

Señores

DIVISION DE NUEVAS CREACIONES

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

Bogotá, D.C.

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Debidamente traducida, adjunto acompaño las copias oficiales de las solicitudes de patente básicas británicas No. GB 0003514.7, No. GB 0003513.9 y No. GB 0012574, las cuales le solicito agregar a este expediente para los fines legales respectivos.

De Ustedes atentamente,

GERMAN CASTILLO GRAU

T.P. No. 2978 del C.S.J.



INVESTOR IN PEOPLE

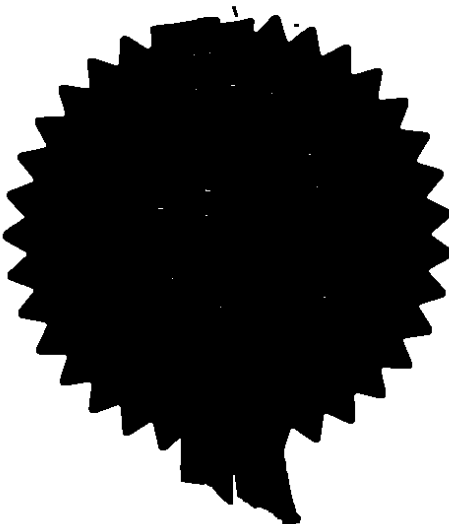
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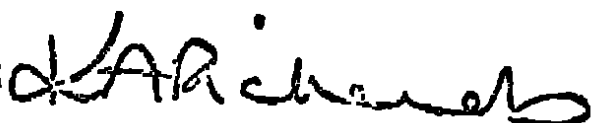
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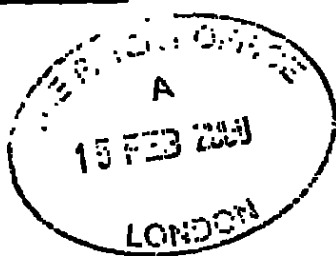
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16FEB00 ESI3468-1 D02029
P01/7700 0.00-0003513.9

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1. Your reference RFW/EB/C70422

2. Patent application number 0003513.9
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3. Full name, address and postcode of the or of each applicant (underline all surnames) SmithKline Beecham GmbH & Co KG
Hermannstrasse 7, D-77815 Buhl/Baden, , Germany
Patents ADP number (if you know it)
If the applicant is a corporate body, give the country/state of its incorporation German 7216518002

4. Title of the invention Toothbrush

5. Name of your agent (if you have one) CORPORATE INTELLECTUAL PROPERTY
"Address for service" in the United Kingdom to which all correspondence should be sent SMITHKLINE BEECHAM PLC
TWO NEW HORIZONS COURT
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MIDDLESEX TW8 9EP
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing (day / month / year)
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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer yes if:
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2

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Description

Claim(s)

Abstract

Drawings

8

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Statement of inventorship and right
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11.

We request the grant of a patent on the basis of this
application

Signature

R F Walker

Date 15-Feb-00

R F Walker

12. Name and daytime telephone number of
person to contact in the United Kingdom

R F Walker 020 8975 6336

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Patents Form 1/77

Toothbrush

This invention relates to toothbrushes, in particular to brush parts for electric toothbrushes.

Electric toothbrushes generally have a cluster of bristles mounted in a bristle holder, and an electric drive motor located in the brush handle which drives the bristle holder so as to move the bristles in a way which cleans the teeth when the moving bristles are applied to the teeth. A common construction is a holder which is arranged to be rotatable about an axis substantially parallel to the direction of the bristles and passing through the centre of the cluster of bristles. Such constructions are for example disclosed in US 5,652,916 and US 4,479,516. Such rotary motion can be oscillatory about this axis, and it is known to move this axis around a conical surface, e.g. in US 5862558. It is also known from US 5,577,285 for the bristle holder to perform an alternating oscillatory lifting motion in the direction of its axis of rotation. Various configurations of bristles, in terms of their cluster in plan as viewed along the bristle direction, are known for use in electric toothbrushes, ranging from simple rings or series of concentric rings of tufts of bristles, to more elaborate configurations. Some such configurations are for example disclosed in US 5,625,916, WO 97/01307, US 5,652,990, US 5,467,495, WO 98/26730, and WO 99/03372.

It is an object of this invention to provide an improved brush part suitable for an electric toothbrush. Other objects and advantages of the invention will be apparent from the following description.

According to this invention a brush part for an electric toothbrush is provided, comprising a bristle holder having a cluster of bristles mounted thereon and extending generally in a bristle direction, the bristle holder being connectable to a toothbrush handle containing an electric drive motor and capable of being rotatably driven by the drive motor when connected thereto about a rotation axis generally parallel to the bristle direction, characterised in that:

the bristles of the cluster are arranged in (i) an outer ring or polygon of outer tufts including relatively long bristles, within which there is (ii) at least one inner tuft including relatively long bristles, and (iii) at least one intermediate ring or

polygon of tufts including relatively less long bristles situated radially between the outer ring and the at least one inner tuft.

Preferably the ends of the bristles in the outer and inner tufts, and optionally also the intermediate tufts, are cut so that the ends of the tufts are inclined at an angle which is not perpendicular to the bristle direction so as to slope between the length of the relatively long and less long bristles. In such a surface the ends of the outer tufts slope downwardly toward the centre of the pattern and the end(s) of the inner tuft(s) slopes outwardly toward the edge of the pattern. Typically the slope of the end surface(s) of the inner tuft(s) is steeper, e.g. in the inclusive range 30° - 50° , than the slope of the end surfaces of the outer tufts, which may for example slope in the inclusive range 20° - 40° .

Preferably therefore the ends of the bristles of the outer tufts lie in a substantially conical or pyramidal surface having its projected apex pointing downward toward the bristle holder. Preferably the ends of the bristles of the inner tuft(s) lie(s) in a substantially conical or pyramidal surface having its projected apex pointing upward away from the bristle holder. Preferably the apex-base axes of these conical or pyramidal surfaces in which the ends of the bristles of the outer and inner tufts may lie are both parallel to the bristle direction, are coaxial, and pass through the geometric centre of the bristle cluster as seen in plan looking along the bristle direction downwardly toward the bristle holder. Preferably the ends of the bristles of the intermediate tufts lie in a surface which links the extrapolated sloping surfaces of the inner and outer tufts in a smooth curve. Such a surface may comprise one or more conical surfaces.

The term "cone" as used herein, and derived terms such as "conical" includes both true cones having a circular cross section at all points along their apex-base axis and sides which follow a straight line path between their apex and the edge of their base, and distorted cones, e.g. having distorted circular, e.g. oval cross sections, and/or sides which follow a concave or convex curved line.

Similarly the term "pyramid" as used herein, and derived terms such as "pyramidal" includes both true pyramids having a regular polygonal cross section at all points along their apex-base axis and sides which follow a straight line path between their apex and the edge of their base, and distorted pyramids, e.g. having distorted

polygonal cross sections, and/or sides which follow a concave or convex curved line.

Typically therefore the surface in which the ends of the tufts lie comprises an outer concave dished or saucer-like surface, with its outer rim defined by the sloping surface of the ends of the outer tufts, and with the inner tufts forming a convex peak about the centre of the dished or saucer-like surface. At the same radius from the centre of the bristle cluster the bristles are preferably all at the same height from the surface of the bristle holder, so that the ends of the outermost bristles of the outer tufts lie in a plane perpendicular to the bristle direction. The longest bristles of the inner tufts, being preferably those nearest the centre of the cluster in the above-described conical or pyramidal surface, may extend to the same height from the bristle holder as the longest bristles of the outer tufts.. The longest bristles of the outer tufts are preferably the outermost bristles of the cluster, particularly in the above-described conical and pyramidal surface. Preferably the longest bristles of the inner tufts are longer than longest bristles of the outer tufts, so that the peak of the inner tufts rises above the plane in which the outermost bristles of the outer tufts lie. Typically the highest bristles of the inner tuft(s) may be ca. 9-15% higher relative to the lowest bristles of the intermediate tufts. Typically the highest bristles of the outer tuft(s) may be ca. 4-10% higher relative to the lowest bristles of the intermediate tufts.

A typical width of the bristle cluster of the invention is ca. 10-12.5mm.

The brush part of this invention appears to be suitable for use with most known bristle patterns, i.e. the arrangement of bristles in plan on the holder as viewed down the bristle direction. For example the bristles may be disposed in discrete tufts arranged in concentric rings, or polygons with a tuft at each angle of the polygon.

One preferred pattern comprises three concentric polygons of tufts, being (i) an outer polygon of 12 to 16 tufts, preferably 14 tufts, (ii) an inner triangle, preferably equilateral, of tufts, and between polygons (i) and (ii), an intermediate, preferably regular, polygon (iii) of 7 to 9, preferably 8 tufts. The pattern is preferably symmetrical about the width of the pattern.

Another preferred pattern comprises (i) an outer, preferably regular, polygon of 18 to 22, preferably 20 tufts, (ii) a single tuft at the centre of the pattern, and between polygon (i) and central tuft (ii), a first intermediate, preferably regular, polygon (iiia) of 5 to 7, preferably 6, tufts surrounding the central tuft, and
5 a second intermediate, preferably regular, polygon (iiib) of 12 to 14, preferably 13, tufts surrounding the first intermediate polygon (iiia). The pattern is again preferably symmetrical about the width of the pattern.

