewed in the direction from the motor 4 towards the cutting head 2, the connecting rod 31 is connected with the second blade member 8 at a position 35 that is laterally spaced to that side of the rotational axis 6 at which a tangential component of the motor's rotational velocity around the axis 6 points towards the cutting region 11 of the cutting head 2. In other words, the tangential or instantaneous velocity of the motor shaft 5 at that side of the rotational axis 6 to which the connecting rod 31 extends for connection with the second blade member 8 has a directional or vector component towards the cutting region 11 of the blade members 7, 8. For example, in case the motor shaft 5 rotates in the counterclockwise direction, as shown in Figs. 7 to 10, the connecting rod 31 is connected with the second blade member 8 at a position 35 that is laterally spaced to the right side of the rotational axis 6. This notion or explanation of the arrangement is perhaps best understood with reference to Fig. 10 of the drawings, which shows the arrow indicating the direction of motor rotation laterally spaced from the rotational axis 6 to the same side as that to which the connecting rod 31 extends. That arrow points towards the teeth or prongs 9 of the comb-like blade members 7, 8 defining the front or leading cutting region 11 of the cutting head 2.

[0031] The advantage or benefit of this configuration in the clipper device of the invention is illustrated in Figs. 12 and 13 of the drawings. There it can be seen that the force F acting between the shaft 5 and the movable blade member 8 through the connecting rod 31 is somewhat skewed relative to the perpendicular lateral direction. That is, during operation of the clipper device 10, the force F acting through the connecting rod 31 constantly varies in its direction between the directions shown in Figs. 12 and 13. As a result, the transmission mechanism 30 in the clipper device 10 generates a force component F_H that varies with angular rotation of the shaft 5 and reaches a respective maximum at each of the positions shown in Figs. 12 and 13. The relative magnitude of the force component F_H will depend upon the degree of ec-

centricity of the coupling element 32 from the rotational axis 6 and the length L of the connecting rod 31. Importantly, the arrangement of the connecting rod 31 in the clipper device 10 gives rise to this recurring, transient or intermittent force component F_H, which acts to bias the second, movable cutting blade 8 into engagement or contact with the stationary blade 7. In other words, the force component F_H reinforces the action of the spring elements 15 in supporting the engagement or contact between the blade members 7, 8 in the cutting plane C to ensure maintenance of the desired cutting performance.

[0032] With reference to Figs. 7 to 10, it will be seen that the axis X is a straight line which interconnects the points of maximum lateral displacement (shown in Figs. 8 and 10) of the eccentric connection 32, 34 of the connecting member 31 with the motor shaft 5. Furthermore, it will be noted that this axis X intersects with the rotational axis 6 of the motor and that the connection 33, 35 of the connecting member 31 with the movable blade 8 lies permanently on this axis X.

[0033] In Fig. 14, yet another embodiment of a connecting rod is shown. The connecting rod 37 is elongate and has a length in the range of about 10 mm to about 20 mm, more preferably in a range of about 12 mm to 16 mm. A respective pivot coupling element 38, 39 is provided for pivoting connection with a complementary element on the shaft 5 of the motor and on the second blade member 8, respectively. For example, the pivot coupling element 38 at the end region of the connecting rod 37 for connection to the shaft 5 comprises a slotted circular bore or eyelet with a slot or groove 40. The slotted circular bore or eyelet may be in the form of a slotted circular journal bearing or a slotted cylindrical sleeve for receiving a respective pin element 34 projecting from the shaft of the motor 4. The coupling element 39 at the other, opposite end of the connecting rod 37 may also comprise a slotted circular bore or eyelet with a slot or groove 41 for complementary pivoting connection with a circular pin member 35 formed on and upstanding from the second blade member 8.

[0034] The coupling element 38 defines a first pivot axis through the centre of the eyelet of the coupling element 38, and the coupling element 39 defines a second pivot axis through the centre of the eyelet of the coupling element 39. Thus, each coupling element 38, 39 defines a pivot axis through a respective centre of the eyelet and is configured for surface contact with the complementary pin element 34, 35. According to a preferred embodiment, the first pivot axis of the coupling element 38 and the second pivot axis of the coupling element 39 are parallel to one another. Further preferably, both the first pivot axis of the coupling element 38 and the second pivot axis of the coupling element 39 are perpendicular to a plane, with the movements of the connecting member 37 being performed within said plane.

[0035] The slots or grooves 40, 41 are provided to compensate for an undersize of the circular bore or for an oversize of the pin element 34 on the shaft 5 and of the pin element 35 on the second blade member 8, respectively. According to a preferred embodiment, the plastic material is made of a suitable plastic material, e.g. of an elastic polymer material, and due to the presence of the slots or grooves 40, 41, the slotted circular bores or eyelets may adapt to the size of the complementary pin element 34, 35. Due to the slots or grooves 40, 41, the amount of friction between the slotted circular bores and the complementary pin elements 34, 35 is rather small.

[0036] According to a preferred embodiment, the diameter of a slotted circular bore or of a slotted eyelet is about 0.01 to 0.03 mm smaller than the corresponding outer diameter of the complementary pin element 34, 35. Thus, it is possible to set up pivot couplings which are free of float. As a consequence, wear of the pivot couplings is reduced, and the operation of the pivot couplings becomes less noisy. The grooves 40, 41 may serve as depots for lubrication grease. Thus, friction is further reduced.

