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(54) **Depilatory device**

(57) A depilatory device (1) in this invention comprising a housing (200), a plucking means, a pinching mechanism, and a plucking mechanism. The plucking means includes a plucking cylinder (16) which is supported to the housing (200). The plucking cylinder (16) carries a plurality of pinching units (300L, 300R) at a circumference surface of the plucking cylinder (16). The pinching unit is composed of a first blade (31L) and a second blade (23L). At least one of the first blade (31L) and the second blade (23L) is movable toward and away from the other of the first blade and the second blade to have an opened position and a pinch position. Each of the pinching units

has a hair introducing direction perpendicular to the gap between the first blade and the second blade in the opened position. The pinching mechanism is configured to provide the opened position and the pinch position to the first blade and the second blade. The plucking mechanism is configured to rotate the plucking cylinder. The pinching units are arranged to have their hair introducing directions which are inclined with respect to the longitudinal axis as well as a circumferential direction of the plucking cylinder.

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Description

TECHNICAL FIELD

[0001] This invention relates to a depilatory device for removal of a user's hair, and especially for plucking the user's hair for removal of the user's hair.

BACKGROUND ART

[0002] Japanese patent application publication No. 2006-524521A (United States patent application publication No. US2006/0271071, and PCT application publication No. WO2004/095973) discloses a conventional plucking cylinder of a depilatory device. The conventional depilatory device comprises a housing, the plucking cylinder, a pinching mechanism, and a plucking mechanism. The housing is formed at its one end with a head. The plucking cylinder is supported to the head. The plucking cylinder carries a plurality of pinching units. Each of the pinching units has a stationary blade and a movable blade. Each of the stationary blade and the movable blade has an inside surface. The movable blade is disposed to have its inside surface in an opposed relation to the inside surface of the stationary blade. The movable blade is configured to be movable toward and away from the stationary blade. Therefore, the movable blade is configured to be movable between a pinch position and an opened position. The movable blade in the opened position is spaced from the stationary blade to have a gap between the movable blade and the stationary blade. Therefore, the movable blade in the opened position is spaced from the stationary blade by a gap width W defined by the gap. The movable blade in the pinch position closes the gap. The pinching mechanism is configured to move the movable blade between the opened position and the pinch position. Consequently, the inside surface of the movable blade in the pinch position is cooperative with the inside surface of the stationary blade to pinch the hair in the gap. The plucking mechanism is configured to rotate the plucking cylinder in order to rotate the stationary blade and the movable blade in the pinch position. Consequently, the plucking cylinder plucks the hair between the stationary blade and the movable blade in the pinch position. In this manner, the depilatory device removes the user's hair from the user's skin.

[0003] Each of the pinching unit has a hair introducing direction. The hair introducing direction is perpendicular to the gap width and is perpendicular to a radial direction of the plucking cylinder. That is, the pinching unit is arranged to have the stationary blade and the movable blade with their lengths along the circumferential direction. Therefore, the pinching unit has a depilatory area having a width parallel to the axis of the plucking cylinder and a length parallel to the circumferential direction of the plucking cylinder. The gap between the stationary blade and the movable blade is narrow. Consequently, the conventional depilatory device is configured to pluck

the user's hair in a narrow depilatory area defined by the gap along the circumferential direction of the plucking cylinder and the length of the first blade and the second blade. Therefore, there is a necessity to use the depilatory device many times in order to depilate the user's hair

DISCLOSURE OF THE INVENTION

[0004] This invention is achieved to solve the above problem. An object in this invention is to provide a depilatory device which is configured to pluck the user's hair in a large depilatory area at one time.

[0005] In order to solve the above problem, the depilatory device for removal of human hairs in this invention comprises a housing, a plucking means, a pinching mechanism, and a plucking mechanism. The housing is formed at its upper end with a head. The plucking means includes a plucking cylinder which is supported to the head. The plucking cylinder is driven to rotate about a longitudinal axis of the plucking cylinder. The plucking cylinder carries a plurality of pinching units at a circumference surface of the plucking cylinder. Each pinching unit is composed of a first blade and a second blade which are arranged in an opposed relation with each other. At least one of the first blade and the second blade is movable toward and away from the other of the first blade and the second blade to move between an opened position and a pinch position. The first blade and the second blade in the opened position are configured to form a gap between the first blade and the second blade. The first blade and the second blade in the pinch position is configured to close the gap for pinching the hair in the gap between the first blade and the second blade. Each pinching unit has a hair introducing direction which is perpendicular to a gap width of the gap for introducing the hair between the first blade and the second blade. Each pinching unit has the hair introducing direction which is perpendicular to a radial direction of the plucking cylinder. A pinching mechanism is configured to move the at least one of the first blade and the second blade between the opened position and the pinch position. The plucking mechanism is configured to rotate the plucking cylinder for plucking the hair pinched to the first blade and the second blade. The pinching units are arranged to have their introducing directions. The hair introducing directions are inclined with respect to the longitudinal axis as well as a circumferential direction of the plucking cylinder.

[0006] With this configuration, each of the pinching units has a depilatory area along the circumferential surface of the plucking cylinder. The depilatory area is defined between the first blade and the second blade. The depilatory area has a pinching width along the longitudinal axis of the plucking cylinder, and has a pinching length along the circumferential direction of the plucking cylinder. The hair introducing direction is inclined with respect to the circumferential direction of the plucking cylinder as well as the longitudinal axis of the plucking cylinder.

Therefore, the pinching width of the pinching unit in this invention is larger than the pinching width of the pinching unit which has pinching length parallel to the circumferential direction of the plucking cylinder. Therefore, with this configuration, the pinching unit is configured to pinch the hairs in the large width. Consequently, this configuration makes it possible for the depilatory device to pluck the hairs from a large width along the plucking cylinder.

[0007] It is preferred that the pinching units are arranged along a direction parallel to a longitudinal direction and spaced from each other in said longitudinal axis.

[0008] In this case, the pinching units are configured to receive the hairs from a broad length along the longitudinal axis of the plucking cylinder. Therefore, the depilatory device is configured to pluck a large amount of the hairs per one rotation of the plucking cylinder. Therefore, this configuration makes it possible to enhance an efficiency of plucking the hair from the skin in one rotation of the plucking cylinder.

[0009] It is preferred that each of the pinching units has a depilatory area which is defined between the first blade and the second blade and which extends along the circumferential surface so as to have a pinching width along the longitudinal axis within depilatory area. The plucking cylinder has a depilatory length along the longitudinal axis in the circumferential surface. The pinching units are arranged within the depilatory length. A sum of the pinching widths is equal to or larger than the depilatory length.

[0010] In this case, the pinching units are configured to receive the hair from a full depilation length along the longitudinal axis of the plucking cylinder. Therefore, the depilatory device is configured to pluck a large amount of the hair per one rotation of the plucking cylinder.

[0011] It is preferred that the pinching units are arranged in a plurality of rows spaced circumferentially of the plucking cylinder. Each row includes a plurality of the pinching units which are spaced from each other along the longitudinal axis.

[0012] It is also preferred that the pinching units in the row are staggered from the other pinching units in the other adjacent rows.

[0013] In this case, the depilatory device is configured to pluck a large amount of the hair per one rotation of the plucking cylinder.

[0014] It is preferred that at least one of said pinching units is disposed to have its hair introducing direction which is differently inclined with respect to that of the other pinching units in same row.

[0015] In this case, the pinching units are configured to pinch the hairs which are grown toward a various direction.

[0016] It is also preferred that at least one of the pinching unit is disposed to have its introducing direction which is oppositely inclined with respect to that of the other pinching unit in same row.

[0017] It is more preferred that the pinching units on opposite length ends in same row has their hair introduc-

ing directions which are oppositely oriented with respect to each other.

[0018] In this case, the pinching units stretch the user's skin according to the rotation of the plucking cylinder on the skin. Consequently, the hairs are erected according to the plucking cylinder which runs on the skin. As a result, the pinching units pinch the hairs easily. Therefore, this configuration makes it possible for the plucking cylinder to enhance efficiency of plucking the hairs.

[0019] It is preferred that the pinching units are composed of a set of first pinching units and a set of second pinching units. A set of the first pinching units is arranged in series with a set of the second pinching units. The first pinching units are arranged to have said hair introducing direction which is oppositely oriented with respect to said hair introducing direction of said second pinching units. The number of said first pinching units is equal to the number of said second pinching units.

[0020] It is more preferred that each said pinching units has a leading end with respect to a rotation direction of the plucking cylinder. The pinching units are disposed within each half length of the plucking cylinder to have the leading ends directed axially outwardly from the lengthwise center of the plucking cylinder.

[0021] In this case, the plucking cylinder stretches the skin axially outwardly of plucking cylinder. Therefore, the plucking cylinder is configured to stretch the skin uniformly such that the pinching units erect the hair of the skin. That is, this configuration also makes it possible for the plucking cylinder to enhance efficiency of plucking the hairs.

[0022] It is preferred that the plucking cylinder further carries a plurality of projections at the circumferential surface. The projections are arranged between the pinching units such that the pinching units and projections are arranged in the row. The projection has a projection length. The projection length extends along the circumferential surface, and is inclined with respect to the introducing direction of the adjacent pinching units in the same row.