The brush part of this invention appears to be suitable for all electric toothbrushes in which the bristle holder is mounted for and moveable in rotary
10 motion about an axis transverse, e.g. substantially perpendicular, to the longitudinal head - handle axis of the toothbrush, substantially parallel to the bristle direction, and passing through or close to the centre of the bristle pattern. Preferably the rotary motion is oscillatory, i.e. involving rotation through an angle in one rotary direction, alternating with rotation through substantially the same angle in the
15 opposite rotational direction. Preferably this rotary motion is combined with reciprocal motion of the bristles along the bristle direction, i.e. up and down the bristle direction. For example the motion of the bristle holder, combining such oscillatory rotary and reciprocal motion, may be reciprocally helical. Suitable drive mechanisms to drive the bristle holder in this way are known, for example in US 5,
20 577, 285 and the drive speeds, amplitudes, and oscillation frequencies, e.g. ca. 3000 - 6000 rpm achievable by means of such known drive mechanisms are believed to be suitable for the brush part of the present invention.

Therefore the invention further provides an electric toothbrush having a brush part as described above. For example the brush part of this invention may be
25 connectable, preferably replaceably connectable, to a toothbrush handle containing an electric drive motor. For this purpose the brush part suitably comprises part of a toothbrush head which is itself provided with connection means by which the brush part may be connected to the handle and to the motor. The brush part may for example be rotatably mounted on the toothbrush head, for example by known
30 means, such as an axle mounting, many types of which are known. The connection means may comprise a hollow neck part extending longitudinally between the head and the handle and enclosing a drive shaft by which the motor can drive the brush

part via suitable transmission means. The neck part may itself be connectable, preferably replaceably, at its end remote from the head, to the handle in a manner which also connects the drive shaft to the motor. Alternatively the head may itself be connectable, preferably replaceably, to the neck part at its end remote from the handle, to the neck part in a manner which also connects the drive shaft to the brush part. Many means by which the motor can drive the shaft and the shaft drive the brush part are known.

Generally an electric toothbrush is an elongate structure which comprises a head (including the brush part) and handle disposed along a head - handle axis being the length of the toothbrush, and for example if the bristle holder performs oscillatory rotary motion the bristle holder may oscillate about a mean alignment relative to the length direction of the electric toothbrush.

The toothbrush bristle holder and the bristles themselves of the brush part of this invention may be made of materials which are conventional in the field of electric toothbrush manufacture, e.g. respectively of plastics materials and nylon fibres. The plastics material parts of the bristle holder and other plastics material parts of the toothbrush may be made by an injection moulding process, and accordingly the invention further provides a process for making a toothbrush as described herein, comprising injection moulding of plastics material. Further the invention provides an injection mould suitable for use in such a process.

The invention will now be described by way of example only with reference to the accompanying drawings in which:

Fig. 1 Shows the overall layout of an electric toothbrush of this invention.

Fig. 2 Shows a plan view of the brush part of the toothbrush of Fig. 1

Fig. 3 Shows a side view of and a cross section through the bristle holder and bristle cluster of the brush part of Fig. 2.

Fig. 4 Shows a plan view of another brush part of the toothbrush of Fig. 1.

Fig. 5 Shows a side view of and a cross section through the bristle holder and bristle cluster of the brush part of Fig. 4

Referring to Fig. 1 an electric toothbrush is shown overall in side view 10. The toothbrush 10 comprises a handle 11 by which it may be held, and which includes a drive motor, batteries, controls etc. The handle 11 is replaceably

connected at link 12, suitably a bayonet connection, to a replaceable section 13 including a head 14 at the end of the section 13 remote from handle 11 and a neck part 15. The assembly of handle 11 replaceable section 13 and head 14 are disposed along the length direction A--A of the toothbrush 10. In the head 14 is mounted a
 5 brush part comprising a bristle holder 16, from which a cluster of bristles 17 extend in a general bristle direction B--B generally perpendicular to length A--A. The holder 16 is driven by the motor (not shown) via drive shaft 18 (shown generally) extending along inside the neck part 15. The bristle holder 16 is mounted on an axle (not shown) in head 14 for oscillatory rotation about an axis passing through the
 10 centre of the bristle cluster 17 and parallel to the bristle direction B--B and for simultaneous reciprocal movement up and down this axis as shown by the arrows.

In use the holder 16 performs simultaneously an oscillatory, i.e. reversing, rotary motion about an axis of rotation parallel to bristle direction B--B and passing through the centre in plan of the cluster of bristles 17, and a reciprocal motion up
 15 and down along the bristle direction B--B. The amplitude of the oscillatory rotary motion is ca. 30° either side of a mean position, and the amplitude of the reciprocal motion is ca. 1.0mm. Numerous drive mechanisms are known in the art to achieve such motion.

Referring to Fig. 2, a plan view of the bristle cluster 16 is shown, looking
 20 down onto the holder 15 in the bristle direction B--B. The bristles 16 are disposed in discrete circular section tufts 21, each ca. 1.4mm diameter, set in corresponding mounting holes (not shown) in a conventional manner in the holder 15, which is circular in plan, and rotatable about an axis passing through its centre. The tufts 21 are arranged in a pattern which comprises three concentric polygons of tufts, being
 25 (i) an outer polygon 21A of 14 tufts, (ii) an inner equilateral triangle of tufts 21B, and between the polygon 21A and the inner triangle 21B, an intermediate regular polygon of 8 tufts 21C. The pattern is symmetrical about the width of the pattern, about a line C - C passing through an apex of the triangle 21B and through a side of the intermediate polygon 21C.

30 Referring to Fig. 3 a cross section through the bristle cluster 16 of Fig. 2 is shown, following the line D - D. From Fig. 3 it is seen that the polygon of outer tufts 21A includes relatively long bristles which rise to their highest point from the

bristle holder 15 at the edge of the cluster 16. The bristles in the outer tufts 21A are cut in a gentle curve sloping down toward the centre of the pattern, and so that the ends of the tufts are inclined at an angle α , sloping downwards toward the centre of the cluster. It will be understood that the end surfaces of all the tufts 21A

- 5 consequently lie in a conical or pyramidal surface with its apex pointing downwards towards the bristle holder 15.

- The bristles at the outer rim of the polygon 21A are the highest bristles of the outer tufts 21A and lie in a plane perpendicular to the bristle direction B--B. The triangle of inner tufts 21B also include relatively long bristles. The ends of the
- 10 bristles in the inner tufts 21B are also cut so that the ends of the tufts 21B are inclined at an angle β , sloping down toward the edge of the cluster 16, such that the ends of the bristles of the inner tufts 21B lie in a substantially conical or pyramidal surface having its projected apex pointing upward away from the bristle holder 15. The slope angle β of the end surfaces of the inner tufts 21A is steeper, ca. 40° , than
- 15 the slope angle α of the end surfaces of the outer tufts 21C which is ca. 30° . The base-apex axes of these two respective conical surfaces are coaxial, parallel to the bristle direction B--B and pass through the centre of the cluster 16 in plan.

- Between the polygons 21A and 21B the intermediate polygon 21C of tufts includes bristles which are relatively less long than the highest bristles of the tufts
- 20 21A and 21C. The ends of the bristles of the intermediate tufts 21B lie in a shallow conical surface with its projected apex pointing away from the bristle holder 15, and having its base-apex axis coaxial with the other two base-apex axes, and which links the extrapolated sloping surfaces of the inner 21A and outer 21C tufts in a smooth curve.

- 25 The surface in which the ends of the tufts 15 lie consequently comprises a concave dished or saucer-like surface, with its rim defined by the outer tufts 21A, and with the inner tufts 21B forming a convex peak about the centre of the dished or saucer-like surface. At the same radius from the centre of the bristle cluster 16 the bristles are all at the same height from the surface of the bristle holder 15, so
- 30 that the ends of the outermost bristles of the outer tufts 21A lie in a plane perpendicular to the bristle direction B--B. The longest bristles of the inner tufts 21B, being those nearest the centre of the cluster 16 are longer than the longest

bristles of the outer tufts 21A, so that the peak of the inner tufts 21B rises above the plane in which the outermost bristles of the outer tufts 21C lie. The width of the bristle cluster 16 is ca. 12.5mm. Typical heights in mm of the bristles from the bristle holder 15 are shown in Fig. 3.

Claims:

1. A brush part for an electric toothbrush, comprising a bristle holder having a cluster of bristles mounted thereon and extending generally in a bristle direction, the
5 bristle holder being connectable to a toothbrush handle containing an electric drive motor and capable of being rotatably driven by the drive motor when connected thereto about a rotation axis generally parallel to the bristle direction, characterised in that:
- the bristles of the cluster are arranged in (i) an outer ring or polygon of
10 outer tufts including relatively long bristles, within which there is (ii) at least one inner tuft including relatively long bristles, and (iii) at least one intermediate ring or polygon of tufts including relatively less long bristles situated radially between the outer ring and the at least one inner tuft.
- 15 2. A brush part according to claim 1 characterised in that the ends of the bristles in the outer and inner tufts are cut so that the ends of the tufts are inclined at an angle which is not perpendicular to the bristle direction so as to slope between the length of the relatively long and less long bristles.
- 20 3. A brush part according to claim 2 characterised in that the ends of the outer tufts slope downwardly toward the centre of the pattern and the end(s) of the inner tuft(s) slopes outwardly toward the edge of the pattern.
4. A brush part according to claim 3 characterised in that the slope of the end
25 surface(s) of the inner tuft(s) is steeper than the slope of the end surfaces of the outer tufts.
5. A brush part according to any one of claims 2, 3 or 4 characterised in that
30 the ends of the bristles of the outer tufts lie in a substantially conical or pyramidal surface having its projected apex pointing downward toward the bristle holder and the ends of the bristles of the inner tuft(s) lie(s) in a substantially conical or

pyramidal surface having its projected apex pointing upward away from the bristle holder.