[0037] It will be appreciated that the above description of the preferred embodiments of the invention with reference to the drawings has been made by way of example only. Thus, a person skilled in the art will appreciate that various changes, modifications and/or additions may be made to the parts particularly described and illustrated without departing from the scope of the invention as defined in the claims.

Claims

1. A hair clipper device (10) comprising:

a first blade member (7);

a second blade member (8) which is adapted for reciprocating movement relative to the first blade member (7) and cooperates with the first blade member (7) to generate a cutting action there-between;

a motor (4) for driving the reciprocating movement of the second blade member (8), wherein the motor has a rotor or shaft (5) which rotates about a rotational axis (6); and

a connecting member (31) which interconnects the rotor or shaft (5) of the motor (4) and the second blade member (8), wherein the connecting member (31) extends in a direction transverse to the rotational axis (6) and is connected with the second blade member (8) at a position laterally spaced from the rotational axis (6),

characterized in that an end region of the connecting member includes a first pivot coupling element (32), such as an eyelet or a pin, for pivoting connection with the rotor or shaft (5) of the motor, and wherein an opposite end region of the connecting member includes a second pivot coupling element (33), such as an eyelet or a pin, for pivoting connection with the second

blade member (8), wherein the first pivot coupling element (32) comprises a slotted circular bore or a slotted eyelet with a first groove (40), and wherein the second pivot coupling element (39) comprises a slotted circular bore or a slotted eyelet with a second groove (41).

2. A device (10) according to claim 1, wherein the connecting member (31) is adapted to be pivotally connected with the rotor or shaft (5) of the motor and/or pivotally connected with the second blade member (8).

3. A device (10) according to claim 2, wherein the pivot connection between the connecting member (31) and the rotor or shaft (5) of the motor, on the one hand, and/or between the connecting member (31) and the second blade member (8), on the other hand, provides for pivoting movement about respective pivot axes, and wherein the pivot connection provides surface contact with the connecting member.

4. A device (10) according to claim 1, wherein the first pivot coupling element (32) defines a first pivot axis through an eyelet or a pin of the first pivot coupling element (32), and wherein the second pivot coupling element (33) defines a second pivot axis through an eyelet or a pin of the second pivot coupling element (33).

5. A device (10) according to claim 1 or claim 4, wherein a first pivot axis of the first pivot coupling element (32) and a second pivot axis of the second pivot coupling element (33) are parallel to one another.

6. A device (10) according to claim 4 or claim 5, wherein both the first pivot axis of the first pivot coupling element (32) and the second pivot axis of the second pivot coupling element (33) are perpendicular to a plane, with the connecting member (31) being adapted for moving within said plane.

7. A device (10) according to any one of the preceding claims, wherein the inner diameter of the slotted circular bore or the slotted eyelet is about 0.01 to 0.03 mm smaller than the corresponding outer diameter of a complementary pin element (34, 35).

8. A device (10) according to any one of the preceding claims, wherein the reciprocating movement of the second blade member (8) relative to the first blade member (7) provides a substantially linear displacement in the range of about 2 mm to 6 mm, and preferably in the range of about 3 mm to 4 mm.

9. A device (10) according to any one of the preceding claims, wherein the connecting member (31) is substantially rigid and elongate and has a length (L) within the range of about 8 mm to 24 mm, preferably within the range of about 10 mm to 20 mm, and more preferably within the range of about 12 mm to 16 mm.

10. A device (10) according to any one of the preceding claims, wherein the first blade member (7) and the second blade member (8) together define a generally straight cutting region (11) at a leading or front edge of the device (10) and a cutting plane (C) therebetween, and wherein the cutting plane (C) is preferably intersected by the rotational axis (6) of the motor (4) at a non-perpendicular angle (α).

11. A device (10) according to any one of the preceding claims, wherein, when viewed along the rotational axis (6) of the motor (4), the connecting member (31) is connected with the second blade member (8) at a position laterally spaced to a side of the rotational axis (6) at which the direction of rotation of the motor (4) around the axis (6) is towards the cutting region (11).

12. A device (10) according to any one of the preceding claims, wherein, when viewed in the direction from the motor (4) towards a cutting head (2), the connecting rod (31) is connected with the second blade member (8) at a position (35) that is laterally spaced to that side of the rotational axis (6) at which a tangential component of the motor's rotational velocity around the axis (6) points towards a cutting region (11) of the cutting head (2).

13. A device (10) according to any one of the preceding claims, wherein a tangential velocity of the shaft (5) at that side of the rotational axis (6) to which the connecting member (31) extends for connection with the second blade member (8) has a directional or vector component towards a cutting region (11) of the blade members (7, 8).

14. A device (10) according to claim 13, wherein the directional or vector component towards the cutting region (11) generates a force component (F_H) that acts to maintain the second blade member (8) in contact or engagement with the first blade member (7).

15. A device (10) according to claim 14, wherein the force component supports an engagement between the first blade members (7) and the second blade member (8) in the cutting plane to ensure maintenance of a desired cutting performance.

16. A device (10) according to any one of the preceding claims, wherein a line extended between points of maximum lateral displacement of the eccentric connection (32, 34) of the connecting member (31) to the motor shaft (5) defines a line which also extends to the position (33, 35) at which the connecting mem-

ber (31) is connected with the second blade member.

17. A device (10) according to any one of the preceding claims, wherein the connecting member (31) is connected with the rotor or shaft (5) of the motor (4) at a position eccentric to the rotational axis (11), preferably via an intermediate member (36), which may be partially disc-shaped, rigidly connected with the rotor or shaft (5) of the motor (4).