[0023] The plucking cylinder with this configuration is urged to the skin through the pinching units and the projections. That is, the plucking cylinder applies the uniform pressure to an entire axial length of the plucking cylinder.

[0024] It is preferred that the plucking means includes a plurality of said plucking cylinders. The rotation mechanism is configured to rotate all cylinders in a same rotation direction.

[0025] It is preferred that the head includes a guard covering said plucking cylinder. The guard having an opening through which said cylinder is exposed.

[0026] It is more preferred that the opening is divided by a plurality of cross bars each of which extends in an inclined manner with respect to the longitudinal axis of the plucking cylinder as well as the circumferential direction of the plucking cylinder.

[0027] It is most preferred that the cross bars extends in parallel with the introducing direction of adjacent one of said pinching units.

[0028] In this case, the hairs which are inserted through the opening is directed by the cross bars along a direction which is parallel to the hair introducing direction of the pinching units. The hairs directed parallel to the hair introducing direction is easily pinched by the pinching units. Therefore, this configuration makes it possible for the depilatory device to enhance the efficiency of plucking the hairs.

[0029] It is more preferred that the pinching units in the row is composed of a set of first pinching units and a set of second pinching units. Each pinching unit has a leading end with respect to a rotation direction of the plucking cylinder. Each projection has a leading end with respect to the rotation direction of the plucking cylinder. Each of the first pinching units and the second pinching units are disposed to have their leading ends directed axially outwardly from a lengthwise center of the plucking cylinder. The projection between the first pinching units is directed axially inwardly from the lengthwise end of the plucking cylinder. The projection between the second pinching units is directed axially inwardly from the lengthwise end of the plucking cylinder.

[0030] In this case, the first pinching unit is cooperative with the projection between the first pinching units to stretch the skin. Similarly, the second pinching unit is cooperative with the projection between the second pinching units to stretch the skin. That is, the pinching units are cooperative with the projections to stretch the skin. Therefore, the hairs of the skin are erected according to the stretch of the skin. The erected hairs are easily pinched by the pinching units. In this manner, this configuration makes it possible for the plucking cylinder to enhance the efficiency of pinching the hairs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031]

Fig. 1 (a) is a front view of a depilatory device in this invention.

Fig. 1 (b) is a top view of the depilatory device in this invention.

Fig. 1 (c) is a side cross-sectional view taken along the line A - A of the depilatory device in this invention.

Fig. 1 (d) is a front cross-sectional view taken along the line B - B of the depilatory device in this invention.

Fig. 2 (a) is a front view of a guard in this invention.

Fig. 2 (b) is a top view of the guard in this invention.

Fig. 2 (c) is a side cross-sectional view of the guard in this invention.

Fig. 2 (d) is a perspective view of the guard in this invention.

Fig. 3 is a top view of the depilatory device without the guard in this invention.

Fig. 4 is a perspective view of the plucking cylinder in this invention.

Fig. 5 (a) is a front view of the plucking cylinder in this invention.

Fig. 5 (b) is a side view of the plucking cylinder in this invention.

Fig. 5 (c) is a side cross-sectional view of the plucking cylinder in this invention.

Fig. 6 is an exploded perspective view of the plucking cylinder in this invention.

Fig. 7 is a front cross-sectional view taken along the line C - C of the plucking cylinder in this invention.

Fig. 8 is a side cross-sectional view taken along the line D - D of the plucking cylinder in this invention.

Fig. 9 (a) is an arrangement of pinching units of the plucking cylinder in this invention.

Fig. 9 (b) shows pinching widths of the pinching units in Fig. 9 (a).

Fig. 9 (c) shows a depilatory area of the pinching unit of this invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0032] The depilatory device in this invention is explained with attached drawings. Fig. 1 (a), (b), (c), and (d) show the depilatory device 1 in this invention. X direction indicated by arrow in Fig. 1 (a) indicates a right direction of the depilatory device 1. Y direction in Fig. 1 (a) indicates an upper direction of the depilatory device 1. In addition, components of reference numeral with suffix letter of R are symmetrically formed with respect to components of reference numeral with suffix letter of L. Therefore, explanations of the components of the reference numerals with the suffix letter of R are omitted by the explanation of the components of the reference numeral with the suffix letter of L. Similarly, explanations of motions of the components of the reference numeral with the suffix letter of R is omitted by the explanations of motions of the components of the reference numeral with the suffix letter of L. As shown in Fig. 1 (a) to Fig. 8, the depilatory device 1 comprises a housing 200, a pair of plucking cylinders 16, actuation bars 39, gears 6, and a driving source 4.

[0033] As shown in Fig. 1 (a) to Fig. (d), the housing 200 is provided for housing a pair of the plucking cylinders 16, the actuation bar 39, the gears 6, and the driving source 4. The housing 200 includes a body 2 and a head 7 which is attached to an upper end of the head 7. That is, the housing 200 is formed at its upper end with the head 7. As shown in Fig. 1 (a), the body 2 is formed with a switch 3. The head 7 includes a guard 10 shown in Fig. 2 (a) to Fig. 2 (d). The guard 10 is formed with a pair of openings and cross bars 12 which divide the each opening into a plurality of opening sections 13. The opening sections 13 are provided for communicating an outside of the head 7 with an inside of the head 7 and is provided for exposing the plucking cylinder 16 to the outside of the head 7. The cross bars 12 are provided for suitable contact of the skin and the plucking cylinder 16. In particular, the cross bars 12 in the left half of the guard 10 has an inclination which is different from an inclination of the cross bars 12 in the right half of the guard 10.

[0034] Fig. 6 is a perspective view of the plucking cylinders 16a and 16b. The plucking cylinder 16a and the plucking cylinder 16b are defined as the plucking means. It is noted that the plucking cylinder 16b has components which is same as components of the plucking cylinder 16a. Therefore, the explanation of the plucking cylinders 16a and 16b are explained as the plucking cylinder 16. The plucking cylinder 16 has a longitudinal axis, and has a length along the longitudinal axis. The plucking cylinder 16 carries a shaft 47, a plurality of pinching units 300L, 300R, holders 250L, 250R, 250C, support plates 40, and fixing pins 44. The shaft 47 extends through the center of the plucking cylinder 16 along the longitudinal axis. Therefore, the plucking cylinder 16 is supported to the head 7 by the shaft 47 to be rotatable about the longitudinal axis such that the plucking cylinder 16 is driven to rotate along a rotation direction T which is indicated by rotation arrow in Fig. 4. In addition, the plucking cylinder 16 is exposed to the outside of the head 7 through the opening 13. The plucking cylinder 16 is formed to have six insertion holes 19. Each of the insertion holes 19 extends through the plucking cylinder 16 along the longitudinal axis. Each of the insertion holes 19 is parallel to the longitudinal axis. Each of the insertion holes 19 is spaced from the longitudinal axis of the plucking cylinder 16. The insertion holes 19 are provided for receiving the actuation bar 36a, 36b, 36c, 36d, 36e and 36f. The insertion holes 19 are revolved about the longitudinal axis of the plucking cylinder 16. The plucking cylinder 16 is formed at its circumference surface with six recesses 46 each of which is formed to have a rectangular and each of which is arranged along the circumferential direction of the plucking cylinder 16. As shown in Fig. 5(c), each of the plucking cylinders 16 has one longitudinal axial end with a gear 17.

[0035] The pinching units 300L are disposed at a left half of the plucking cylinder in Fig. 6. Each of the pinching units 300L has a stationary plate 210L and a movable plate 220L.

[0036] The stationary plate 210L includes a pair of stationary blades 23L, a coupling plate 22L, and guide plates 24L. The coupling plate 22L is formed into flat, is formed to have a parallelogram, and is formed with a hole 25. The coupling plate 22L has one side coupled to a bottom end of the stationary blade 23L, and has the other side opposite from the one side coupled to a bottom end of the stationary blade 23L. The stationary blade 23L is defined as a second blade. The stationary blade 23L has a length along the one side of the coupling plate, a thickness, and a height along a direction perpendicular to the coupling plate. The stationary blades 23L are formed into flat. Therefore, the stationary blade 23L has an inside face and an outside face which is in an opposite relation to the inside face. The stationary blade has one height end with an edge which is outwardly curved. The stationary blade 23L has one length end with a leading end 233L and the other length end with the trailing end 234L with respect to the rotation direction T of the plucking cylinder 16. The leading end 233L is coupled to the guide plate

24L which extends toward a direction inclined with respect to the length of the stationary blade 23L.