5 6. A brush part according to any one of claims 2 to 5 characterised in that the ends of the bristles of the intermediate tufts lie in a surface which links the extrapolated sloping surfaces of the inner and outer tufts in a smooth curve.

10 7. A brush part according to claim 6 characterised in that the surface in which the ends of the bristles of the intermediate tufts lie comprises one or more conical surfaces.

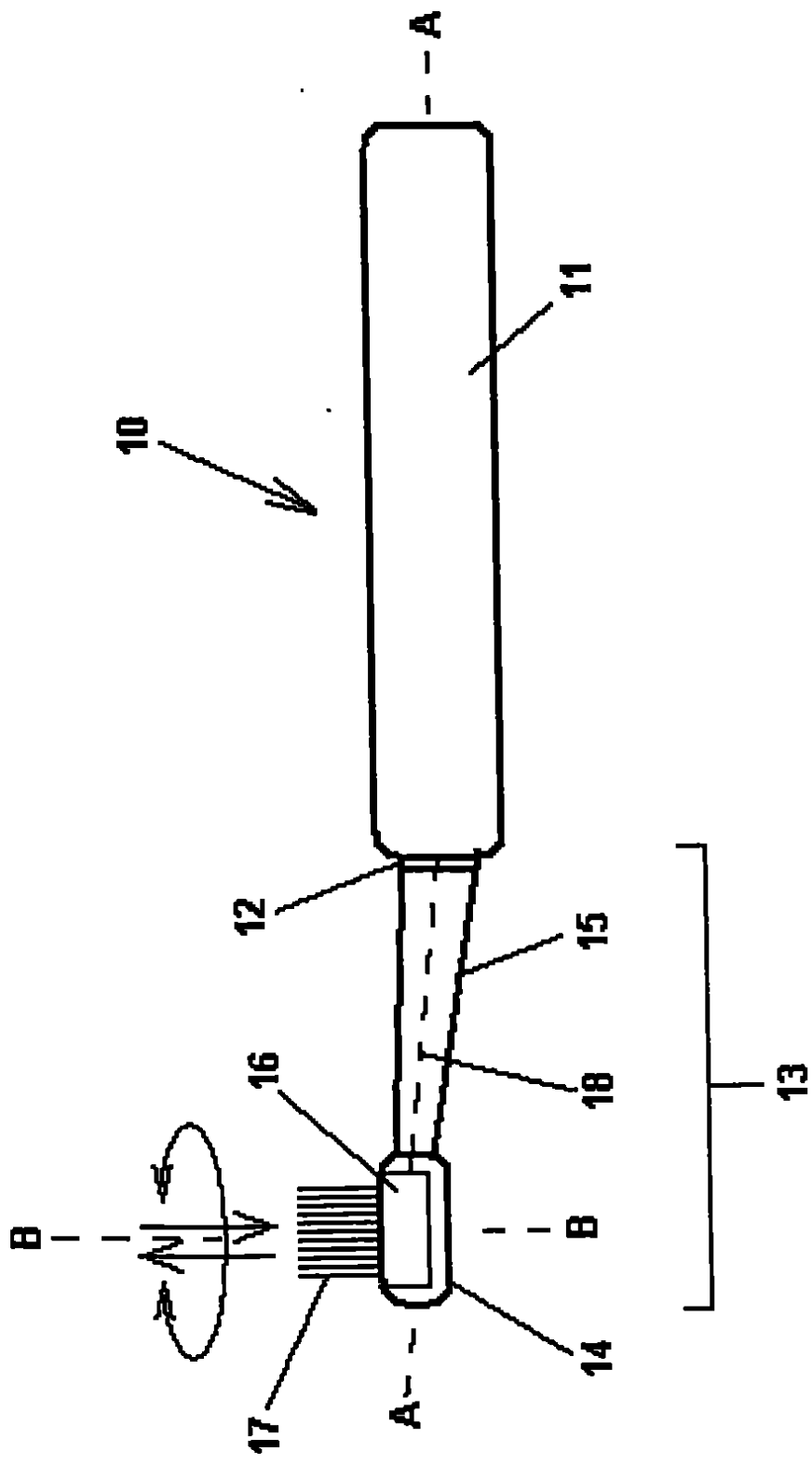
15 8. A brush part according to any one of claims 2 to 7 characterised in that the surface in which the ends of the tufts lie comprises an outer concave dished or saucer-like surface, with its outer rim defined by the sloping surface of the ends of the outer tufts, and with the inner tufts forming a convex peak about the centre of the dished or saucer-like surface.

20 9. A brush part according to any one of the preceding claims characterised in that at the same radius from the centre of the bristle cluster the bristles are all at the same height from the surface of the bristle holder, so that the ends of the outermost bristles of the outer tufts lie in a plane perpendicular to the bristle direction.

25 10. A brush part according to any one of the preceding claims, characterised in that the longest bristles of the inner tufts extend to the same height from the bristle holder as the longest bristles of the outer tufts.

30 11. A brush part according to any one of claims 1 to 9, characterised in that the longest bristles of the inner tufts are longer than longest bristles of the outer tufts, so that the peak of the inner tufts rises above the plane in which the outermost bristles of the outer tufts lie.

12. A brush part according to any one of the preceding claims, characterised in that the bristles are disposed in discrete tufts arranged in concentric rings, or polygons with a tuft at each angle of the polygon.
- 5 13. A brush part according to claim 12 characterised in that the bristles are disposed in three concentric polygons of tufts, being (i) an outer polygon of 12 to 16 tufts, (ii) an inner triangle of tufts, and between polygons (i) and (ii), an intermediate polygon (iii) of 7 to 9 8 tufts.
- 10 14. A brush part according to claim 12 characterised in that the bristles are arranged in (i) an outer polygon of 18 to 22, (ii) a single tuft at the centre of the pattern, and between polygon (i) and central tuft (ii), a first intermediate polygon (iiia) of 5 to 7 tufts surrounding the central tuft, and a second intermediate polygon (iiib) of 12 to 14 tufts surrounding the first intermediate polygon (iiia).
- 15 15. An electric toothbrush having a brush part according to any one of the preceding claims.
- 20 16. An electric toothbrush according to claim 15 characterised in that the brush part comprises part of a toothbrush head and the bristle holder is mounted for and moveable in rotary motion about an axis transverse to the longitudinal head – handle axis of the toothbrush, substantially parallel to the bristle direction, and passing through or close to the centre of the bristle pattern combined with reciprocal motion of the bristles along the bristle direction up and down the bristle direction.
- 25 17. An electric toothbrush according to claim 16 characterised in that the bristle holder is mounted to perform oscillatory rotary motion.