Patentansprüche

1. Haarschneidevorrichtung (10), umfassend:

ein erstes Messerglied (7);
ein zweites Messerglied (8) ausgebildet zur Hin- und Herbewegung relativ zum ersten Messerglied (7) und kooperierend mit dem ersten Messerglied (7) zum Erzeugen eines Schneidvorgangs zwischen den Messergliedern;
einen Motor (4) zum Antreiben der Hin- und Herbewegung des zweiten Messerglieds (8), wobei der Motor einen Rotor oder Schaft (5) aufweist, welcher um eine Rotationsachse (6) rotiert; und
ein Verbindungsglied (31), welches den Rotor oder Schaft (5) des Motors (4) und das zweite Messerglied (8) miteinander verbindet, wobei das Verbindungsglied (31) sich in einer Richtung quer zur Rotationsachse (6) erstreckt und in einer Position lateral beabstandet von der Rotationsachse (6) mit dem zweiten Messerglied (8) verbunden ist,
dadurch gekennzeichnet, dass ein Endbereich des Verbindungsglieds ein erstes Drehkupplungselement (32) beinhaltet, wie z.B. eine Öse oder einen Stift, zur drehbeweglichen Verbindung mit dem Rotor oder Schaft (5) des Motors, und wobei ein gegenüberliegender Endbereich des Verbindungsglieds ein zweites Drehkupplungselement (33) beinhaltet, wie z.B. eine Öse oder einen Stift, zur drehbeweglichen Verbindung mit dem zweiten Messerglied (8), wobei das erste Drehkupplungselement (32) eine geschlitzte kreisförmige Bohrung oder eine geschlitzte Öse mit einer ersten Nut (40) umfasst, und wobei das zweite Drehkupplungselement (33) eine geschlitzte kreisförmige Bohrung oder eine geschlitzte Öse mit einer zweiten Nut (41) umfasst.

2. Vorrichtung (10) nach Anspruch 1, wobei das Verbindungsglied (31) ausgebildet ist, drehbeweglich mit dem Rotor oder Schaft (5) des Motors und/oder drehbeweglich mit dem zweiten Messerglied (8) verbunden zu sein.

3. Vorrichtung (10) nach Anspruch 2, wobei die Drehverbindung zwischen dem Verbindungsglied (31) und dem Rotor oder Schaft (5) des Motors einerseits, und/oder zwischen dem Verbindungsglied (31) und dem zweiten Messerglied (8) andererseits, für eine Drehbewegung um jeweilige Drehachsen sorgt, und wobei die Drehverbindung Oberflächenkontakt mit dem Verbindungsglied herstellt.

4. Vorrichtung (10) nach Anspruch 1, wobei das erste Drehkupplungselement (32) eine erste Drehachse durch eine Öse oder einen Stift des ersten Drehkupplungselements (32) definiert, und wobei das zweite Drehkupplungselement (33) eine zweite Drehachse durch eine Öse oder einen Stift des zweiten Drehkupplungselements (33) definiert.

5. Vorrichtung (10) nach Anspruch 1 oder Anspruch 4, wobei eine erste Drehachse des ersten Drehkupplungselements (32) und eine zweite Drehachse des zweiten Drehkupplungselements (33) parallel zueinander sind.

6. Vorrichtung (10) nach Anspruch 4 oder 5, wobei sowohl die erste Drehachse des ersten Drehkupplungselements (32) und die zweite Drehachse des zweiten Drehkupplungselements (33) perpendikulär zu einer Ebene sind, wobei das Verbindungsglied (31) ausgebildet ist zur Bewegung innerhalb dieser Ebene.

7. Vorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei der Innendurchmesser der geschlitzten kreisförmigen Bohrung oder der geschlitzten Öse etwa 0,01 bis 0,03 mm kleiner ist als der entsprechende Außendurchmesser eines komplementären Stiftelements (34, 35).

8. Vorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei die Hinund Herbewegung des zweiten Messerglieds (8) relativ zum ersten Messerglied (7) eine im Wesentlichen lineare Verlagerung im Bereich von etwa 2 mm bis 6 mm, und bevorzugt im Bereich von etwa 3 mm bis 4 mm ergmöglicht.

9. Vorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei das Verbindungsglied (31) im Wesentlichen steif und länglich ist und eine Länge (L) im Bereich von etwa 8 mm bis 24 mm, bevorzugt im Bereich von etwa 10 mm bis 20 mm, und weiter bevorzugt im Bereich von etwa 12 mm bis 16 mm aufweist.

10. Vorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei das erste Messerglied (7) und das zweite Messerglied (8) zusammen einen im Allgemeinen geradlinigen Schneidbereich (11) und eine Vorderflanke oder Vorderkante der Vorrichtung (10) und eine Schneideebene (C) dazwischen definieren,

und wobei die Schneideebene (C) bevorzugt von der Rotationsachse (6) des Motors (4) in einem nichtperpendikulären Winkel (α) geschnitten wird.

11. Vorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei, wenn entlang der Rotationsachse (6) des Motors (4) betrachtet, das Verbindungsglied (31) mit dem zweiten Messerglied (8) in einer Position lateral beabstandet zu einer Seite der Rotationsachse (6) verbunden ist, an welcher die Rotationsrichtung des Motors (4) um die Achse (6) in Richtung des Schneidebereichs (11) ist.

12. Vorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei, wenn in der Richtung vom Motor (4) in Richtung eines Schneidkopfs (2) betrachtet, die Verbindungsstange (31) mit dem zweiten Messerglied (8) in einer Position (35) verbunden ist, welche lateral zu derjenigen Seite der Rotationsachse (6) beabstandet ist, an welcher eine tangentiale Komponente der Rotationsgeschwindigkeit des Motors um die Achse (6) in Richtung eines Schneidebereichs (11) des Schneidkopfs (2) weist.

13. Vorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei eine Tangentialgeschwindigkeit des Schafts (5) an derjenigen Seite der Rotationsachse (6), an welcher das Verbindungsglied (31) sich zur Verbindung mit dem zweiten Messerglied (8) erstreckt, eine direktionale oder vektorielle Komponente in Richtung eines Schneidebereichs (11) der Messerglieder (7, 8) hat.

14. Vorrichtung (10) nach Anspruch 13, wobei die direktionelle oder vektorielle Komponente in Richtung des Schneidebereichs (11) eine Kraftkomponente (F_H) erzeugt, welche zum Halten des zweiten Messerglieds (8) in Kontakt oder Eingriff mit dem ersten Messerglied (7) wirkt.

15. Vorrichtung (10) nach Anspruch 14, wobei die Kraftkomponente einen Eingriff zwischen dem ersten Messerglied (7) und dem zweiten Messerglied (8) in der Schneideebene unterstützt, um Aufrechterhaltung einer gewünschten Schneideleistung sicherzustellen.

16. Vorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei eine zwischen Punkten maximaler lateraler Verlagerung der exzentrischen Verbindung (32, 34) des Verbindungsglieds (31) zum Motorschaft (5) gezogene Linie eine Linie definiert, welche sich auch zu der Position (33, 35) erstreckt, in welcher das Verbindungsglied (31) mit dem zweiten Messerglied verbunden ist.

17. Vorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei das Verbindungsglied mit dem Rotor oder Schaft (5) des Motors (4) in einer Position exzentrisch zur Rotationsachse (6) verbunden ist, bevorzugt über ein starr mit dem Rotor oder Schaft (5) des Motors (4) verbundenes Zwischenglied (36), welches teilweise scheibenförmig sein kann.

Revendications

1. Dispositif de tondeuse à cheveux (10) comprenant :

un premier élément de lame (7) ;
un second élément de lame (8) qui est adapté pour un mouvement de va-et-vient par rapport au premier élément de lame (7) et coopère avec le premier élément de lame (7) pour générer une action de coupe entre ceux-ci ;
un moteur (4) pour entraîner le mouvement de va-et-vient du second élément de lame (8), dans lequel le moteur présente un rotor ou un arbre (5) qui tourne autour d'un axe de rotation (6) ; et
un élément de liaison (31) qui relie le rotor ou l'arbre (5) du moteur (4) et le second élément de lame (8), dans lequel l'élément de liaison (31) s'étend dans une direction transversale à l'axe de rotation (6) et est relié au second élément de lame (8) à une position espacée latéralement de l'axe de rotation (6),
caractérisé en ce qu'une région d'extrémité de l'élément de liaison comprend un premier élément de couplage par pivotement (32) tel qu'un oeillet ou une broche, pour la liaison pivotante avec le rotor ou l'arbre (5) du moteur, et dans lequel une région d'extrémité opposée de l'élément de liaison comprend un second élément de couplage par pivotement (33) tel qu'un oeillet ou une broche pour la liaison pivotante avec le second élément de lame (8), dans lequel le premier élément de couplage par pivotement (32) comprend un trou circulaire oblong ou un oeillet oblong avec une seconde rainure.

2. Dispositif (10) selon la revendication 1, dans lequel l'élément de liaison (31) est adapté pour être relié de manière pivotante au rotor ou à l'arbre (5) du moteur et/ou relié de manière pivotante au second élément de lame (8).

3. Dispositif (10) selon la revendication 2, dans lequel la liaison pivotante entre l'élément de liaison (31) et le rotor ou l'arbre (5) du moteur d'une part et/ou entre l'élément de liaison (31) et le second élément de lame (8) d'autre part, fournit le mouvement pivotant autour d'axes de pivotement respectifs, et dans lequel la liaison pivotante fournit un contact de surface avec l'élément de liaison.

4. Dispositif (10) selon la revendication 1, dans lequel

le premier élément de couplage par pivotement (32) définit un premier axe de pivotement à travers un oeillet ou une broche du premier élément de couplage par pivotement (32), et dans lequel le second élément de couplage par pivotement (33) définit un second axe de pivotement à travers un oeillet ou une broche du second élément de couplage par pivotement (33).

5. Dispositif (10) selon la revendication 1 ou la revendication 4, dans lequel un premier axe de pivotement du premier élément de couplage par pivotement (32) et un second axe de pivotement du second élément de couplage par pivotement (33) sont parallèles l'un à l'autre.

6. Dispositif (10) selon la revendication 4 ou la revendication 5, dans lequel à la fois le premier axe de pivotement du premier élément de couplage par pivotement (32) et le second axe de pivotement du second élément de couplage par pivotement (33) sont perpendiculaires à un plan, l'élément de liaison (31) étant adapté pour se déplacer dans ledit plan.

7. Dispositif (10) selon l'une quelconque des revendications précédentes, dans lequel le diamètre intérieur du trou circulaire oblong ou de l'oeillet oblong est plus petit d'environ 0,01 à 0,03 mm que le diamètre extérieur correspondant d'un élément de broche complémentaire (34, 35).