[0037] The movable plate 220L has a movable blade 31 L, a fulcrum plate 33L, and a guide plate 32L. The movable blade 31 L is defined as a first blade. The movable blade 31 L has a length, a thickness, and a height. The movable blade 31 L is formed into flat. The movable blade 31 L has an inside face and an outside face which is opposite to the inside face. The inside face of the movable blade 31 L is formed with a groove which extends along a length of the movable blade. It is noted that the groove of the inside face of the movable blade 31 L is not shown in the illustrations. However in Fig. 6, the movable blade 31 R is has an inside face with a groove 35 which corresponds to the groove of the inside face of the movable blade 31 L. The movable blade 31 L has one height end with an edge which is outwardly curved. The movable blade 31 L has a lower end coupled to the fulcrum plate 33L which is formed with a hole 34 extending along the longitudinal axis of the plucking cylinder 16. The movable blade 31 L is cooperative with the stationary blade 23L to pinch the user's hair of the skin. The movable blade 31 L has one length end with a leading end 243L and the other length end with a trailing end 244L with respect to the rotation direction T of the plucking cylinder 16. The leading end 243L is cooperative with the leading end 233L to define a leading end of the pinching unit 300L. The leading end 243L of the movable blade 31 L is coupled to the guide plate 32L which extends toward a direction inclined with respect to the length of the movable blade 31 L. It is noted that the pinching units 300R are disposed at a right half of the plucking cylinder. Each component of the pinching unit 300R is formed to have a symmetrical form with respect to each component of the pinching unit 300L.

[0038] The holder 250L is disposed at the left half of the plucking cylinder shown in Fig. 6. The holder 250L includes a base plate 26L, a projection 28L, and a leg 29L. The base plate 26L is formed into flat. The projection 28L is projected from an upper surface of the base plate 26L. The projection 28L is formed to have a projection length which extends along the circumferential surface of the plucking cylinder 16. The projection 28L has one length end with a leading end 288L and the other length end with a trailing end with respect to the rotation direction of the plucking cylinder 16. The leg 29L extends toward a lower direction from a lower surface of the base plate 26L. The leg 29L is formed with a hole which is not shown and which passes through the longitudinal axis of the plucking cylinder 16. It is noted that the holder 250R is disposed at the right half the plucking cylinder 16. Furthermore, the holder 250C is disposed at a center in longitudinal axis of the plucking cylinder 16.

[0039] The support plates 40 are formed into rectangular shape to have a length along the longitudinal axis of the plucking cylinder 16. The support plates 40 are disposed on the circumferential surface of the plucking cylinder 16 such that each of the support plate 40 covers

the recess 46. Therefore, the support plate 40 is arranged along the circumferential surface of the plucking cylinder 16. The support plate 40 is provided for mounting the stationary plate 210L, 210R, the movable plate 220L, 220R and the holders 250L, 250C, 250R. The stationary blade 23L mounted on the support plate 40 is located in an opposed relation to the movable blade 31 L. In addition, the pinching units are mounted on the support plate 40 and are arranged along the length of the support plate 40. Consequently, as shown in Fig. 8, the plucking cylinder 16 carries a plurality of the pinching units 300L and 300 R at the circumferential surface of the plucking cylinder 16. The pinching units 300L are arranged in a plurality of rows 20. The rows 20 are arranged along the circumferential direction of the plucking cylinder 16, and are spaced circumferentially of the plucking cylinder 16. The row 20 includes a plurality of the pinching units 300L, 300R. One of the pinching units 300L, 300R is spaced from the other adjacent pinching units 300L, 300R. Therefore, the row includes a plurality of the pinching units 300L, 300R which is spaced from each other along said longitudinal axis. In particular, the row 20 includes a set of the pinching units 300L and a set of the pinching units 300R. A set of the pinching units 300L and a set of the pinching units 300R are arranged in series.

[0040] The actuation bars 36a to 36f in Fig. 7 include a main bar 37, a pad 39 coupled to one end of the main bar 37, and a boss 399 coupled to the other end of the main bar 37. The main bar 37 has its upper surface with notches 38 which is provided for receiving a tip of the fulcrum plate 33L.

[0041] The actuation bars 36a to 36f are configured to receive pressure from rollers 9 which are disposed at a tip of the head 7. When the actuation bar 36a to 36f receives the pressure along the longitudinal axis, the actuation bar 36 is moved into the insertion hole 19. The actuation bars 36a to 36f are cooperative with the roller 9 to define a pinching mechanism.

[0042] Fig. 7 shows the front cross-sectional view of the plucking cylinder 16. As shown in Fig. 7, a spring 45 is disposed in the recess 46. The actuation bars 36a to 36f are inserted into the insertion hole 19 such that the boss 399 is inserted into one end of the spring 45. In addition, when the actuation bars 36a to 36f are inserted into the insertion hole 19, the notches 38 are exposed through the recess 46. The recess 46 is covered by the support plate 40, and subsequently the stationary plate 210L is mounted on the support plate 40. The movable plate 220L is mounted on the support plate such that the fulcrum plate 33L passes through the opening of the stationary plate 210L. The fulcrum plate 33L which is passed through the opening is disposed such that a lower end of the fulcrum plate 33L is inserted into the notch 38. Consequently, the movable blade 31 L is disposed in an opposed relation to the stationary blade 23L. In this way, the pinching units 300L are arranged on the support plate 40 such that the pinching units 300L are arranged along the length of the support plate 40. As shown in Fig. 5 (b),

the pinching units 300L and 300R are respectively attached to the plucking cylinder 16 by the fixing pin 44. In addition, two pinching units 300L and two pinching units 300R are mounted on the support plate 40. Therefore, the number of the pinching units 300L is equal to the number of the pinching units 300R in the row. Furthermore, because the lower end of the fulcrum plate 33L is inserted into the notch 38, the movable blade 31 L is configured to be movable toward and away from the stationary blade 23L. Therefore, the movable blade 31 L is configured to be movable between an opened position and a pinch position. The movable blade 31 L in the opened position forms a gap between the stationary blade 23L and the movable blade 31 L. Therefore, the movable blade 31 L in the opened position is spaced from the stationary blade 23L by a gap width W. The movable blade 31 L in the pinch position is explained below. The stationary blade 23L has the inside face which extends along the length of the stationary blade 23L. The inside face of the stationary blade 23L is faced to the inside face of the movable blade 31 L. The inside face of the movable blade 31 L extends along the length of the movable blade 31 L. Therefore, the movable blade has the inside face which is located in an opposed relation to the inside face of the stationary blade 23L. So, the inside faces of the stationary blade 23L and the movable blade 31 L have length directions extending along the length of the stationary blade 23L and the movable blade 31 L, respectively. This length direction extends along the circumferential surface of the plucking cylinder 16. The stationary blade 23L is cooperative with the movable blade 31 L to pinch the hairs within the length of the stationary blade 23L and the movable blade 31 L in the pinch position. Therefore, the length of the stationary blade 23L and the movable blade 31 L is defined as a pinching length.

[0043] Because the coupling plate 22L is formed to have the parallelogram, the stationary blades 23L have the pinching length along the circumferential surface of the plucking cylinder 16. In addition, because the coupling plate 22L is formed to have the parallelogram, the pinching length of the pinching unit 300L is inclined with respect to the circumferential direction of the plucking cylinder 16 as well as the longitudinal axis of the plucking cylinder 16. Meanwhile, it is preferred that the pinching unit is disposed to have the pinching length inclined at 12 degrees to 13 degrees with respect to the circumferential direction of the plucking cylinder 16. The gap between the movable blade 31 L and the stationary blade 23L receives the hairs along the pinching length. Therefore, the length direction of the pinching length is defined as a hair introducing direction HD for introducing the hairs into the gap between the inside faces of the stationary blade 23L and the movable blade 31 L. This hair introducing direction is perpendicular to the gap width of the gap between the stationary blade 23L and the movable blade 31 L. The hair introducing direction which is parallel to the pinching length is inclined with respect to the circumferential direction of the plucking cylinder 16 as well

as the longitudinal axis of the plucking cylinder 16. Therefore, the hair introducing direction is inclined at 12 degrees to 13 degrees with respect to the circumferential direction of the plucking cylinder 16. However, the inclination angle of the hair introducing direction with respect to the circumferential direction is not limited to 12 degrees to 13 degrees. It is preferred that the hair introducing direction is inclined at 30 degrees with respect to the circumferential direction of the plucking cylinder 16.

[0044] In addition, as shown in Fig. 3, the pinching units 300L in the left half of the plucking cylinder 16 has the hair introducing direction which is oppositely inclined with respect to the hair introducing direction of the pinching units 300R in the right half of the plucking cylinder 16. In particular, the pinching units 300L in the left half of the plucking cylinder 16 has the hair introducing direction which is inclined with respect to the circumferential direction such that the hair introducing direction of the pinching units 300L is directed outward from a lengthwise center of the plucking cylinder 16. Consequently, the pinching units 300L has the leading end 233L which is located at an axially outwardly of the plucking cylinder 16 than the trailing end 234L. Similarly, the pinching units 300R in the right half of the plucking cylinder 16 has the hair introducing direction which is inclined with respect to the circumferential direction such that the hair introducing direction of the pinching units 300R is directed outward from the lengthwise center of the plucking cylinder 16. Consequently, the pinching units 300R has the leading end 233R which is located at an axially outwardly of the plucking cylinder 16 than the trailing end 234R. Accordingly, the hair introducing direction of the pinching units 300L are oppositely directed to the hair introducing direction of the pinching units 300R.

[0045] Furthermore, the stationary blade 23L is cooperative with the movable blade 31 L to define a depilatory area D therebetween in Fig. 9 (c). The depilatory area is along the circumferential surface of the plucking cylinder 16. The depilatory area D has a pinching width S in Fig. 9 (b) parallel to the longitudinal axis of the plucking cylinder 16, and a pinching length along the length of the movable blade 31 L and the stationary blade 23L. The pinching width S is defined by a distance between the leading end of the stationary blade 23L and the trailing end of the movable blade 31 L.