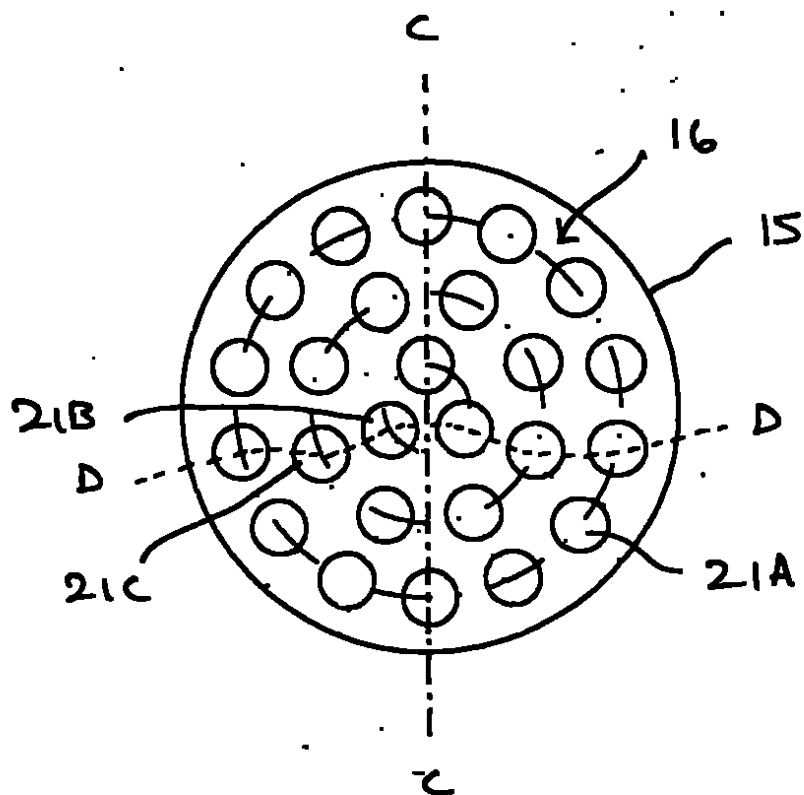


Fig. 2

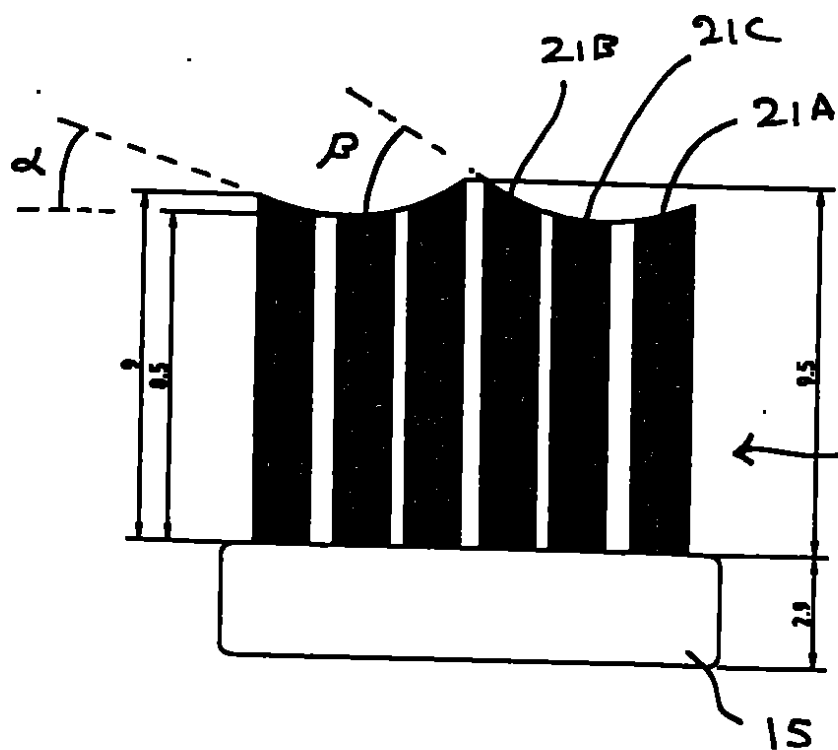


Fig. 3

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71

OFICINA DE PATENTES

SOLICITUD DE PATENTE

1. Su referencia: **RFW/EB/C70422**

2. Solicitud No. **0003513.9** **15 de febrero de 2000**

3. Nombre completo y código postal de cada solicitante:

Dirección: **SmithKline Beecham GmbH & Co KG,
Hermannstrasse 7, D-77815 Buhl/Baden,
Alemania.**

No. APD 7216518002

Si el solicitante es una entidad, indique el país/estado de constitución:

Alemania

4. **TITULO DE LA INVENCION:**

CEPILLO DE DIENTES

5. **NOMBRE DE SU AGENTE:**

Nombre del Agente: **CORPORATE INTELLECTUAL PROPERTY**

Dirección para notificaciones: **SMITHKLINE BEECHAM PLC
TWO NEW HORIZONS COURT
BRENTFORD
MIDDLESEX TW8 9EP**

NO. ADP Patentes

6. **N/A**

7. **N/A**

8. **N/A**

0003513.9 - abr 01

15

9. Número de hojas radicadas (En inglés). Descripción: 08 Reivindicaciones: 3

Resumen : - Dibujos: -2

10. Solicitud de examen preliminar y búsqueda:

11. Solicitamos se nos adjudique una patente con base en esta solicitud.

R F Walker

15 de febrero de 2000

12. Nombre y teléfono del contacto en el Reino Unido Nombre y teléfono del contacto en el Reino Unido (FIRMA) R F Walker 020 8975 6336

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LEGALIZACIONES

OFICINA DE PATENTES

Concept House
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NP10 8QQ

El suscrito, un funcionario debidamente autorizado conforme a los Artículos 74(1) y (4) de la Ley de Desreglamentación y Contratación de 1994 para firmar y expedir certificados en nombre del Contralor General, certifico que la copia adjunta es una copia correcta de los documentos archivados originalmente con respecto a la solicitud de patente que allí se identifica.

De acuerdo con las Reglamentaciones de Patentes de 1982 (Re-registro de Compañías), si una compañía nombrada en este certificado y en los documentos adjuntos se ha vuelto a registrar según la Ley de Compañías de 1980 con el mismo nombre con el que fue registrada inmediatamente antes del re-registro, salvo la sustitución o inclusión como la última parte del nombre de las palabras "sociedad anónima" o su equivalente en galés, las referencias al nombre de la compañía y sus documentos adjuntos serán tratadas como referencias al nombre con el cual fue re-registrada.

De acuerdo con las reglas, las palabras "sociedad anónima" (o en inglés *public limited company*) pueden ser reemplazadas por las letras p.l.c, plc. P.L.C ó PLC.

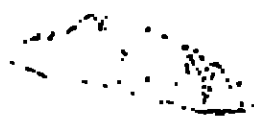
* El re-registro bajo la Ley de Compañías no constituye una nueva entidad legal sino simplemente somete a la compañía a ciertas normas de ley adicionales.

(FIRMA) (K.A. RICHARDS

FECHA: 15 de febrero de 2001

(SELLO DE LACRE)

PS



CEPILLO DE DIENTES

REVINDICACIONES:

1. Se provee una parte de cepillo para un cepillo de dientes eléctrico, que comprende un soporte para cerdas con un conjunto de cerdas montado sobre el mismo y que por lo general, se extiende en dirección de las cerdas; el soporte de las cerdas se conecta a una empuñadura del cepillo que contiene un motor y que puede ser accionado de manera giratoria por el motor cuando está conectada al mismo alrededor de un eje de rotación generalmente transversal a un eje entre la parte del cepillo y la empuñadura, caracterizada en que:

las cerdas del conjunto están dispuestas en (i) un anillo exterior o polígono de crestas exteriores incluidas cerdas relativamente largas, dentro de las cuales hay (ii) al menos una cresta interior incluidas cerdas relativamente largas, y (iii) al menos un anillo intermedio o polígono de crestas incluidas cerdas relativamente menos largas situadas radialmente entre el anillo y la al menos una cresta interior.

2. Una parte de un cepillo según la reivindicación 1, caracterizada en que los extremos de las cerdas en las crestas exterior e interior están cortadas de modo que los extremos de las crestas estén inclinados a un ángulo que no sea perpendicular a la dirección de las cerdas de forma que hace una inclinación entre la longitud de las cerdas relativamente largas y las cerdas relativamente menos largas.

3. Una parte de un cepillo según la reivindicación 2, caracterizado en que los extremos de las crestas externas se inclinan hacia abajo hacia el centro del patrón y el(los) extremo(s) de la(s) cresta(s) interior(es) se inclina(n) hacia fuera hacia el borde del patrón.

4. Una parte de un cepillo según la reivindicación 3, caracterizada en que la inclinación de la(s) superficie(s) extrema(s) de la(s) cresta(s) interior(es) es(son)

más aguda(s) que la inclinación de las superficies de los extremos de las demás crestas.

5. Una parte de un cepillo según cualquiera de las reivindicaciones 2, 3 o 4, caracterizada en que los extremos de las cerdas de las crestas exteriores quedan en una superficie sustancialmente cónica o piramidal que tiene su ápice proyectado señalando hacia abajo hacia el soporte de las cerdas y los extremos de las cerdas de la(s) cresta(s) interior(es) queda(n) en una superficie sustancialmente cónica o piramidal que tiene su ápice proyectado indicando hacia fuera del soporte de cerdas.

6. Una parte de un cepillo según cualquiera de las reivindicaciones 2 a 5, caracterizada en que los extremos de las cerdas de las crestas intermedias quedan en una superficie que se liga con las superficies inclinadas extrapoladas de las crestas interiores y exteriores en una leve curva.

7. Una parte de un cepillo según la reivindicación 6, caracterizada en que la superficie en la que están los extremos de las cerdas de las crestas intermedias comprende una o más superficies cónicas.

8. Una parte de un cepillo según cualquiera de las reivindicaciones 2 a 7 caracterizada en que la superficie en la que quedan los extremos de las crestas comprende una superficie cóncava o en forma de plato, con un borde exterior definido por la superficie inclinada de los extremos de las crestas exteriores, y las crestas interiores forman un pico convexo alrededor del centro de la superficie cóncava o en forma de plato.

9. Una parte de un cepillo según cualquiera de las reivindicaciones anteriores, caracterizada en que en el mismo radio del centro del conjunto de cerdas, las cerdas todas tienen la misma altura desde la superficie del soporte de cerdas, de modo que los extremos de las cerdas que sobresalen más de las crestas exteriores quedan en un plano perpendicular en dirección a las cerdas.

10. Una parte de un cepillo según cualquiera de las reivindicaciones anteriores, caracterizado en que las cerdas más largas de las crestas interiores se extienden a la misma altura desde el soporte de cerdas que las cerdas más largas de las crestas exteriores.

11. Una parte de un cepillo según cualquiera de las reivindicaciones 1 a 9, caracterizada en que las cerdas más largas de las crestas interiores son más largas que las cerdas más largas de las crestas exteriores, de modo que el pico de las crestas interiores se eleva por encima del plano donde quedan las cerdas que sobresalen más de las crestas exteriores.

12. Una parte de un cepillo según cualquiera de las reivindicaciones anteriores, caracterizada en que las cerdas están colocadas en crestas separadas dispuestas en anillos concéntricos o polígonos, con una cresta en cada ángulo del polígono.