8. Dispositif (10) selon l'une quelconque des revendications précédentes, dans lequel le mouvement de va-et-vient du second élément de lame (8) par rapport au premier élément de lame (7) fournit un déplacement sensiblement linéaire dans la plage d'environ 2 à 6 mm et de préférence dans la plage d'environ 3 à 4 mm.

9. Dispositif (10) selon l'une quelconque des revendications précédentes, dans lequel l'élément de liaison (31) est sensiblement rigide et allongé et présente une longueur (L) dans la plage d'environ 8 à 24 mm, de préférence dans la plage d'environ 10 à 20 mm, et de manière davantage préférée dans la plage d'environ 12 à 16 mm.

10. Dispositif (10) selon l'une quelconque des revendications précédentes, dans lequel le premier élément de lame (7) et le second élément de lame (8) définissent ensemble une région de coupe (11) généralement droite sur une arête avant ou frontale du dispositif (10) et un plan de coupe (C) entre eux, et dans lequel le plan de coupe (C) est de préférence coupé par l'axe de rotation (6) du moteur (4) à un angle non perpendiculaire (α).

11. Dispositif (10) selon l'une quelconque des revendications précédentes, dans lequel, vu le long de l'axe de rotation (6) du moteur (4), l'élément de liaison (31) est relié au second élément de lame (8) à une position latéralement espacée d'un côté de l'axe de rotation (6), à laquelle la direction de la rotation du moteur (4) autour de l'axe (6) est vers la région de coupe (11).

12. Dispositif (10) selon l'une quelconque des revendications précédentes, dans lequel, vu dans la direction du moteur (4) vers une tête de coupe (2), la tige de liaison (31) est reliée au second élément de lame (8) à une position (35) qui est espacée latéralement de ce côté de l'axe de rotation (6), à laquelle une composante tangentielle de la vitesse rotative du moteur autour de l'axe (6) est dirigée vers une région de coupe (11) de la tête de coupe (2).

13. Dispositif (10) selon l'une quelconque des revendications précédentes, dans lequel une vitesse tangentielle de l'arbre (5) sur le côté de l'axe de rotation (6), auquel l'élément de liaison (31) s'étend pour la liaison avec le second élément de lame (8) présente une composante directionnelle ou vectorielle vers une région de coupe (11) des éléments de lame (7, 8).

14. Dispositif (10) selon la revendication 13, dans lequel la composante directionnelle ou vectorielle vers la région de coupe (11) génère une composante de force (F_H) qui agit pour maintenir le second élément de lame (8) en contact ou en prise avec le premier élément de lame (7).

15. Dispositif (10) selon la revendication 14, dans lequel la composante de force supporte une prise entre les premiers éléments de lame (7) et le second élément de lame (8) dans le plan de coupe pour assurer le maintien d'une performance de coupe souhaitée.

16. Dispositif (10) selon l'une quelconque des revendications précédentes, dans lequel une ligne étendue entre des points de déplacement latéral maximum de la liaison excentrique (32, 34) de l'élément de liaison (31) avec l'arbre de moteur (5) définit une ligne qui s'étend aussi jusqu'à la position (33, 35), à laquelle l'élément de liaison (31) est relié au second élément de lame.

17. Dispositif (10) selon l'une quelconque des revendications précédentes, dans lequel l'élément de liaison (31) est relié au rotor ou à l'arbre (5) du moteur (4) à une position excentrique à l'axe de rotation (11), de préférence via un élément intermédiaire (36) qui peut être en partie en forme de disque, relié rigidement au rotor ou à l'arbre (5) du moteur (4).