[0046] The holder 250L is mounted on the support plate 40 such that the holder 250L is located between the stationary blades 23L. Consequently, the projection 28L, 28R and 28C are carried by the plucking cylinder 16 to be located on the circumferential surface of the plucking cylinder 16. In addition, the coupling plate 22L is interposed between the holder 250L and the support plate 40. The projection 28L is arranged between the pinching units 300L. Consequently, the projection 28L, 28C, 28R and pinching units 300L, 300R are arranged in the row. The projection 28L has the projection length which is inclined with respect to the hair introducing direction of the adjacent pinching units 300L. Therefore,

the projection 28L is arranged to have a leading end 288L with respect to the rotation direction of the plucking cylinder 16. The projection 28L is arranged to have the leading end 288L which is directed axially inwardly from the lengthwise end of the plucking cylinder 16.

[0047] The holder 250C is mounted on the support plate 40. Consequently, the projection 28L is arranged between the pinching unit 300L and the pinching unit 300R. Therefore, the projection 28C has the projection length which is inclined with respect to the hair introducing direction of the adjacent pinching unit 300L and the adjacent pinching unit 300R. Subsequently, the fixing pin 44 is inserted through the plucking cylinder 16 such that the fixing pin 44 passes through the holes 34 and the holes of the leg 29L, 29C, 29R. Consequently, the movable blade 31 L swings about a tip of the fulcrum plate 33L according to the movement of the actuation bar 36a. Consequently, the movable blade 31 L swings about a tip of the fulcrum plate 33L according to the movement of the actuation bar 36a.

[0048] In this manner, the pinching units 300L, 300R are disposed on the circumferential surface of the plucking cylinder 16. In particular, a set of the pinching units 300L is disposed on the left half of the circumferential surface of the plucking cylinder 16. A set of the pinching units 300R is disposed on the right half of the circumferential surface of the plucking cylinder 16. As shown in Fig. 3, a pair of the plucking cylinder 16a and the plucking cylinder 16b is supported to the head through the shaft 47 such that the longitudinal axis of the plucking cylinder 16a is parallel to the longitudinal axis of the plucking cylinder 16b. The plucking cylinders 16 are arranged along a direction perpendicular to the length direction of the plucking cylinder 16. As shown in Fig. 6, the stationary blade 210L and the movable blade 31 L have the length along the circumferential surface of the plucking cylinder 16. When the actuation bar 36a to 36f is driven to reciprocate along the longitudinal axis of the plucking cylinder 16, the movable blade 31 L is swung about a tip of the fulcrum plate 33L. Therefore, according to the movement of the actuation bar 36a to 36f along the longitudinal axis of the plucking cylinder 16, the movable blade 31 L is moved toward and away from the stationary blade 23L about a tip of the fulcrum plate 33L. When the movable blade 31 L is moved away from the stationary blade 23L, the movable blade 31 L is moved into the opened position such that the movable blade 31 L is spaced from the stationary blade 23L. Therefore, in a condition where the movable blade 31 L is in the opened position, the movable blade 31 L is cooperative with the stationary blade 23L to form the gap between the movable blade 31 L and the stationary blade 23L. On the other hand, when the movable blade 31 L is moved toward the stationary blade 23L, the movable blade 31 L is moved into the pinch position such that the movable blade 31 L closes the gap. Therefore, the stationary blade 23L is fixed to the plucking cylinder 16. The movable blade 31 L is configured to move relative to the stationary blade 23L. Fig. 5 (a) shows

an arrangement of the pinching units 300L, 300R on the circumferential surface of the plucking cylinder 16. As shown in Fig. 5 (a), the pinching units are arranged on the circumferential surface of the plucking cylinder 16 such that the stationary blade 23L and the movable blade 31L has their lengths inclined with respect to the longitudinal axis of the plucking cylinder 16 as well as the circumferential direction of the plucking cylinder 16. In addition, a plurality of the support plates 40 is mounted at the circumferential surface of the plucking cylinder 16. Therefore, the pinching units 300L, 300R are arranged in a plurality of rows which are spaced circumferentially of the plucking cylinder. Each row includes a plurality of the pinching units which are spaced from each other along the longitudinal axis. Therefore, the pinching units 300L, 300R are arranged along a direction parallel to the longitudinal axis and spaced from each other in said longitudinal axis. In addition, one row is offset from the other adjacent rows in the longitudinal axis.

[0049] The gears 6 are provided for rotation of the plucking cylinder 16. In particular, as shown in Fig. 1 (c), one of the gears 6 is meshed with the gear 17 of each of the plucking cylinder 16. Therefore, the plucking cylinder 16 is rotated according to the rotation of the gears 6. In particular, both of the plucking cylinders 16a and the plucking cylinder 16b are rotated in the same rotation direction T

[0050] The drive source 4 is provided for rotating one of the gears 17. The drive source 4 is such as a motor and a battery. The drive source 4 is started upon the switch 3 being pressed.

[0051] The depilatory device 1 is operated as follows. To begin with, the plucking cylinders 16 are urged against the user's skin through the opening of the guard 10 of the head 7. Consequently, the hairs are inserted into the head 7 through the opening with the cross bars. Subsequently, the switch 3 is pressed. Upon the switch 3 is pressed, the battery starts supplying electrical power to the motor 4. When the motor 4 is energized by the battery, the motor 4 rotates one of the gears 6 through a connecting shaft 400. Therefore, rotation movement of the gears 6 is transmitted to the plucking cylinders 16 through the gears 6. Accordingly, the plucking cylinders 16 are rotated in the rotation direction T shown in Fig. 4. In this way, the motor 4 activates gears in order to rotate the plucking cylinder 16. Therefore, the gears 6 are cooperative with the gear 17 to define a plucking mechanism. The plucking cylinder 16 runs on the user's skin according to the rotation of the plucking cylinder 16, thereby the depilatory device 1 moving toward a direction U. Therefore, the depilatory device 1 plucks the hairs in the depilatory area of the skin by one of the plucking cylinder 16, and subsequently plucks the hairs in the depilatory area of the skin again. In addition, the plucking cylinder 16 carries the pinching units 300L. The leading ends 233L, 243L of the stationary blade 23L and the movable blade 31 L are respectively directed axially outwardly from the lengthwise center of the plucking cylinder 16. Therefore, ac-

cording to the rotation of the plucking cylinder 16, the pinching units 300L are cooperative with the pinching units 300R to stretch the user's skin. Consequently, the hair in the skin is erected by the pinching units 300L, 300R. The guide plates 32L and 24L guide the erected hairs into the gap between the stationary blade 23L and the movable blade 31 L.

[0052] At this moment, the rollers 9 continuously apply the pressure along the longitudinal axis to one of the pads 39 of the actuation bars 36a to 36f which is located at the tip of the head 7. According to the pressure from the rollers 9, the actuation bar 36a is moved toward the inside of the plucking cylinder 16 along the insertion hole 19. Upon the actuation bar 36a moving toward the inside of the plucking cylinder 16, the movable blade 31 L is swung about the lower end of the fulcrum plate 33L. Therefore, according to the movement of the actuation bar 36 toward the inside of the plucking cylinder 16, the movable blade 31 L is moved toward the stationary blade 23L such that the gap between the movable blade 31 L and the stationary blade 23L is closed. That is, the movable blade 31 L is moved into the pinch position. Therefore, the hairs in the gap are pinched by the stationary blade 23L and the movable blade 31L.

[0053] The motor 4 continuously rotates the plucking cylinder 16 along the rotation direction T. Therefore, the pinching units 300L carried by the plucking cylinder 16 are rotated about the shaft 47 while pinching the user's hairs within the depilatory area. Consequently, the plucking cylinder 16 plucks the user's hairs. When the plucking cylinder 16 is rotated along the rotation direction while the pinching unit 300L pinching the user's hairs, the actuation bar 36a is moved from a tip of the head to the lower end of the head 7. Therefore, according to the rotation of the plucking cylinder 16, the pressure applied to the actuation bar 35a from the rollers 9 is removed. Therefore, the spring 45 applies the spring biases to the actuation bar 36a so that the actuation bars 36a is moved toward an outside of the plucking cylinder along the longitudinal axis. Upon the actuation bars 36a to 36f are moved toward the outside of the plucking cylinder 16 along the longitudinal axis, the movable blade 31 L is moved away from the stationary blade 23L. That is, the movable blade 31 L is moved into the opened position. Consequently, the pinching units 23L release the user's hair. In this manner, the rollers 9 apply the pressure to the actuation bars 36a to 36f in order, and the plucking cylinder continuously plucks the user's hairs. In addition, this plucking cylinder 16 has the pinching units. The pinching units 300L, 300R are arranged in rows 20 which are arranged along the circumferential direction. Therefore, the depilatory device 1 is configured to pluck the hairs many times per one rotation. Consequently, the depilatory device 1 is configured to pluck a large amount of the hairs per one rotation of the plucking cylinder 16.

