

The present invention has for its object a small depilating apparatus which may be held in the user's hand and which is intended for the elimination of superfluous hair.

5 There are already existing small devices designed for the same purpose. French Patent Application N° 2 307 491 describes an apparatus comprising two pairs of contra-rotating rollers which are intended to pull out hairs brought into engagement therebetween. However, the effectiveness
10 of this apparatus is limited. This is due to the very nature of the members being used for pulling out the hairs. Another cause of the limited effectiveness of this apparatus lies with the fact that the point at which the hairs are actually grasped between the two rollers, that is the point
15 of contact between these, is necessarily widely set back from the corresponding end of the housing of the device.

French Patent Application N° 2 334 320 describes another depilating apparatus in which there is provided a helical coil spring rotating about its own axis, the

windings of which are alternatively loosened and pressed against each other, with the purpose that hairs may become engaged between these windings while they are loose for being subsequently pinched between these as they are
5 tightened again, for being pulled out because of the rotation of the spring about its own axis.

However, it is difficult for the ends of the hairs which are to be pulled out to become engaged between the windings of the rotary spring, because of the helical
10 configuration of the latter. For the same reason, the hairs are moved in the transversal direction by the rotating windings, which prevents them from properly entering inside the spring. Furthermore, those hairs which have nevertheless been able to become engaged between the
15 windings are then pinched at one sole point, namely the point of contact between the two windings located on either side of the hair. There exists, therefore, a substantial risk of slipping when the spring continues to rotate, in which case the corresponding hairs are not pulled out by
20 the spring. Finally, there is no provision for means adapted for the subsequent removal of the hairs engaged between the windings of the springs. Moreover, this removal would be very difficult to achieve. Also, when this spring is compressed, the windings are tightened together
25 over the whole of their surface. The hairs having been pulled out can therefore be released only after the spring has been loosened. However, this requires some time, so that this limits the operating speed accordingly.

This is why the apparatus according to the invention
30 is designed so as to avoid the drawbacks of earlier devices, in order that it may be really effective for easily and rapidly pulling out the hairs which are to be eliminated.

For this purpose, this apparatus comprises mobile members for pulling the hairs out, consisting in a series

of disks placed side by side and forming a rotary roller containing at least one series of pinching blades engaged between two adjacent disks and held interdependent in rotation inside this roller by a fastening element, these
5 blades being periodically actuated by control means so as to hold tightly against these disks the hairs engaged inside the roller; this roller being disposed at one end of a small housing which can be held in the hand and which contains an electric motor for driving this roller; the
10 disks being directly driven in rotation by a central rotary shaft connected to the electric motor, these disks transmitting the rotation movement to the said series of pinching blades; the fastening element for one same series of pinching blades being formed of a solid piece which is common
15 to this series of blades and provides a regular invariable spacing between these blades.

In one specific embodiment, the blades provided for pinching the hairs which are to be pulled out are parallel together and are carried by a movable support arranged for
20 sliding along a direction parallel to the axis of the above-mentioned disks, means being provided for periodically causing the sliding movement of this support so as to press the pinching blades against the rotary disks for gripping the hairs which are to be pulled out.

25 In this manner, the ends of the hairs which are to be pulled out become very easily engaged between the rotating disks, since these disks are parallel together and perpendicular to their axis of rotation. On another hand, the effectiveness of the present apparatus is optimized because the hairs engaged between the rotating disks
30 are gripped not only in a single point, but rather along the whole length of their engagement depth between the disks.

Further features and advantages of the apparatus according to this invention will appear from the following description, given with reference to the appended drawings which are merely indicative and in which :

- 5 Figure 1 represents one embodiment of the present apparatus, more specifically an end view of its terminal face where there is provided an entrance slot for the hairs which are to be pulled out;
- Figure 2 is a partly cut-out elevation view, taken along
10 line II-II of Figure 1;
- Figures 3 and 4 are partial cross-sectional views taken along different section planes;
- Figure 5 is an elevation end view of one of the rotary
15 disks provided in this apparatus, at a different scale;
- Figure 6 is a perspective view, also at a different scale, of one of the pinching combs provided in this apparatus and which consists in a series of pinching blades carried by a movable support.

20 The apparatus shown in Figures 1 - 5 comprises a small housing 1 which can be held in the user's hand and which is formed of two half-shells assembled together. This housing contains a small electric motor 2 energized by a (rechargeable) battery 3. The operation of this motor
25 may be controlled by a push-button 4 protruding from one of the sides of the housing.

On one end 5 of the housing is provided an aperture or slot 6, or a grid 6a intended for receiving the hairs to be pulled out. Preferably, the walls of this slot are slanted
30 ted for facilitating the penetration of the hairs into this slot when the apparatus is moved along the skin in the direction provided for the movement of the apparatus. The external edge of the slot 6, which is located on the opposite side, presents a salient lip intended for "combing"

the hairs in order to force them to enter into the slot 6.