13. Una parte de un cepillo según la reivindicación 12, caracterizada en que las cerdas están colocadas en tres polígonos concéntricos de crestas, que son (i) un polígono de 12 a 16 crestas, (ii) un triángulo interior de crestas y entre los polígonos (i) y (ii), un polígono intermedio (iii) de 7 a 9 crestas.

14. Una parte de un cepillo según la reivindicación 12, caracterizada en que las cerdas están colocadas en (i) un polígono exterior de 18 a 22, (ii) una sola cresta en el centro del patrón y entre el polígono (i) y la cresta central (ii), un primer polígono intermedio (iiia) de 5 a 7 crestas alrededor de la cresta central, y un segundo polígono intermedio (iiib) de 12 a 14 crestas alrededor del primer polígono intermedio (iiia).

15. Un cepillo de dientes eléctrico que tiene una parte de un cepillo según cualquiera de las reivindicaciones anteriores.

16. Un cepillo de dientes eléctrico según la reivindicación 15, caracterizado en que la parte del cepillo comprende una cabeza de cepillo de dientes y el soporte está montado para que se mueva en dirección rotatoria alrededor de un eje transversal a la cabeza longitudinal – eje de la empuñadura del cepillo de dientes,

sustancialmente. Dirección a las cerdas, y pasa a través o cerca del centro del patrón de cerdas combinado con el movimiento recíproco de las cerdas a lo largo de la dirección de las cerdas hacia arriba y hacia abajo de la dirección de las cerdas.

17. Un cepillo de dientes eléctrico según la reivindicación 16, caracterizado en que el soporte de las cerdas está montado para realizar un movimiento oscilatorio rotatorio.



INVESTOR IN PEOPLE

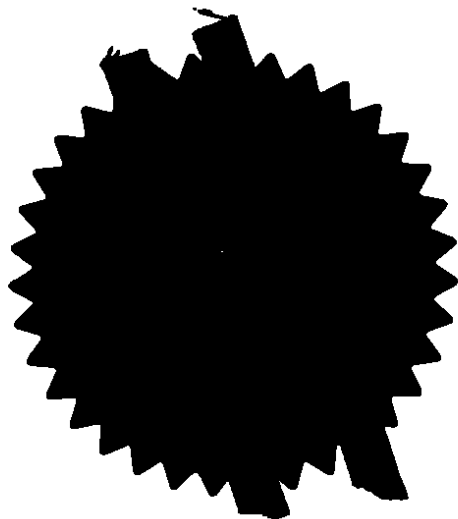
The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

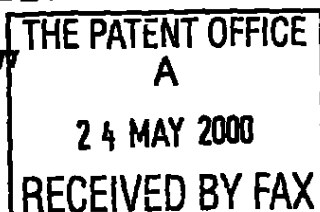


Signed Ansower.

Dated 15 February 2001

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P01/7700 0.00-0012574.0

Patents Form 1/77

Patents Act 1977
(Rule 16)The
Patent
Office

1/77

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office
Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference

RFW/EB/C70443

2. Patent application number

(The Patent Office will)

0012574.0

24 MAY 2000

3. Full name, address and postcode of the or of each applicant (underline all surnames)SmithKline Beecham GmbH & Co KG
Hermannstrasse 7, D-77815 Buchl (Baden),
Germany

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

German

7901782001

4. Title of the invention

Toothbrush

5. Name of your agent (if you have one)

CORPORATE INTELLECTUAL PROPERTY

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

SMITHKLINE BEECHAM PLC
TWO NEW HORIZONS COURT
BRENTFORD
MIDDLESEX TW8 9EP

Patents ADP number (if you know it)

58 669 74004

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and (if you know it) the or each application number

Country Priority application number Date of filing
(if you know it) (day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer yes if:

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is named as an applicant, or
- c) any named applicant is a corporate body

See note (4)

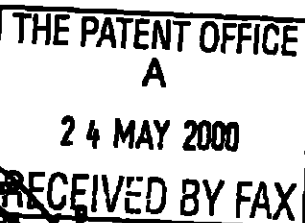
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Priority Documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 1/77)

Request for preliminary examination and search (Patents Form 3/77)

Request for substantive examination (Patents Form 10/77)

...

Any other documents (please specify)

11.

We request the grant of a patent on the basis of this application

Signature

R F Walker

Date 24-May-00

12. Name and daytime telephone number of person to contact in the United Kingdom

R F Walker 020 8975 6336

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After an application for a Patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission unless an application has been filed at least six weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

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Patents Form 1/77

Toothbrush

This invention relates to toothbrushes, in particular to brush parts for electric toothbrushes.

Electric toothbrushes generally have a head which incorporates a brush part
5 which includes a cluster of bristles mounted in a bristle holder, and an electric drive motor located in the brush handle which drives the bristle holder so as to move the bristles in a way which cleans the teeth when the moving bristles are applied to the teeth. A common construction is a holder which is arranged to be rotatable about an axis substantially parallel to the direction of the bristles and passing through the
10 centre of the cluster of bristles.

Such constructions are for example disclosed in US 5,652,916 and US 4,479,516. Such rotary motion can be oscillatory about this axis, and it is known to move this axis around a conical surface, e.g. in US 5,862,558. It is also known for example from US 5,577,285 for the bristle holder to perform an alternating
15 oscillatory rotary motion and a reciprocal up and down motion in the direction of its axis of rotation, being parallel to the bristle direction. Various configurations of bristles, in terms of their cluster in plan as viewed along the bristle direction, are known for use in electric toothbrushes, ranging from simple rings or series of concentric rings of tufts of bristles, to more elaborate configurations. Some such
20 configurations are for example disclosed in US 5,625,916, WO 97/01307, US 5,652,990, US 5,467,495, WO 98/26730, and WO 99/03372.

It is an object of this invention to provide an improved brush part suitable for an electric toothbrush. Other objects and advantages of the invention will be apparent from the following description.

25 According to this invention a brush part for an electric toothbrush is provided, comprising a bristle holder having a cluster of bristles mounted thereon and extending generally in a bristle direction, the bristle holder being connectable to a toothbrush handle containing an electric drive motor and capable of being rotatably driven by the drive motor when connected thereto about a rotation axis
30 generally transverse to an axis between the brush part and the handle, characterised in that:

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the ends of the bristles remote from the bristle holder lie in a substantially part-cylindrical surface, the length axis of the cylinder being oriented substantially perpendicular to the bristle direction.

The term "cylindrical" as used herein includes true cylinders i.e. a shape
5 having straight longitudinal sides and a circular cross section, with the longitudinal axis of the cylinder passing through the centre of the circular section. The term also includes distorted cylinders, e.g. shapes with convex bulging longitudinal sides e.g. "barrel" shapes, and shapes with concave sides, i.e. wider at the cylinder ends than at a waist partway between the ends, provided however that the radius of curvature
10 of the convex or concave sides is greater than the radius of curvature of the cross section shape. Also the term "cylinder" includes such shapes with oval or oblate circular, or polygonal, including polygonal with rounded corners or sides, cross section. A part true cylindrical surface is preferred.

Preferably the central longitudinal axis of the cylinder passes through a
15 constructed axis aligned in the bristle direction and passing through the centre of the bristle cluster.

Suitably the curve of the cross section of the part cylindrical surface is such that the difference in length (i.e. from the surface of the holder) between the bristles at the centre of the cluster and the edge of the cluster is in the range 0.2 - 0.01 of
20 width of the cluster across the longitudinal cylindrical axis. [In other words this corresponds to a curve of the cross section of the part cylindrical surface such that the ratio of the difference in length between the bristles at the centre of the cluster and the edge of the cluster : width of the cluster across the longitudinal cylindrical axis is in the range 1 : 5 to 1 : 10]. It is found that a relatively shallow cylindrical
25 curve of the part cylindrical surface can result in an improved power efficiency of the electric toothbrush, e.g. less battery usage for a given cleaning efficiency. Therefore preferably the said difference in length is in the range 0.05 - 0.08 of the width, more preferably in the range 0.06 - 0.07, e.g. 0.062 - 0.065.

A typical width for the cluster of the brush part of this invention is ca. 10 -
30 12.5mm, e.g. 10.5 - 11.5 mm measured perpendicular to the bristle direction. With such a width a suitable radius of curvature of the cross section of the cylindrical surface can be calculated from the above dimensions.

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It is preferred that if the bristles are disposed in discrete tufts, e.g. of circular cross section as defined by mounting holes in the holder into which the tufts are fitted, the ends of the bristles remote from the holder in a tuft follow the said part cylindrical shape, e.g. these ends may be cut to follow this shape. Alternatively
5 but less preferred these ends may be cut perpendicular to the bristle direction, e.g. parallel to the face of the holder from which the bristles project, so that these ends follow the part cylindrical surface only in a stepwise manner.

In a second aspect of this invention it has unexpectedly been discovered that the use of bristles longer than the commonly used 8 - 8.5 mm provides an
10 advantageous tooth cleaning effect. Possibly this is due to the greater flexibility of such longer bristles.