[0054] The depilatory device 1 in this invention has the pinching units 300L which has a large pinching width. Fig. 9 (a) shows a development view of the plucking cyl-

inder 16 with the pinching units in the present invention. The pinching units are arranged in the rows. The rows are arranged along the circumferential direction of the plucking cylinder 16 such that the pinching units in the row are staggered from the other pinching units in the other adjacent rows. As shown in Fig. 9, the plucking cylinder has a depilatory length L within which the pinching units 300L, 300R are arranged. Each of the pinching units 300L, 300R has the depilatory area which has the pinching width S which extending along the longitudinal axis of the plucking cylinder 16. Therefore, a sum of the pinching widths S is equal to the depilatory length. However, it is also possible that a sum of the pinching widths is larger than the depilatory length. Further, the pinching units 300L in the left half of the plucking cylinder 16 has the hair introducing direction which is differently inclined with respect to the hair introducing direction of the pinching units 300R in the right half of the plucking cylinder 16. Therefore, the pinching units 300L is disposed to have the hair introducing direction which is differently inclined with respect to the introducing direction of the pinching units 300R in the same row. Therefore, the hairs which are grown toward a various direction is received by the pinching units 300L, 300R which have the hair introducing directions differently inclined each other. Therefore, the depilatory device 1 in the present invention with the pinching units 300L, 300R is capable of receiving the hairs which are grown toward a various direction. That is, the depilatory device 1 in this invention has a large depilation effect of removing the hairs.

[0055] As above mentioned, plucking cylinder 16 has the pinching units which includes the stationary blade 23L, and the movable blade 31 L. Each of the stationary blade 23L and the movable blade 31 L are arranged in an opposed relation to each other such that the stationary blade 23L has the inside face which is faced with the inside face of the movable blade 31 L. Therefore, the stationary blade 23L is cooperative with the movable blade 31 L to define the depilatory area. The depilatory area has the pinching length and the pinching width. The pinching length is defined as the hair introducing direction for introducing the hair into the gap between the stationary blade 23L and the movable blade 31 L. The pinching width is defined by a distance between the leading end 233L of the stationary blade 23L and the trailing end 244L of the movable blade 31 L. The hair introducing direction is inclined with respect to the circumferential direction of the plucking cylinder 16 and the longitudinal axis of the plucking cylinder 16. Therefore, the pinching width with this configuration is larger than the pinching width of the pinching unit which has a stationary blade and a movable blade which are parallel to the circumferential direction of the plucking cylinder 16. Therefore, the depilatory device 1 in this invention is configured to pluck the hairs from a large width along the plucking cylinder 16.

[0056] Furthermore, each of the pinching units of the depilatory device 1 in the present invention has the depilatory area along the circumferential surface so as to

have a pinching width along the longitudinal axis within the depilatory area. The plucking cylinder 16 has the depilatory length along the longitudinal axis. The pinching units are disposed within the depilatory length. A sum of the pinching widths of all the pinching units 300L, 300R is equal to or larger than said depilatory length. Consequently, the depilatory device 1 in the present invention is configured to pluck the hair over an entire length of the depilation length. Therefore, there is no possibility for the depilatory device 1 in this invention to leave the hairs of the skin where the plucking cylinder rolls.

[0057] In addition, the pinching units 300L, 300R in the row are staggered from the other pinching units 300L, 300R in adjacent rows. Therefore, the depilatory device 1 in the present invention is configured to pluck the hair over an entire length of the depilation length.

[0058] Further, the pinching units 300L have the leading end with respect to a rotation direction T. The pinching units 300L is disposed within the left half length of the plucking cylinder 16 to have the leading end directed axially outwardly from the lengthwise center of the plucking cylinder. The pinching units 300R are disposed within the right half length of the plucking cylinder 16 to have the leading end directed axially outwardly from the lengthwise center of the plucking cylinder 16. Therefore, according to the rotation of the plucking cylinder 16, the user's skin is stretched by the pinching units 300L and the pinching units 300R. When the skin is stretched by the pinching units 300L and 300R, the hairs are erected. The erected hair is easily inserted into the gap of the pinching units 300L, 300R. Therefore, the plucking cylinder 16 is configured to pluck the erected hairs easily.

[0059] Furthermore, the plucking cylinder 16a is supported to the head with a predetermined mounting angle which is angularly displaced from a mounting angle of plucking cylinder 16b. In particular, the plucking cylinder 16a is supported to the head with a mounting angle which is angularly displaced at 30 degrees from the mounting angle of the plucking cylinder 16b. Consequently, this configuration makes it possible for the depilatory device 1 to pluck the hair many times.

[0060] In addition, the head includes a guard which covers the plucking cylinder. The guard has an opening through which the cylinder is exposed. The opening is divided by a plurality of cross bars. Each of the cross bars is inclined with respect to the longitudinal axis of the plucking cylinder, and also is inclined with respect to the circumferential direction of the plucking cylinder 16. That is, the cross bars is not parallel to the circumferential direction of the plucking cylinder 16. Therefore, the cross bars never cover the same portion of the skin continuously according to the movement of the depilatory device 1. Furthermore, it is preferred that the cross bars extends in parallel with the hair introducing direction of adjacent one of the pinching units. Consequently, the pinching units 300L, 300R easily pinch the hairs which are directed by the cross bars 12 of the guard 10.

[0061] In addition, the pinching units 300L has the

leading end 243L which is directed axially outwardly from the lengthwise center of the plucking cylinder 16. On the other hand, the projection 28L is disposed between the pinching units 300L and has the leading end 288L which is directed axially inwardly from the lengthwise end of the plucking cylinder 16. Therefore, the projection 28L is co-operative with the pinching units 300L to stretch the skin. Consequently, the projection 28L is cooperative with the pinching units 300L to erect the hair of the skin, thereby the pinching units easily pinching the erected hair.

Claims

1. A depilatory device for removal of human hairs comprising:

a housing formed at its upper end with a head;
a plucking means which includes a plucking cylinder supported to said head, said plucking cylinder being driven to rotate about a longitudinal axis of said plucking cylinder; said plucking cylinder carrying a plurality of pinching units at a circumference surface of said plucking cylinder, each pinching unit being composed of a first blade and a second blade arranged in an opposed relation with each other, at least one of said first blade and said second blade being movable toward and away from the other of said first blade and said second blade to move between an opened position and a pinch position, said first blade and said second blade being configured to form a gap therebetween in said opened position and being configured to close the gap for pinching the hair in said gap between said first blade and said second blade in said pinch position, each pinching unit having a hair introducing direction perpendicular to a gap width of said gap for introducing the hair between said first blade and said second blade;
a pinching mechanism being configured to move said at least one of the first blade and the second blade between said opened position and said pinch position; and
a plucking mechanism configured to rotate said plucking cylinder for plucking the hair pinched by said first blade and said second blade;

wherein

said pinching units are arranged to have their hair introducing directions which are inclined with respect to said longitudinal axis as well as a circumferential direction of said plucking cylinder.

2. The depilatory device as set forth in claim 1, wherein said pinching units are arranged along a direction parallel to said longitudinal axis and spaced from each other in said longitudinal axis.

3. The depilatory device as set forth in claim 1, wherein each of said pinching units has a depilatory area between the first blade and the second blade and along the circumferential surface so as to have a pinching width along the longitudinal axis within depilatory area, said plucking cylinder has a depilatory length along said longitudinal axis, said pinching units are arranged within the depilatory length, and a sum of said pinching widths being equal to or larger than said depilatory length.

4. The depilatory device as set forth in claim 1, wherein said pinching units are arranged in a plurality of rows spaced circumferentially of said plucking cylinder, and each row including a plurality of said pinching units spaced from each other along said longitudinal axis.

5. The depilatory device as set forth in claim 4, wherein said pinching units in said row are staggered from the other pinching units in the other adjacent rows.

6. The depilatory device as set forth in claim 4, wherein at least one of said pinching units is disposed to have its hair introducing direction which is differently inclined with respect to the other pinching unit in same row.

7. The depilatory device as set forth in claim 4, wherein at least one of said pinching unit is disposed to have its hair introducing direction which is oppositely inclined with respect to the other pinching unit in same row.

8. the depilatory device as set forth in claim 7, wherein said pinching units on opposite lengthwise ends in same row has their hair introducing directions which are oppositely oriented with respect to each other.

9. The depilatory device as set forth in claim 7, wherein said pinching units in said row is composed of a set of first pinching units and a set of second pinching units, a set of said first pinching units and a set of said second pinching units are arranged in series, said first pinching units are arranged to have said hair introducing direction which is oppositely oriented with respect to said hair introducing direction of said second pinching units, and the number of said first pinching units is equal to the number of said second pinching units.

10. The depilatory device as set forth in claim 6, wherein each said pinching unit has a leading end with respect to a rotation direction of the plucking cylinder, and

said pinching units being disposed within each half length of the plucking cylinder to have said leading end directed axially outwardly from a lengthwise center of said plucking cylinder.