Behind this slot is disposed a rotary roller formed of a series of disks 8a made of a resilient metal, carried by a rotary shaft 9a. It will be appropriate to note that
5 the housing end 5 has an outline which corresponds to a cylinder portion, the axis of which coincides with the axis of the shaft 9a. Also, the arrangement is such that the periphery of the disks 8a is in the immediate vicinity of the inside face of the housing end 5, and therefore of the
10 corresponding aperture of the slot 6.

In their normal position illustrated in Figure 3, the disks 8 present a slight interval allowing hairs penetrating through the slot 6 to engage between these disks. However, appropriate means are provided for periodically pinching
15 against these disks the hairs engaged between said disks.

The rotary shaft 9a carries end flanges 18a and 18b and its ends are engaged in bearings 19 provided in the corresponding walls 20 of the housing. One of the end flanges, namely flange 18a, is provided with a peripheral
20 set of gear teeth meshing with pinions for coupling this flange with the driving motor lodged in the housing 1a.

The pinching means provided in this embodiment consist in two combs, each one being formed of a series of blades 21a or 21b engaged between the rotary disks 8a and carried by a
25 shaft, respectively 22a and 22b. These two combs are practically integrated in the rotary roller formed by the disks 8a and they revolve together with this roller. These two combs are in diametrically opposed positions in respect of the shaft 9a of the rotary roller. Their shafts 22a and 22b
30 are parallel to said shaft 9a, while their blades 21a and 21b are parallel to the rotary disks 8a. As shown in Figure 4, the blades 21a and 21b occupy only a reduced fraction of the surface of the disks 8a, facing the periphery thereof.

The respective shafts 22a and 22b of the combs are engaged through apertures 23a and 23b respectively formed through the rotary disks 8a. However, these apertures are wide enough for providing a passage for the blades 21a and 21b for allowing each pinching comb to be inserted inside the rotary roller by engaging these blades 21a and 21b between the disks 8a.

However, as it will appear from Figure 4, these apertures 23a and 23b are angularly offset in respect of the final position occupied by the blades 21a or 21b of the two pinching combs. The insertion of these combs must therefore be made by imparting to them a radial displacement after having placed them inside the apertures 23a or 23b.

The ends of the shaft of each comb are slidably mounted in bores formed in the end flanges 18a and 18b of the roller. More specifically, one of these ends, namely end 24, is engaged in a blind hole of the flange which contains a coil spring 25 which tends to keep each comb in its normal rest position in which the comb blades 21a and 21b are half-way between the disks 8a of the rotary roller, as shown in Figure 6, so that the hairs to be pulled out may engage themselves between the disks and the pinching blades.

The opposite end 26 of the shaft of each pinching comb is slidably mounted in a bore of the corresponding end flange of the roller, which opens outwardly, and this shaft end bears against a cam 27a or 27b carried on the respective wall of the housing. The profile of this cam is such that it will tend to push back the shaft 22a or 22b of the corresponding pinching comb when this member is immediately beyond the slot 6 of the housing along which is provided the grid 6a for letting through the hairs to be pulled out.

Each of these cams presents therefore a boss 28 in the angular sector concerned, namely the sector situated immediately behind the radius of the roller passing through the slot 6, with respect to the direction of rotation of the disks 8a. Accordingly, when, in the course of the rotation of the roller formed of the disks 8a, each one of the pinching combs finds itself in the angular sector concerned, it is pushed back along the axial direction into a position in which the blades of this comb are strongly pressed against the disks 8a facing them, as shown in Figure 4 for the blades 21a of the corresponding comb. Figure 4 is a cross-section view along a plane passing through the middle of the angular sector concerned, so that this plane is therefore offset relative to the cross-section plane of Figure 3.

However, as it emerges from Figure 2, the disposition of the two combs is inverted, and a cam 27a or 27b is provided on each one of the corresponding walls of the housing. In this situation, one of the pinching combs, namely comb 21a, is driven in the direction of arrow F3, while the other comb is driven in the opposite direction shown by arrow F4. As a result, the hairs engaged inside the apparatus are alternatively pinched against either face of each of the rotary disks 8a.

For preventing the pinching combs from rotating about their own axis, they are provided on at least one of their ends with a protrusion 29 having a non-circular cross-section (see Figure 6) which engages a mating recess provided in the corresponding end flange 18a or 18b. It is indeed appropriate that the pinching blades of these combs should always occupy the same relative angular position in respect of the rotary disks 8a.

The pulling out of the hairs engaged in the apparatus takes place through a pinching action against the rotary disks 8a which will then pull them along in their rotary motion. However, the hairs are pinched between one of
5 these disks and one blade of the movable pinching combs. At each revolution there are occurring two similar pinching operations in the rotary roller formed of the disks 8a.