Therefore the invention further provides a brush part for an electric toothbrush, comprising a bristle holder having a cluster of bristles mounted thereon and extending generally in a bristle direction, the bristle holder being connectable to
15 a toothbrush handle containing an electric drive motor and capable of being rotatably driven by the drive motor when connected thereto about a rotation axis capable of being rotatably driven by the drive motor when connected thereto about a rotation axis generally transverse to an axis between the brush part and the handle, characterised in that the bristles extend from the holder, i.e. have a length, of 9.0
20 mm or greater, e.g. up to 10mm, suitably ca. 9.5mm. Such longer bristles may be provided on the holder together with shorter bristles, i.e. of a length less than 9.0mm, e.g. 8.0 - 8.9mm, e.g. 8.5 - 8.9mm, typically 8.8 ± 0.5 mm. Suitably such longer bristles may be provided at the edge of a bristle cluster, with shorter bristles in the inner region, e.g. at the centre of the cluster.

25 For example in the brush part of the first aspect of this invention the longer bristles at the edge of the cluster may have a length 9.0 - 10.0mm, e.g. ca 9.5mm, and shorter bristles at the centre of the cluster and/or across the centre of the cluster in the cylindrical longitudinal axis direction may have a length 8.0 - 9.0mm, e.g. 8.5 - 8.9mm typically 8.8 ± 0.5 mm. Typically therefore in the brush part of the
30 invention the difference in length between longest and shortest bristles may be 0.1 - 2.0mm, e.g. ca. 0.5 - 1.5 mm, suitably 0.5 - 1.0mm, typically 0.6 - 0.8mm. A typical width for the cluster of the invention is again ca. 10 - 12.5mm, e.g. 10.5 -

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11.5 mm measured perpendicular to the bristle direction. Preferably the ends of the bristles of this second aspect of the invention are provided in a part circular surface as in the first aspect of the invention.

The brush part of this invention appears to be suitable for use with most known bristle patterns, i.e. the arrangement of bristles in plan on the holder as viewed down the bristle direction. For example the bristles may be disposed in discrete tufts arranged in concentric rings of tufts or polygons with a tuft at each angle of the polygon, optionally with a single tuft at the centre of the pattern.

One preferred pattern comprises three concentric polygons of tufts, being an inner triangle (preferably equilateral) of tufts surrounded by a first, preferably regular, polygon of 7 to 9, preferably 8 tufts, which is surrounded by a second, preferably regular, polygon of 12 to 16 tufts, preferably 14 tufts. The pattern is preferably symmetrical about the width of the pattern, particularly about the longitudinal axis of the part cylindrical surface.

Another preferred pattern comprises a single tuft at the centre of the pattern, a first, preferably regular, polygon of 5 to 7, preferably 6, tufts surrounding this central tuft, a second, preferably regular, polygon of 12 to 14, preferably 13, tufts surrounding the first polygon, and a third, preferably regular, polygon of 18 to 22, preferably 20 tufts surrounding this second polygon. Suitably regular polygons of even numbers of tufts have apexes aligned with the length axis of the toothbrush.

The brush part of this invention appears to be suitable for all electric toothbrushes in which the bristle holder is mounted for and moveable in rotary motion about an axis transverse to, preferably substantially perpendicular to, the longitudinal head - handle axis of the toothbrush, substantially parallel to the bristle direction, and passing through or close to the centre of the bristle pattern.

Preferably the rotary motion is oscillatory, i.e. involving rotation through an angle in one rotary direction, alternating with rotation through substantially the same angle in the opposite rotational direction. Preferably this rotary motion is combined with reciprocal motion of the bristles along the bristle direction, i.e. up and down the bristle direction. For example the motion of the bristle holder, combining such oscillatory rotary and reciprocal motion, may be reciprocally helical. Suitable drive mechanisms to drive the bristle holder in this way are known, for example in US 5,

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577, 285 and the drive speeds, amplitudes, and oscillation frequencies, e.g. ca. 3000- 6000 rpm achievable by means of such known drive mechanisms are believed to be suitable for the brush part of the present invention.

Therefore the invention further provides an electric toothbrush having a
5 brush part as described above. For example the brush part of this invention may be connectable, preferably replaceably connectable, to a toothbrush handle containing an electric drive motor. For this purpose the brush part suitably comprises part of a toothbrush head which is itself provided with connection means by which the brush
10 part may be connected to the handle and to the motor. The brush part may for example be rotatably mounted on the toothbrush head, for example by known means, such as an axle mounting, many types of which are known. The connection means may comprise a hollow neck part extending longitudinally between the head and the handle and enclosing a drive shaft by which the motor can drive the brush
15 part via suitable transmission means. The neck part may itself be connectable, preferably replaceably, at its end remote from the head, to the handle in a manner which also connects the drive shaft to the motor. Alternatively the head may itself be connectable, preferably replaceably, to the neck part at its end remote from the handle, to the neck part in a manner which also connects the drive shaft to the brush
20 part. Many means by which the motor can drive the shaft and the shaft drive the brush part are known.

Generally an electric toothbrush is an elongate structure which comprises a head (including the brush part) and handle disposed along a head - handle axis being the length of the toothbrush, and for example if the bristle holder performs oscillatory rotary motion the longitudinal axis of the part cylindrical surface may
25 oscillate about a mean alignment perpendicular to the length of the electric toothbrush.

The toothbrush bristle holder and the bristles themselves of the brush part of this invention may be made of materials which are conventional in the field of electric toothbrush manufacture, e.g. respectively of plastics materials and nylon
30 fibres. The plastics material parts of the bristle holder and other plastics material parts of the toothbrush may be made by an injection moulding process, and accordingly the invention further provides a process for making a toothbrush as

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described herein, comprising injection moulding of plastics material. Further the invention provides an injection mould suitable for use in such a process. The invention will now be described by way of example only with reference to the accompanying drawings in which:

- 5 Fig. 1 Shows the overall layout of an electric toothbrush of this invention.
 Fig. 2 Shows a plan view of the brush part of the toothbrush of Fig. 1
 Fig. 3 Shows a side view of and a cross section through the bristle holder
 and bristle cluster of the brush part of Fig. 2.
 Fig. 4 Shows a plan view of another brush part of the toothbrush of Fig. 1.
10 Fig. 5 Shows a side view of and a cross section through the bristle holder
 and bristle cluster of the brush part of Fig. 4.
 Fig. 6 Shows a plan view and a cross section of another brush part of the
 toothbrush of Fig. 1.

- Referring to Fig. 1 an electric toothbrush is shown overall in side view 10.
15 The toothbrush 10 comprises a handle 11 by which it may be held, and which
 includes a drive motor, batteries, controls etc. (not shown). The handle 11 is
 replaceably connected at link 12, suitably a bayonet connection, to a replaceable
 section 13 including a head 14 at the end of the section 13 remote from handle 11
 and a neck part 15. The assembly of handle 11 replaceable section 13 and head 14
20 are disposed along the length direction A-A of the toothbrush 10. In the head 14 is
 mounted a brush part comprising a bristle holder 16, from which a cluster of
 bristles 17 extend in a general bristle direction B-B generally perpendicular to
 length A-A. The holder 16 is driven by the motor (not shown) via drive shaft 18
 (shown generally) extending along inside the neck part 15. The bristle holder 16 is
25 mounted on an axle (not shown) in head 14 for oscillatory rotation about an axis
 passing through the centre of the bristle cluster 17 and parallel to the bristle
 direction B-B and for simultaneous reciprocal movement up and down this axis as
 shown by the arrows.

- In use the holder 16 performs simultaneously an oscillatory, i.e. reversing,
30 rotary motion about an axis of rotation parallel to bristle direction B-B and passing
 through the centre in plan of the cluster of bristles 17, and a reciprocal motion up
 and down along the bristle direction B-B. The amplitude of the oscillatory rotary

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motion is ca. 30° either side of a mean position, and the amplitude of the reciprocal motion is ca. 1.0mm. Numerous drive mechanisms are known in the art to achieve such motion.

Referring to Fig. 2, a plan view of the bristle cluster 17 is shown, looking
5 down onto the holder 16 in the bristle direction B-B. The orientation of the toothbrush length direction A-A is shown. The bristles 17 are disposed in discrete circular section tufts 21, each ca. 1.4mm diameter, set in corresponding mounting holes (not shown) in a conventional manner in the holder 16, which is circular in plan, and rotatable about an axis passing through its centre. The tufts 21 are
10 arranged in a pattern comprising an innermost equilateral triangle of tufts 21A, surrounded by a regular octagon of tufts 21B, which is in turn surrounded by an outermost regular polygon of 14 tufts 21C. The pattern is symmetrical about an axis C-C, which is perpendicular across the brush length A-A, and which passes through an apex of the triangle of tufts 21A and the outer polygon of tufts 21C, and
15 through a side of the octagon of tufts 21B. As will be more clearly seen in Fig. 3 the ends of the tufts 21 remote from the holder 16 lie in a cylindrical surface with the length axis of the cylinder being aligned in the direction C-C.

Referring to Fig. 3 a side view of the bristle cluster 17 of Fig. 2 is shown in Fig. 3A, looking in the direction C-C across the length A-A of the toothbrush 10,
20 and Fig. 3B shows a cross section through the cluster 17 looking along the length direction A-A and across the direction C-C of the toothbrush 10.