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11. The depilatory device as set forth in claim 4, wherein said plucking cylinder further carries a plurality of projections at said circumferential surface, said projections are arranged between said pinching units such that said pinching units and projections are arranged in said row, said projection has a projection length which extends along said circumferential surface and which is inclined with respect to said hair introducing directions of the adjacent pinching units in the same row. 10 15
12. The depilatory device as set forth in claim 1, wherein said plucking means includes a plurality of said plucking cylinders, and said plucking mechanism being configured to rotate all said plucking cylinders in a same rotation direction. 20
13. The depilatory device as set forth in claim 1, wherein said head includes a guard covering said plucking cylinder, said guard having an opening through which said plucking cylinder is exposed. 25
14. The depilatory device as set forth in claim 13, wherein said opening is divided by a plurality of cross bars each of which extends in an inclined manner with respect to the longitudinal axis of said plucking cylinder as well as the circumferential direction. 30 35
15. The depilatory device as set forth in claim 11, wherein said pinching units in said row is composed of a set of first pinching units and a set of second pinching units, each said pinching unit has a leading end with respect to a rotation direction of the plucking cylinder, each projection has a leading end with respect to said rotation direction of the plucking cylinder, each of said first pinching units and said second pinching units are disposed to have their leading end directed axially outwardly from the lengthwise center of said plucking cylinder, said projection between the first pinching units and said projection between the second pinching units are directed axially inwardly from the lengthwise end of said plucking cylinder. 40 45 50