There is no risk of the hairs sliding in relation to the disks, so that the pulling out of the hairs to be eli-
10 minated is achieved with an optimal effectiveness.

Also, for absolutely avoiding any risk of slipping, the disk surfaces may be subjected to a roughening treatment. It is also possible to provide these surfaces with striations or other appropriate raised patterns.

15 Since the disks 8a always remain slightly spaced from each other, and since these disks are perpendicular to their axis of rotation, it is possible to provide cleaning elements engaging themselves between the disks for removing pulled-out hairs. These cleaning elements may be in the form of bristles
20 of a fixed or movable brush. However, these cleaning elements may also consist in a series of cleaning disks carried on a shaft. These disks may be fixed or eventually mounted for rotating in a direction opposite to that of the pulling-out disks 8a. Thus, these cleaning disks perform the
25 removal of the pulled-out hairs which are still engaged between the disks 8a. These hairs are thus caused to fall into a recess from which they can be removed after releasing a small lid provided for this purpose on the housing of the apparatus. It is worth noting that the possibility of clean-
30 ing the pulling-out disks 8a by means of elements inserted between these disks constitutes a specific advantage of the present apparatus. Indeed, this cleaning procedure would be radically impossible in the case of the helical spring device provided in the apparatus described in the French

Patent Application N° 2 334 320.

However, the main advantage of the apparatus according to this invention lies in the fact that its effectiveness is particularly favourable. In these conditions, it
5 will be sufficient to move this apparatus over the skin surface for systematically pulling out all the hairs to be eliminated. This operation is all the more easy since the present apparatus can easily be held in one hand, taking into account its shape which is similar to that
10 of a small electric razor.

Each movable pinching comb may be formed of a single integral part, moulded in plastic material.

Eventually, the rotary roller of the present apparatus might comprise one single pinching comb instead of two,
15 or any other number being compatible with the dimensions of the apparatus.

CLAIMS

1. A skin-depilating apparatus comprising movable members for pulling hairs out consisting in a series of disks (8a) placed side by side and forming a rotary roller
5 containing at least one series of pinching blades (21a or 21b) engaged between two neighbouring disks and held together for rotating inside this roller by means of a holder element, these blades being periodically actuated by control means (25, 26, 27a or 27b) so as to clamp against these
10 disks the hairs being engaged in the roller; this roller being disposed at one end of a small housing (1a) which can be held in one hand and contains an electric motor for driving this roller; the disks (8a) being directly mounted on a central rotary shaft (9a) for rotating therewith, this
15 shaft being coupled with the electric motor, these disks transmitting the rotation movement to the said series of pinching blades; the holder element for one same series of pinching blades (21a or 21b) being formed of a single-piece member common to the series of these blades and
20 maintaining a regular invariable spacing between said blades.
2. Apparatus according to Claim 1, characterized in that the holder element (22a, 22b) for the pinching blades (21a, 21b) of one same series passes through apertures (23a, 23b) provided through the set of rotary disks (8a), and this
25 holder element is movable in translation inside these apertures, in parallel with the rotary shaft (9a) carrying the extractor disks (8a) for simultaneously forming the actuator member for the pinching blades (21a, 21b) of the corresponding series.
- 30 3. Apparatus according to Claim 1, characterized in that the pinching blades (21a, 21b) of one same series are fixedly mounted on a common support (22a, 22b) forming simultaneously their fastening element inside the rotary roller and their actuator element, this element being slidably mounted parallel
35 to the central shaft (9a) of the rotary roller and



passing through apertures (23a, 23b) formed in the disks (8a) of this roller.

4. Apparatus according to Claim 3, characterized in that the pinching blades (21a, 21b) are parallel with the disks (8a) of the rotary roller.

5. Apparatus according to Claim 3 or 4, characterized in that the movable support (22a, 22b) of one same series of pinching blades (21a, 21b) is actuated by a cam (28) against which one end of said support rests slidably, a return spring (25) being disposed against the opposite end for subsequently pushing back the pinching blades (21a, 21b) into a spread-apart position from the disks (8a) of the rotary roller.

6. Apparatus according to one of Claims 2-5, characterized in that the pinching blades (21a, 21b) of a same series occupy only a portion of the surface of the rotary disks (8a) near the periphery thereof, these disks presenting apertures (23a, 23b) which are offset relatively to the final position of the pinching blades (21a, 21b) of each series, while being large enough for allowing said blades to be passed there-through during the assembling of the assembly.

7. Apparatus according to one of the preceding Claims, characterized in that, the rotary roller provided for pulling hairs out being disposed behind a slot (6) of the housing (1), the edge of said slot situated on the side opposite to the intended direction of displacement of this apparatus comprises a salient lip (7) adapted for combing the hairs which are to be pulled out for bringing them into engagement inside this slot.