From Figs. 3A and 3B it is seen that the ends of the bristles 17 remote from the holder 16 lie in a cylindrical surface. Fig. 3A shows the ends of the bristles 17 following the arc of the part circular cross section of the cylindrical surface, the
25 ends of the tufts being profiled, e.g. cut to follow this arc. In Fig. 3B it is seen that the ends of the bristles lie along the straight line of the length axis of the cylindrical surface. Sections through the cluster 17 along other lines, e.g. C'-C', parallel to the direction C-C, i.e. also along the length direction of the cylindrical surface would also show the ends of the bristles of the cluster 17 lying in a straight line.
30 The minimum height of the tufts 21A (measured from the upper surface of the holder 16) of the central triangle is ca. 8.0 mm, and the maximum height of the tufts 21C, i.e. at their outer edge, is ca. 9.5 mm as shown in Fig. 3A. The width of

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the cluster 17, i.e. the dimension between opposite outermost surfaces of the tufts 21C, is ca. 11.0mm. Therefore the ratio of the difference in length (i.e. from the surface of the holder) between the bristles at the centre of the cluster and the edge of the cluster : width of the cluster across the longitudinal cylindrical axis is ca. 1 : 7.5. From these dimensions the radius of curvature of the arc of the part cylindrical surface can also be calculated, being in one example ca. 10.5 mm. The arc of the part-cylindrical surface in which the ends of the bristles 21 lie as shown in Fig 3A occupies ca. 65° of the 360° complete circle of the circular cross section shown of the part cylindrical surface.

Fig 3A also shows generally a transmission part 19 containing an axle hole 110 by which the holder 16 may be mounted for the above mentioned oscillatory rotation and reciprocal motion in head 14 on a pin axle (not shown).

Referring to Fig. 4, a plan view of another bristle cluster 17 is shown, again looking down onto the holder 16 in the bristle direction B--B. The orientation of the toothbrush length direction A--A is again shown. The bristles 16 are again disposed in discrete circular section tufts 41, each ca. 0.7mm diameter, set in corresponding mounting holes (not shown) in a conventional manner in the holder 16, which is circular in plan, and rotatable about an axis passing through its centre. As shown in Fig. 4 the pattern comprises a single tuft 41A at the centre of the pattern, a first regular hexagon of 6 tufts 41B surrounding this central tuft with opposite apexes of the hexagon aligned with the length direction A--A of the toothbrush, a second polygon of 13 tufts 41C surrounding the hexagon 41B, and a third polygon of 20 tufts 41D surrounding this second polygon 41C. The pattern is again symmetrical about an axis C--C, which is perpendicular to the brush length A--A. As will be more clearly seen in Fig. 5 the ends of the tufts 41 remote from the holder 16 lie in a cylindrical surface with the length axis of the cylinder being aligned in the direction C--C.

Referring to Fig. 5 a side view of the bristle cluster 17 of Fig. 4 is shown in Fig. 5A, looking in the direction C--C across the length A--A of the toothbrush 10, and Fig. 5B shows a cross section through the cluster 17 along the direction A--A across the direction C--C of the toothbrush 10.

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From Figs. 5A and 5B it is seen that the ends of the bristles 17 remote from the holder 16 lie in a cylindrical surface. Fig. 5A shows the ends of the bristles 17 following the arc of the part circular cross section of the cylindrical surface, the ends of the tufts being profiled to follow this arc. In Fig. 5A the shortest tuft is the central tuft 41A, with a maximum length of 8.0mm, and the longest tufts are those 41D of the outer polygon, having a maximum length of 9.5mm. The width of the cluster 17, i.e. the dimension between opposite outermost surfaces of the tufts 41D is ca. 11.0mm, and the curvature of the arc of the cylindrical surface can be calculated from this, again in one example being ca. 10.5 mm. In Fig. 5B it is seen that the ends of the bristles lie along the straight line of the length axis of the cylindrical surface. Sections through the cluster 17 along other lines, e.g. C"-C", parallel to the direction C-C, i.e. also along the length direction of the cylindrical surface would also show the ends of the bristles of the cluster 17 lying in a straight line. The arc of the part-cylindrical surface in which the ends of the bristles 21 lie as shown in Fig 5A occupies ca. 65° of the 360° complete circle of the circular cross section shown of the part cylindrical surface.

Fig 5A also shows generally a transmission part 19 containing an axle hole 110 by which the holder 16 may be mounted for the above mentioned oscillatory rotation and reciprocal motion in head 14 on a pin axle (not shown).

Referring to Fig. 6, Fig. 6A shows a cross section through the cluster 17 along the direction A-A across the direction C-C of the toothbrush 10 and a plan view of the bristle cluster 17 is shown in Fig. 6B, looking in the direction C-C across the length A-A of the toothbrush 10.

The plan view of the bristle cluster 17 of Fig. 6B is the same as that of Fig. 5 (the shaded bristles are merely of a different colour to the non-shaded bristles). In Fig. 6A the shortest tuft is the central tuft 61A, with a maximum length of 8.8mm, and the longest tufts are those 61D of the outer polygon, having a maximum length of 9.5mm. The width W-W of the cluster 17, i.e. the dimension between opposite outermost surfaces of the tufts 61D is 11.1mm. Therefore the difference in length between bristles 61A and 61D is 0.7mm, corresponding to 0.0+63 of the width of the cluster 17.

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Claims.

1. A brush part for an electric toothbrush is provided, comprising a bristle holder having a cluster of bristles mounted thereon and extending generally in a
5 bristle direction, the bristle holder being connectable to a toothbrush handle containing an electric drive motor and capable of being rotatably driven by the drive motor when connected thereto about a rotation axis generally transverse to an axis between the brush part and the handle, characterised in that:
the ends of the bristles remote from the bristle holder lie in a substantially
10 part-cylindrical surface, the length axis of the cylinder being oriented substantially perpendicular to the bristle direction.
2. A brush part according to claim 1 wherein the curve of the cross section of the part cylindrical surface is such that the difference in length between the bristles
15 at the centre of the cluster and the edge of the cluster is in the range 0.2 - 0.01 of width of the cluster across the longitudinal cylindrical axis.
3. A brush part according to claim 2 wherein the difference in length is in the range 0.05 - 0.08 of the width.
20
4. A brush part according to claim 3 wherein the difference in length is in the range 0.06 - 0.07 of the width.
5. An electric toothbrush having a brush part according to claim 1.