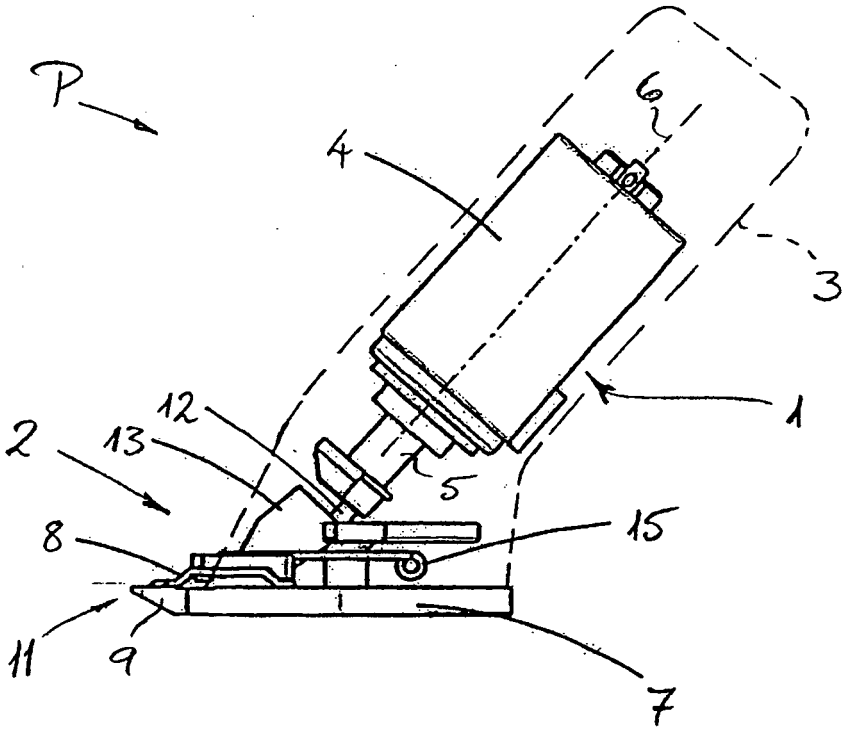


Fig. 1

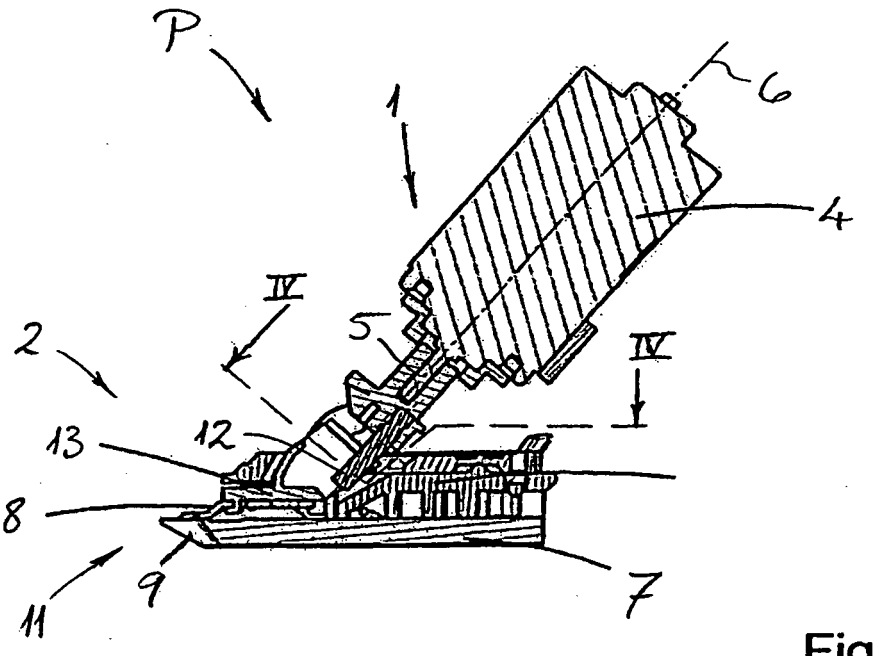


Fig. 2

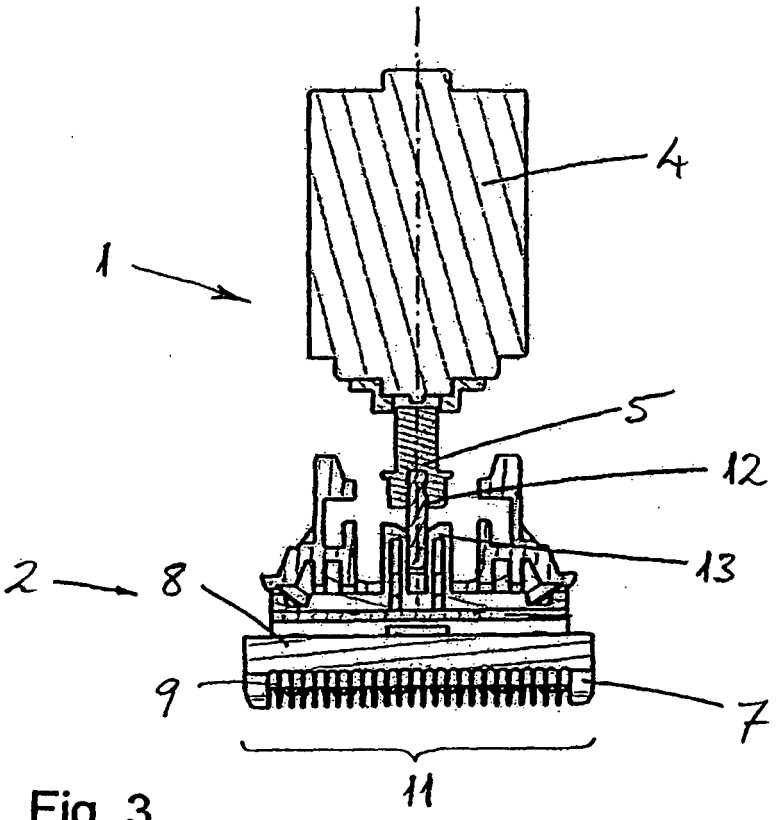


Fig. 3

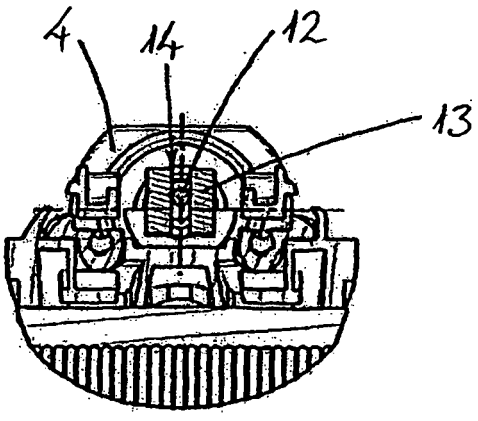


Fig. 4

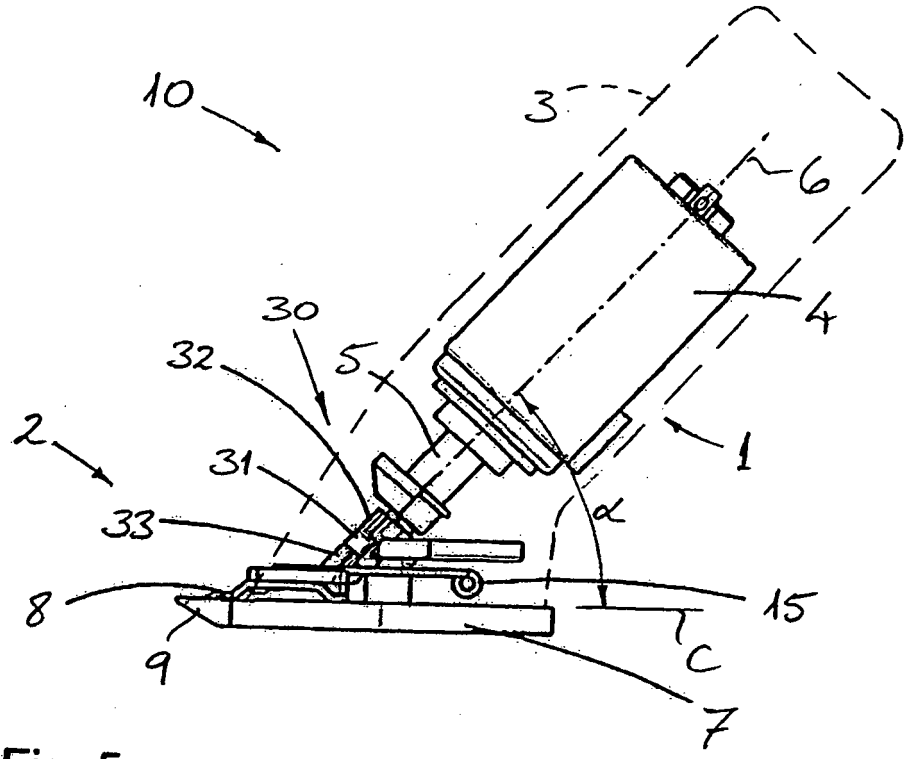


Fig. 5