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Fig. 1

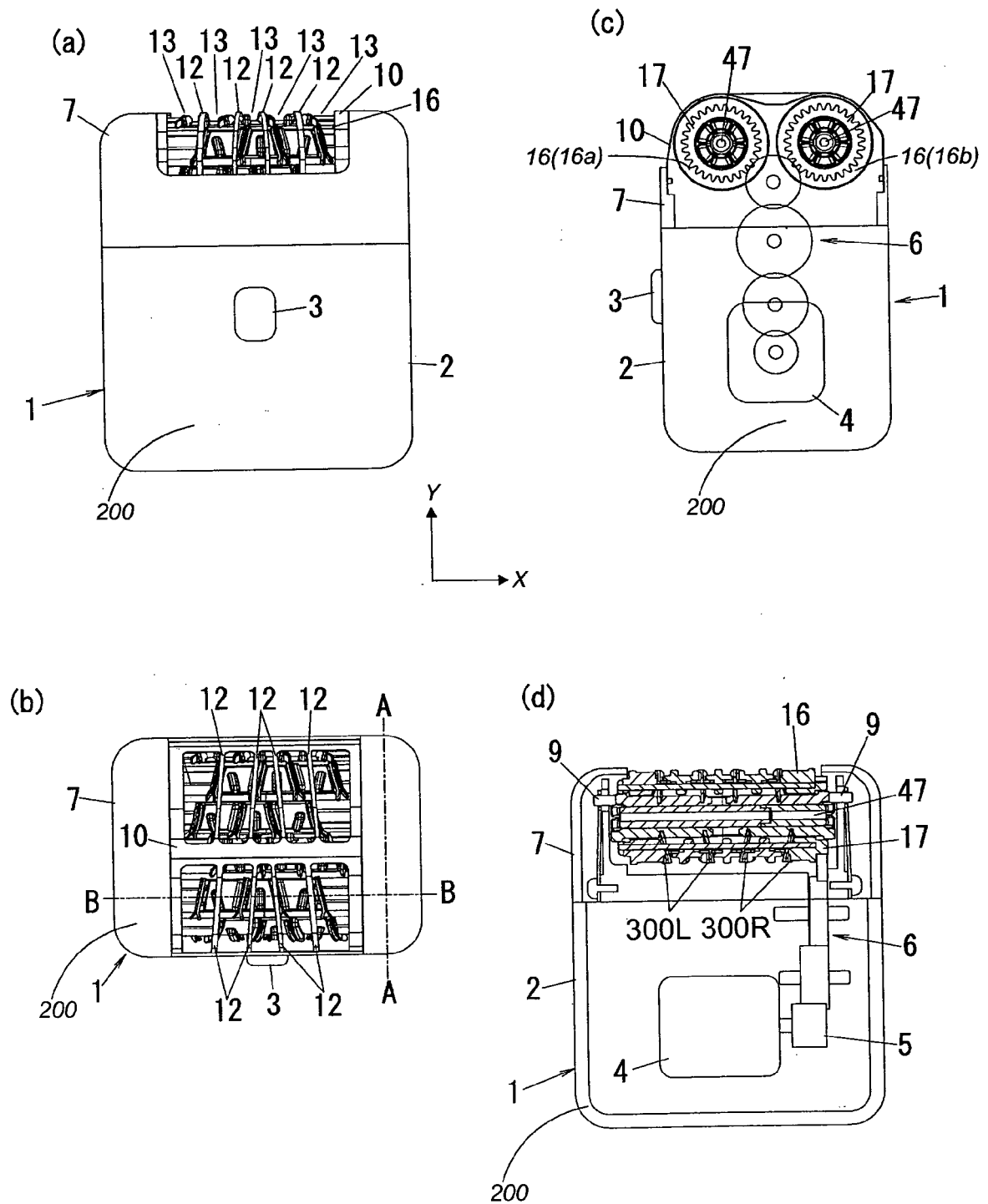


Fig. 2

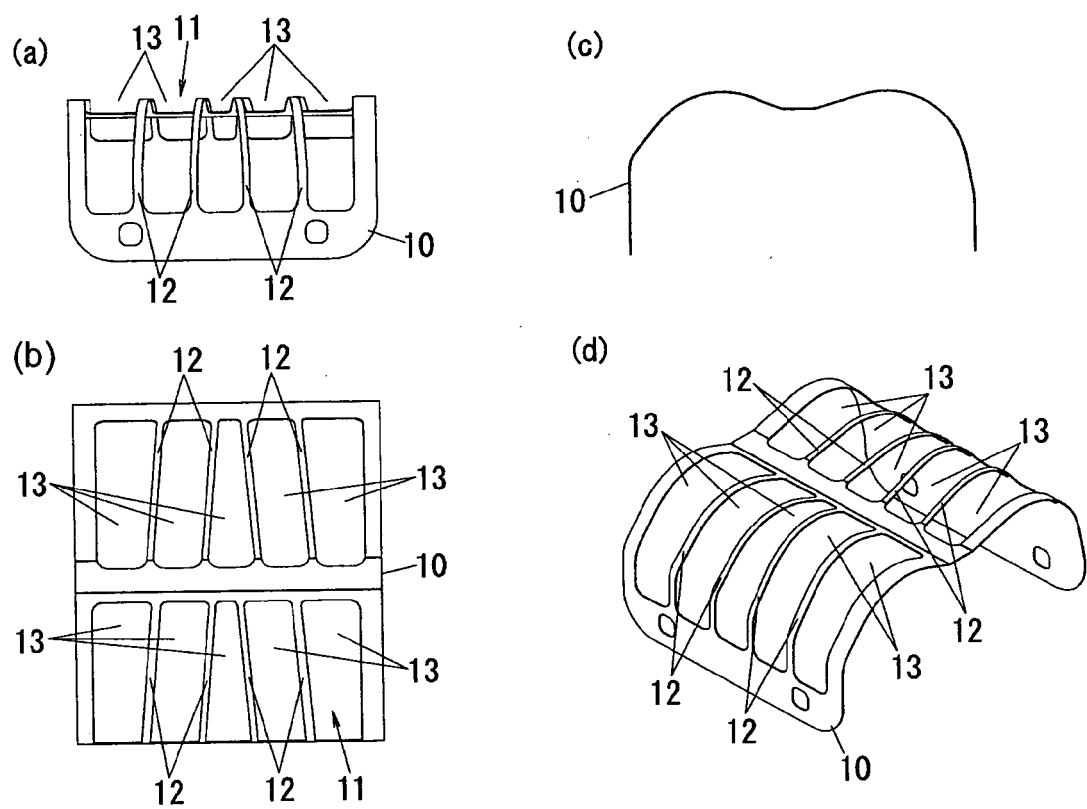


Fig. 3

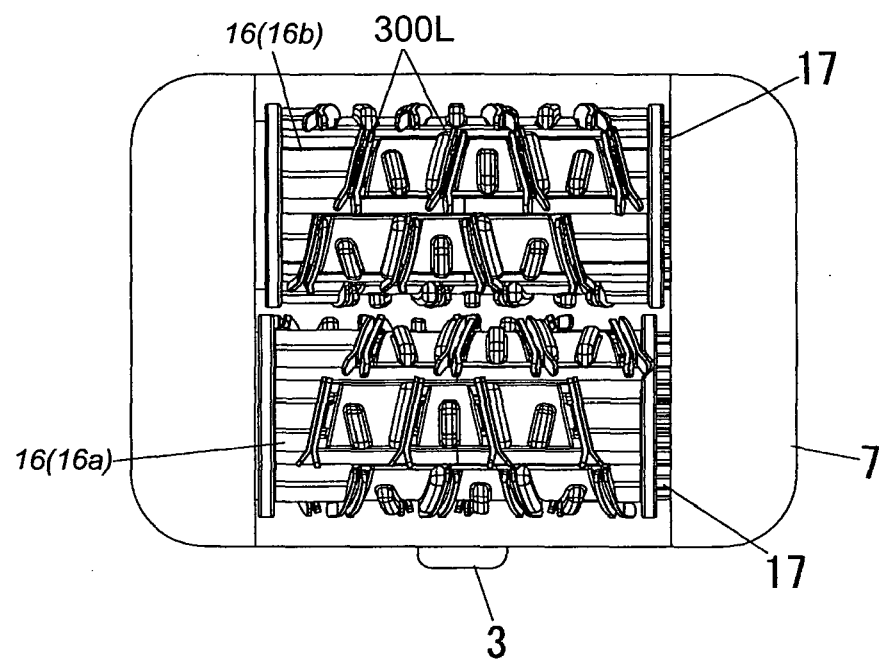


Fig. 4

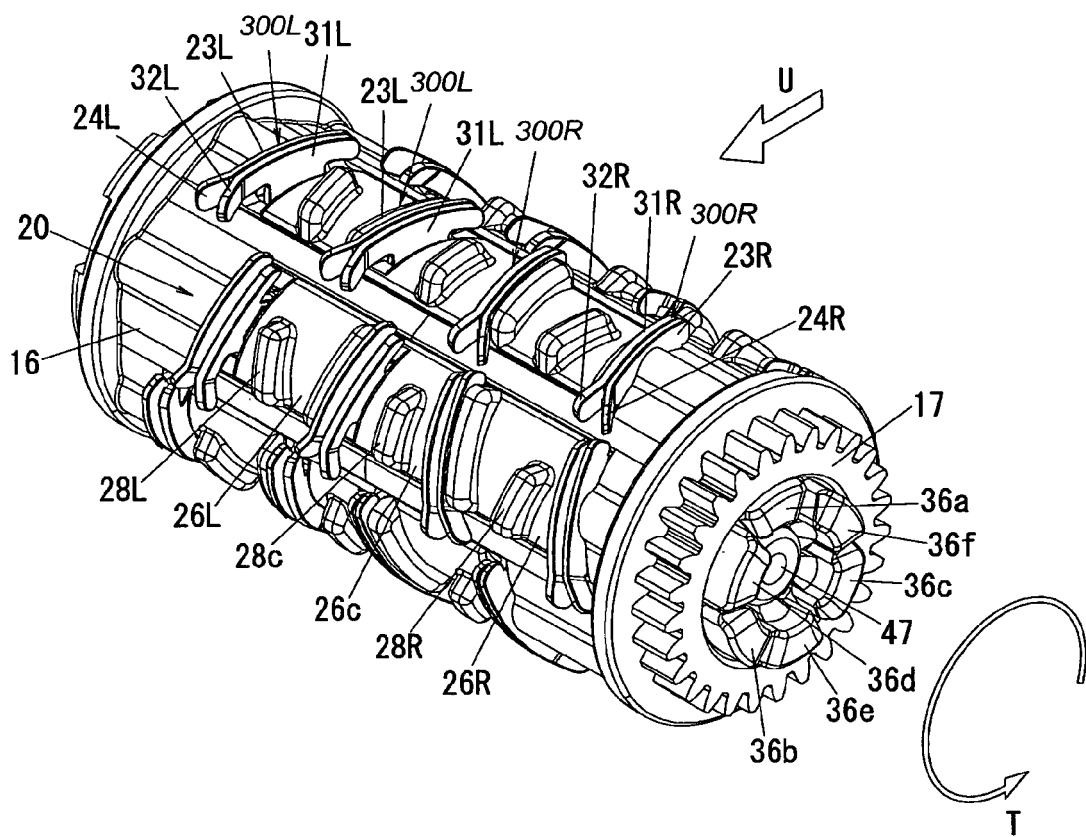


Fig. 5

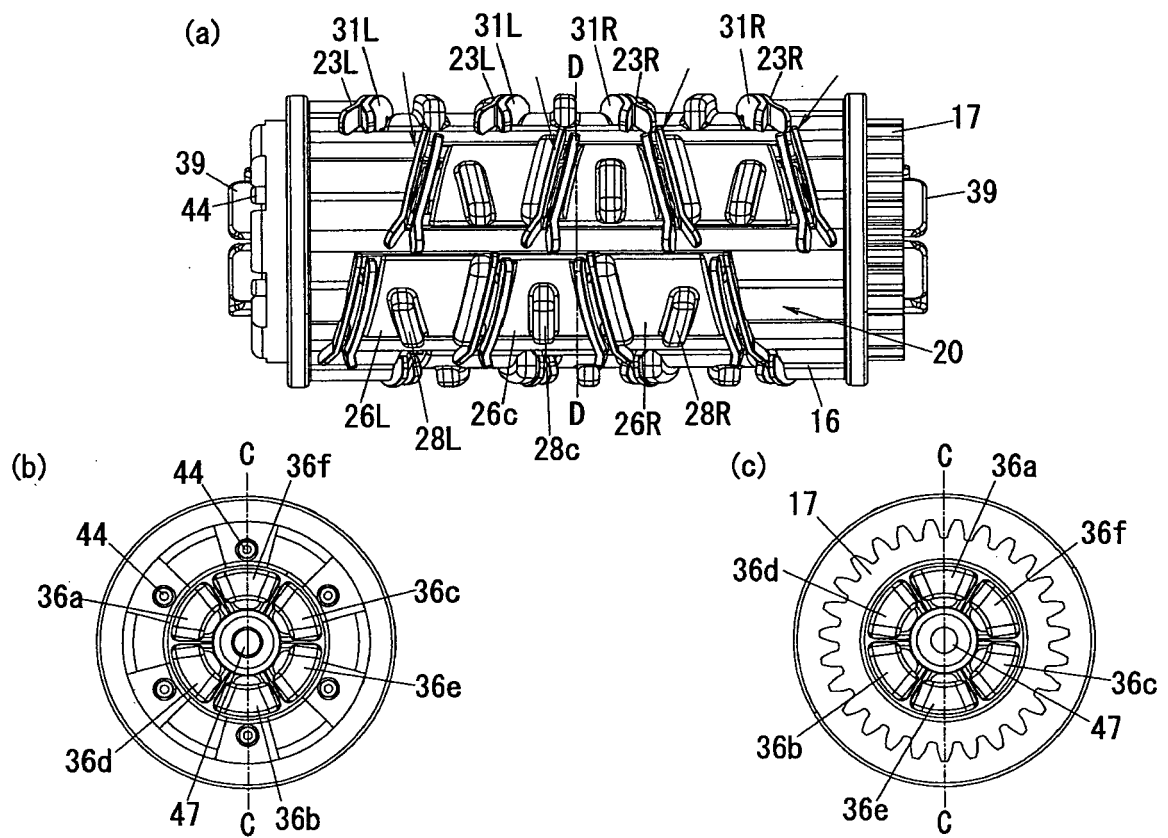