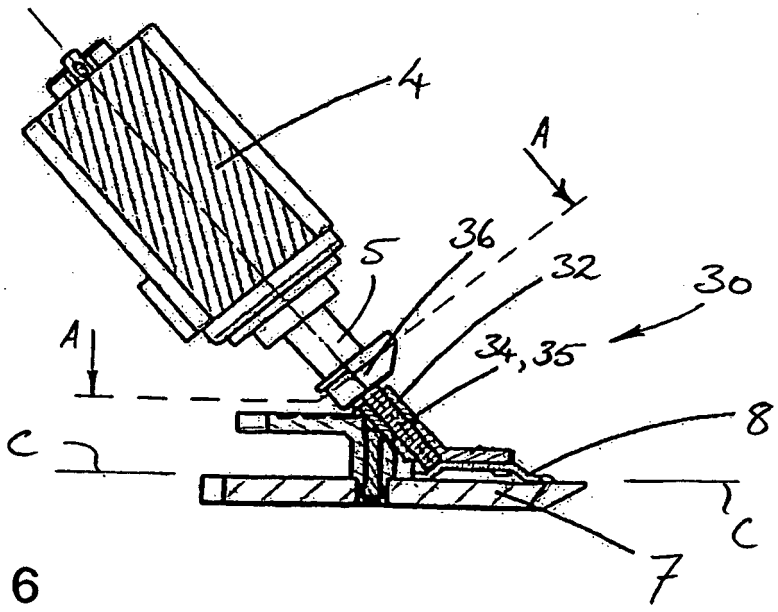


Fig. 6

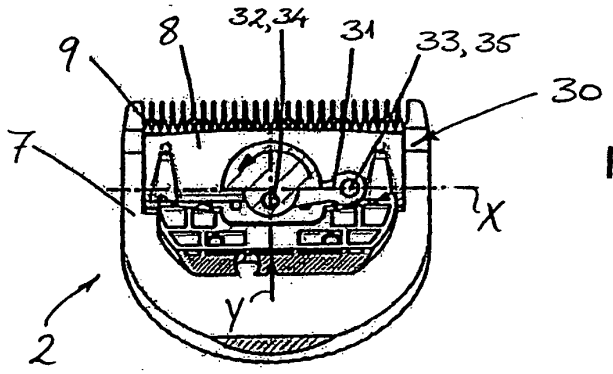


Fig. 7

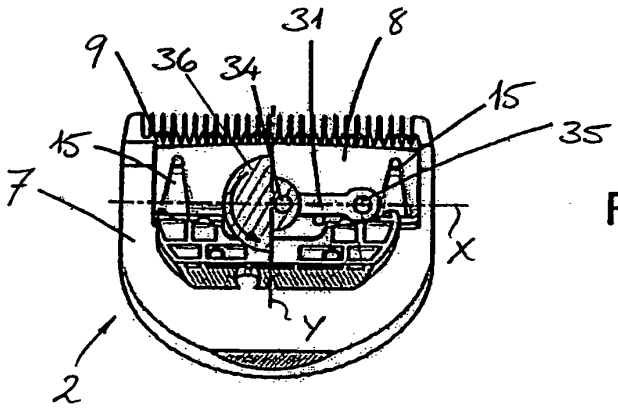


Fig. 8

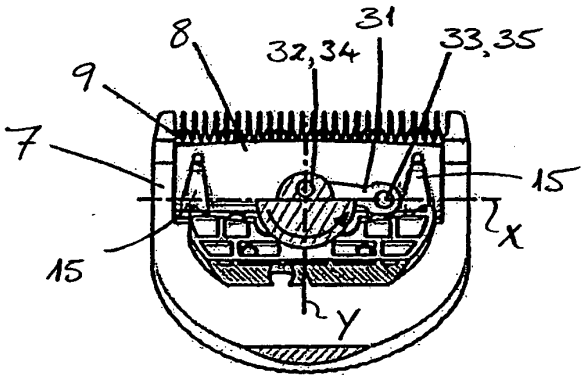


Fig. 9

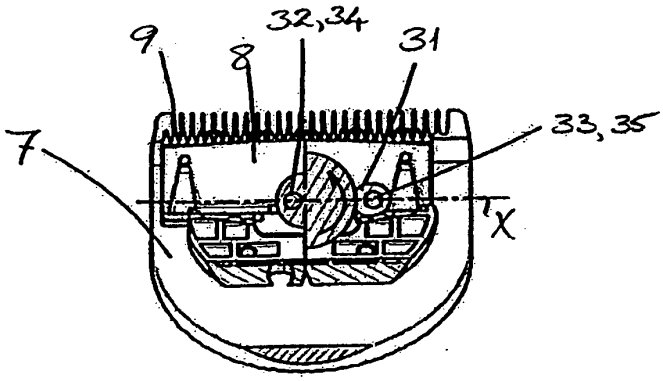


Fig. 10

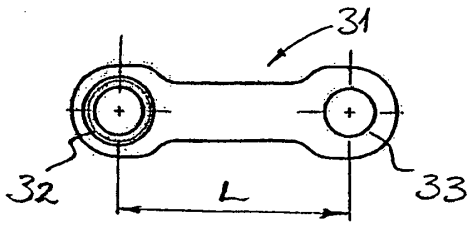