Fig. 6

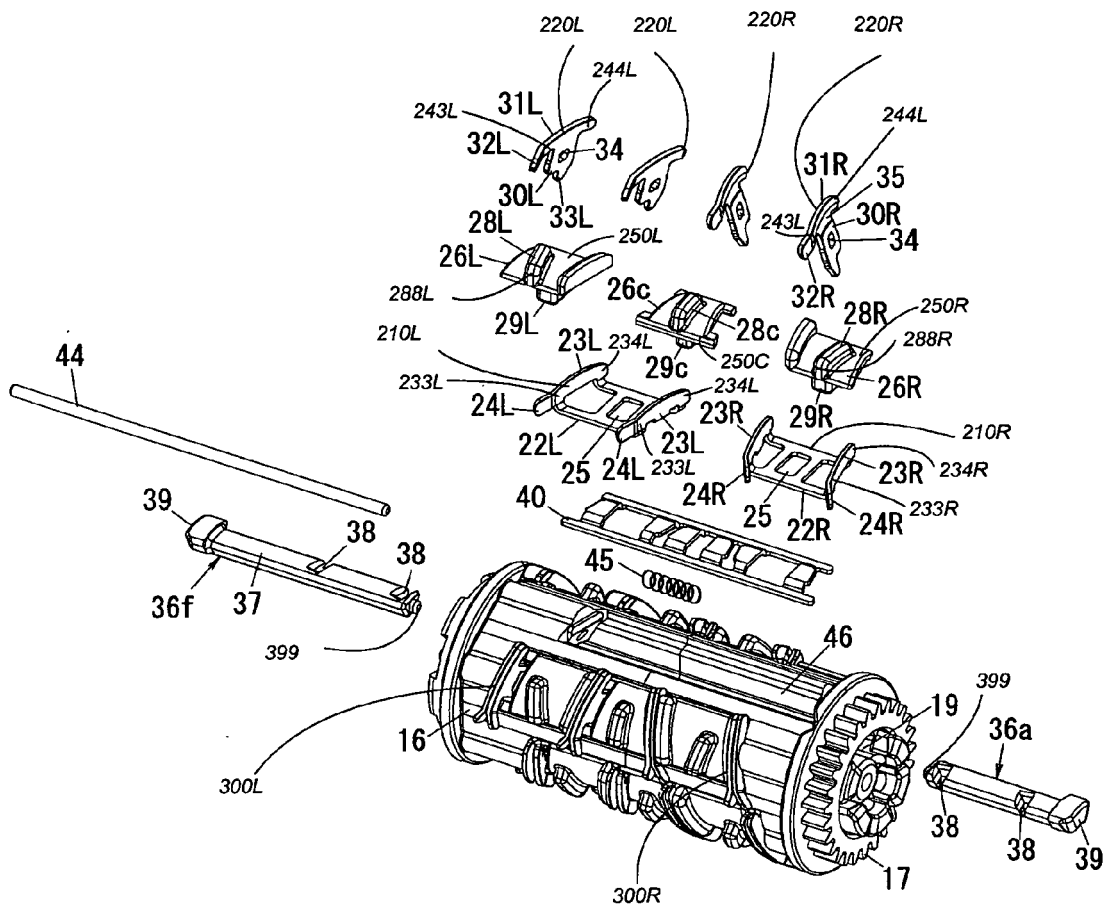


Fig. 7

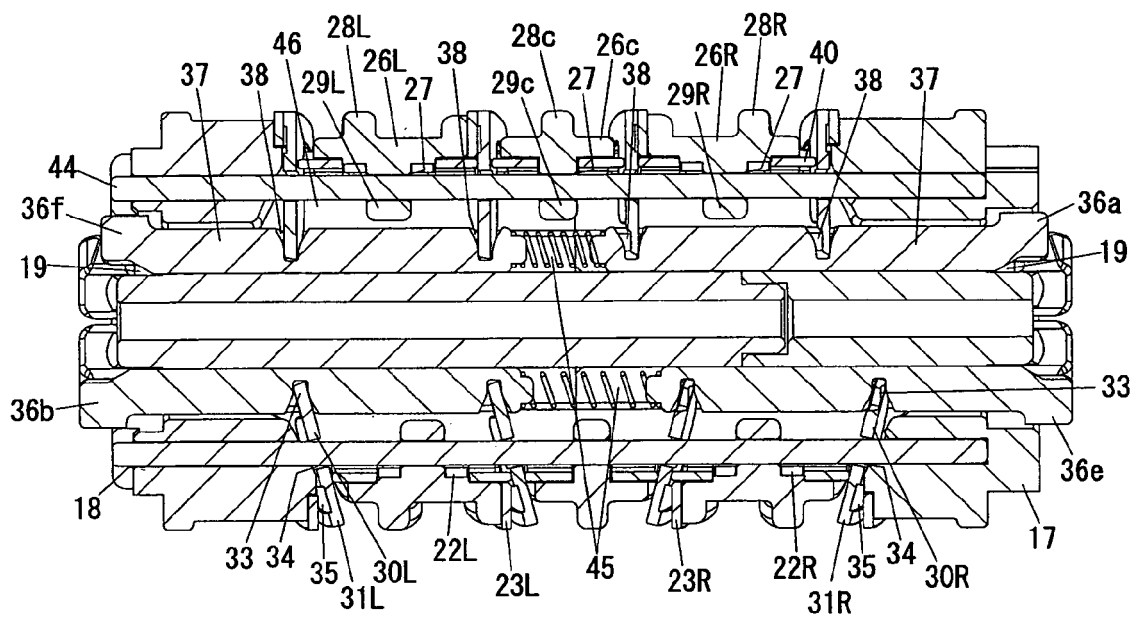


Fig. 8

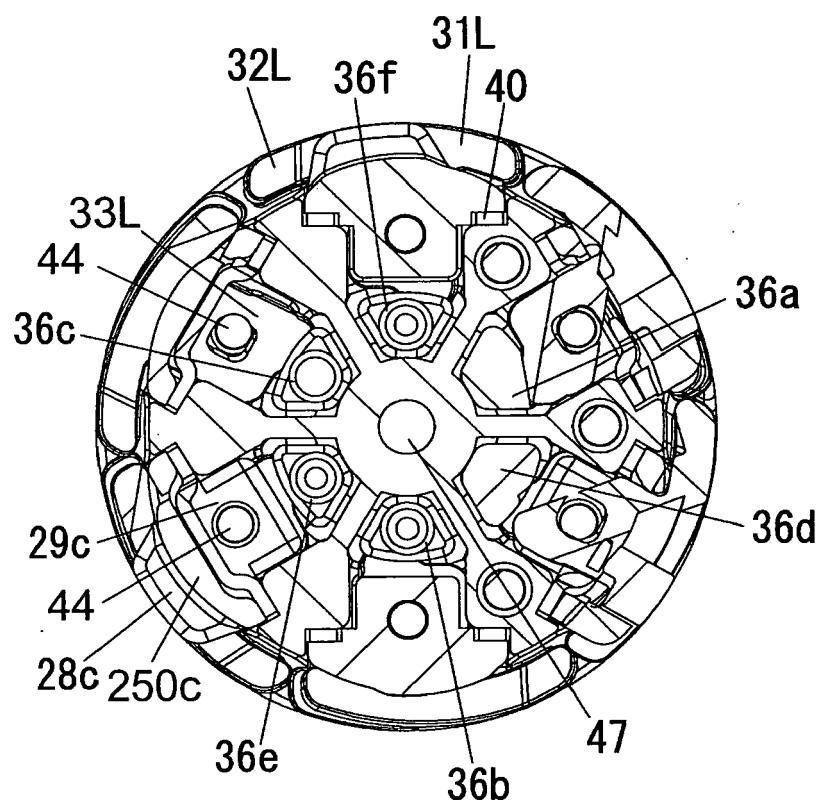
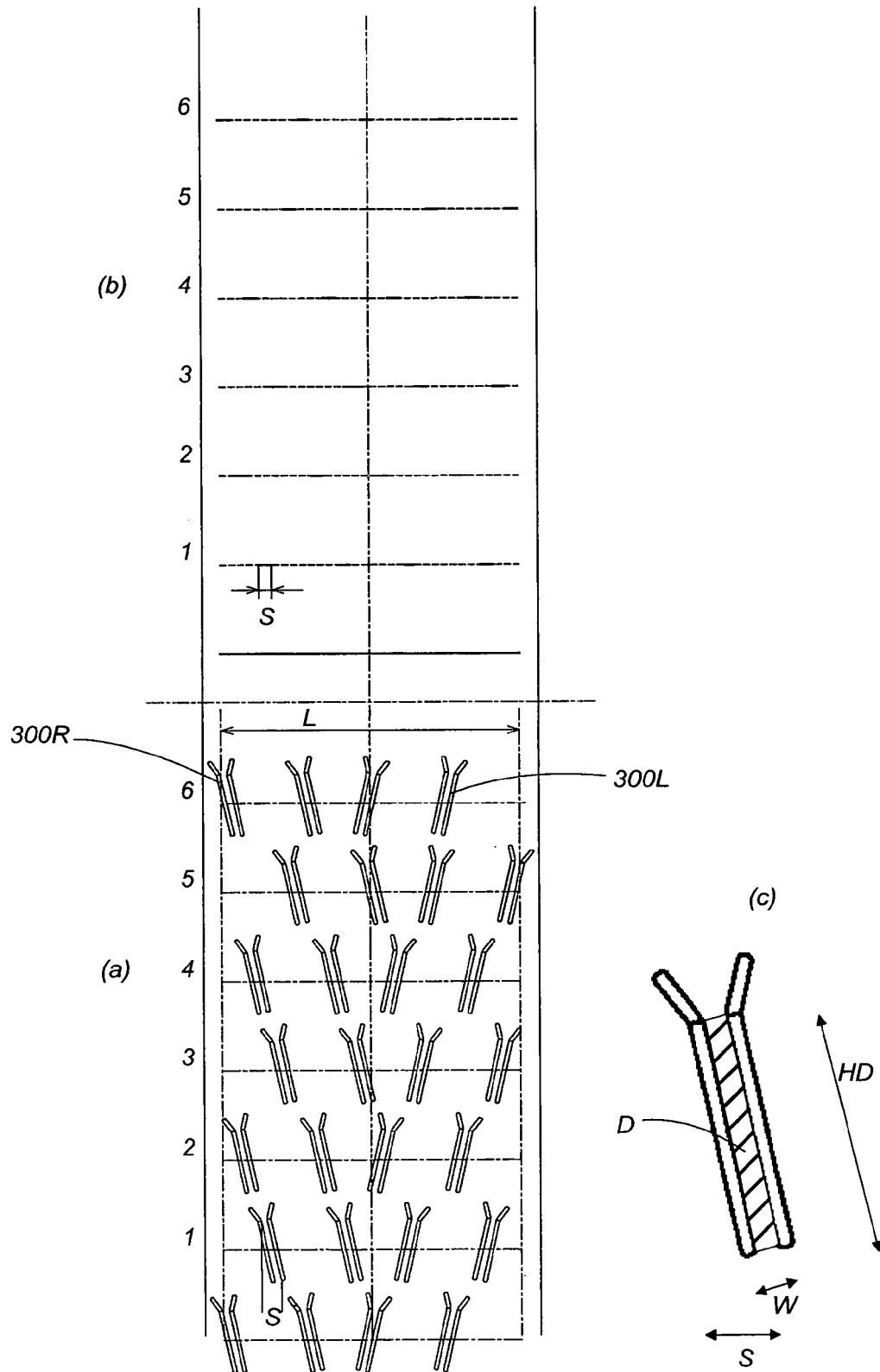


Fig. 9



REFERENCES CITED IN THE DESCRIPTION

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