Fig. 11

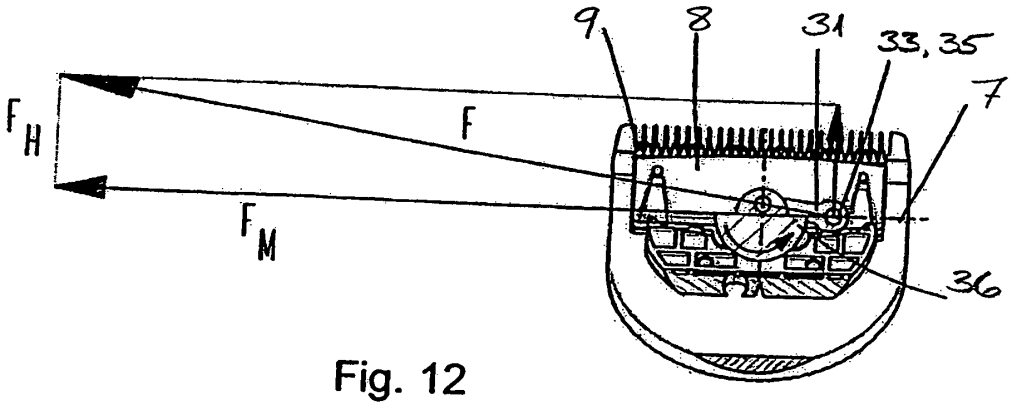


Fig. 12

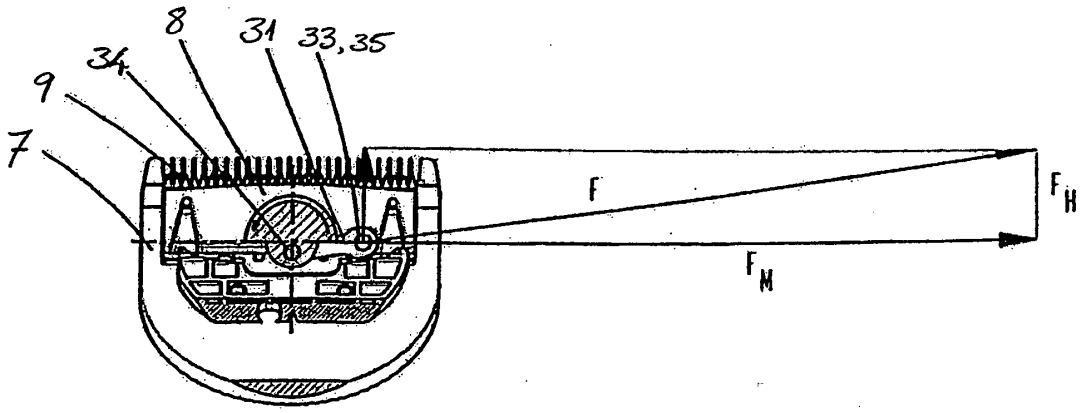


Fig. 13

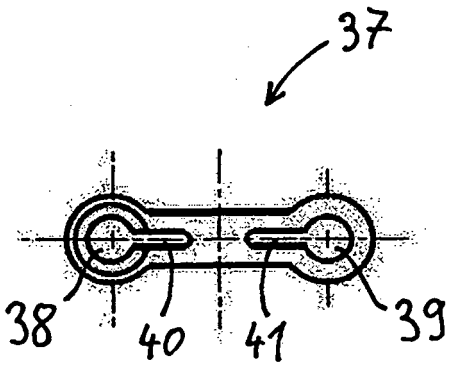


Fig. 14

REFERENCES CITED IN THE DESCRIPTION

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