Fig 1

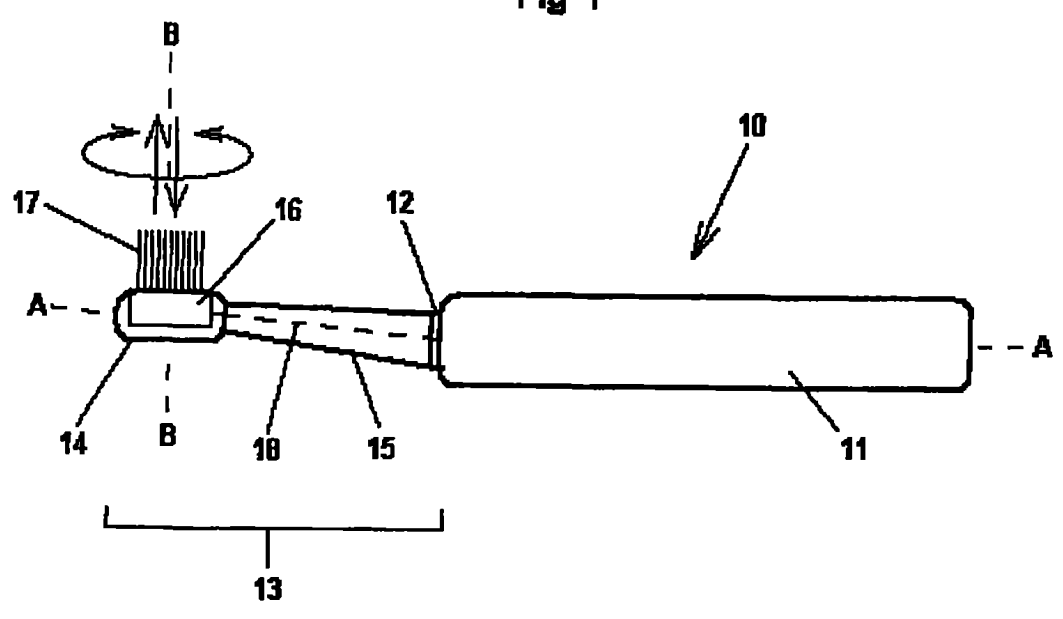


Fig 1

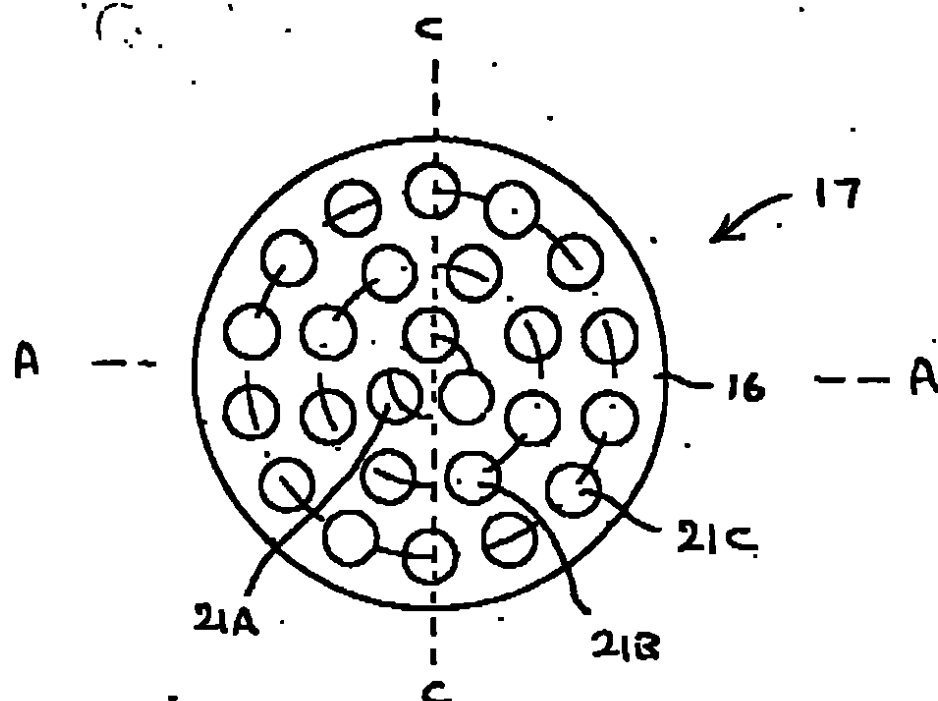


Fig. 2

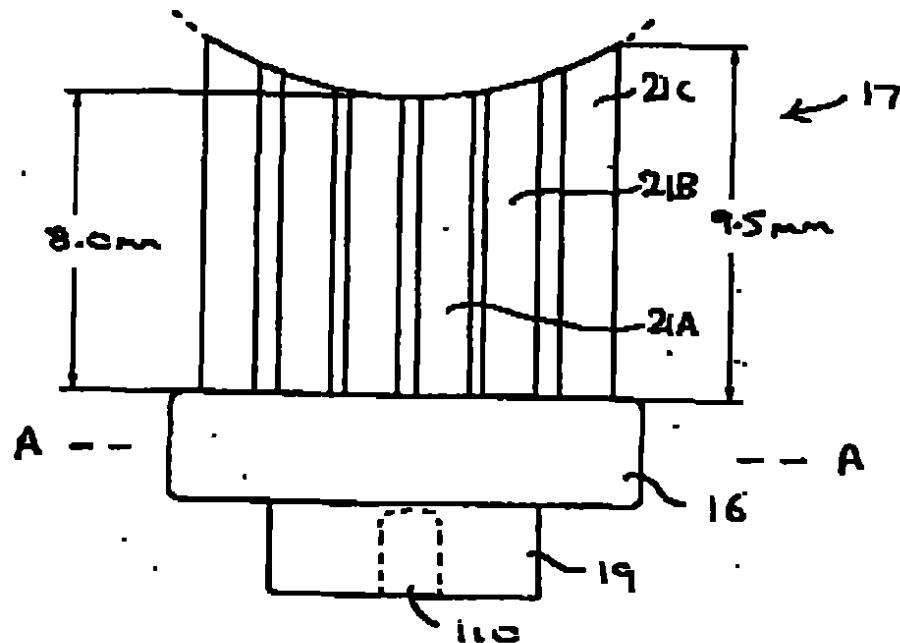


Fig. 3A

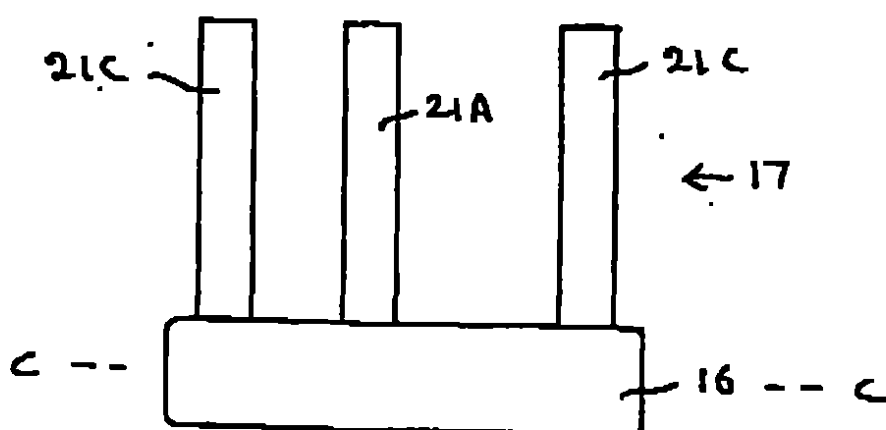


Fig. 3B

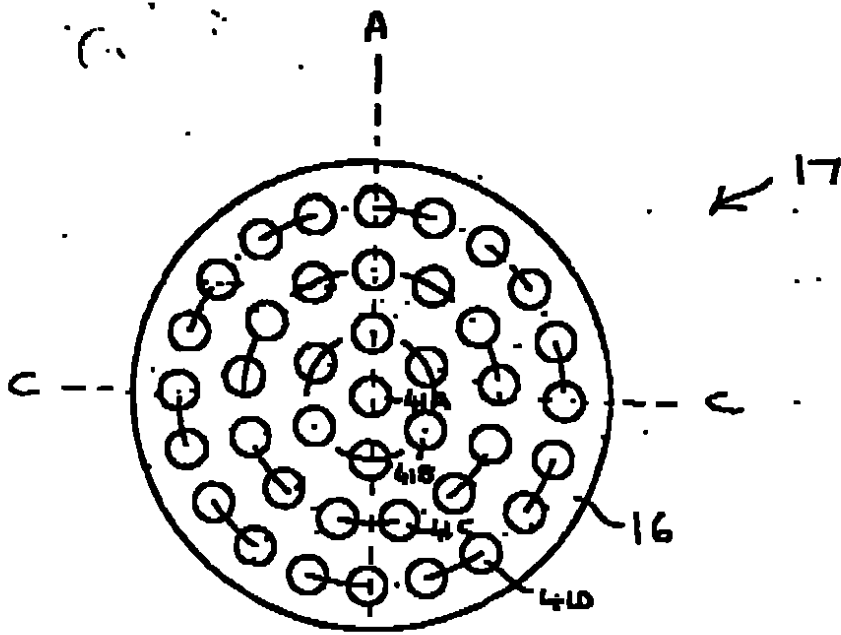


Fig. 4

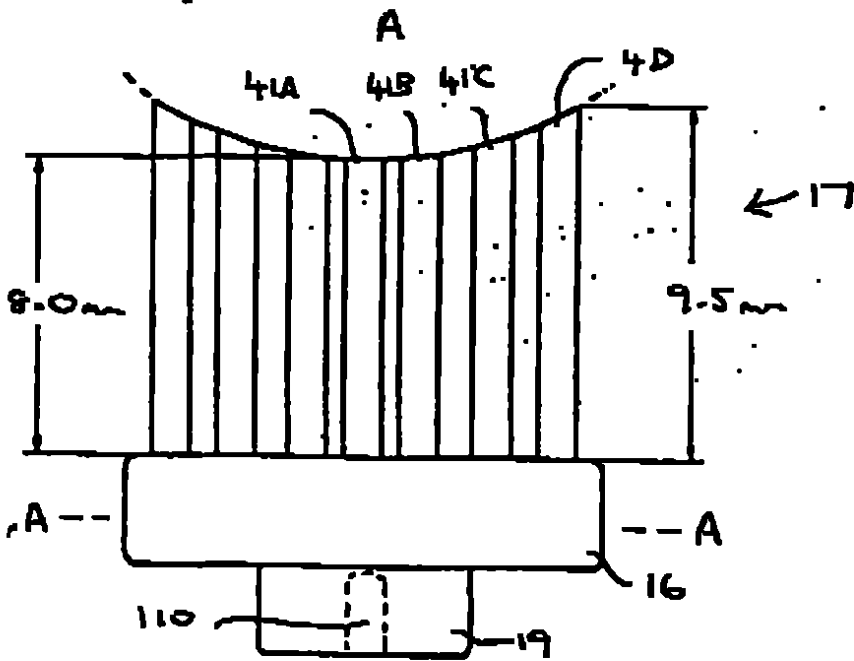


Fig. 5A

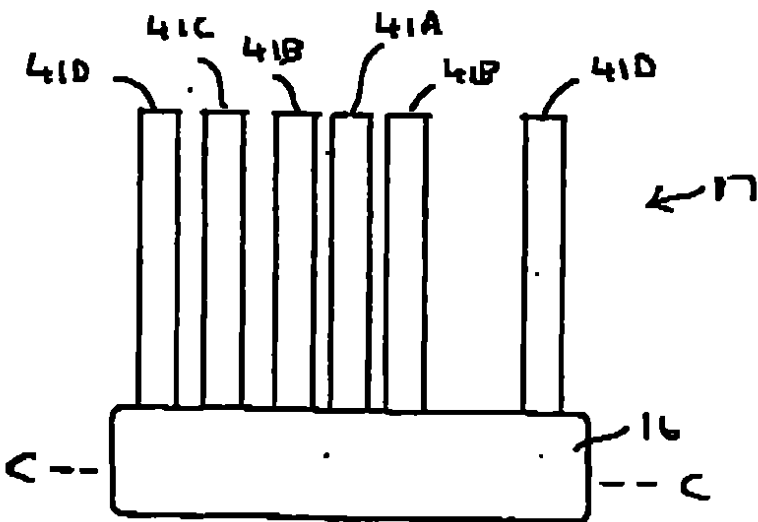
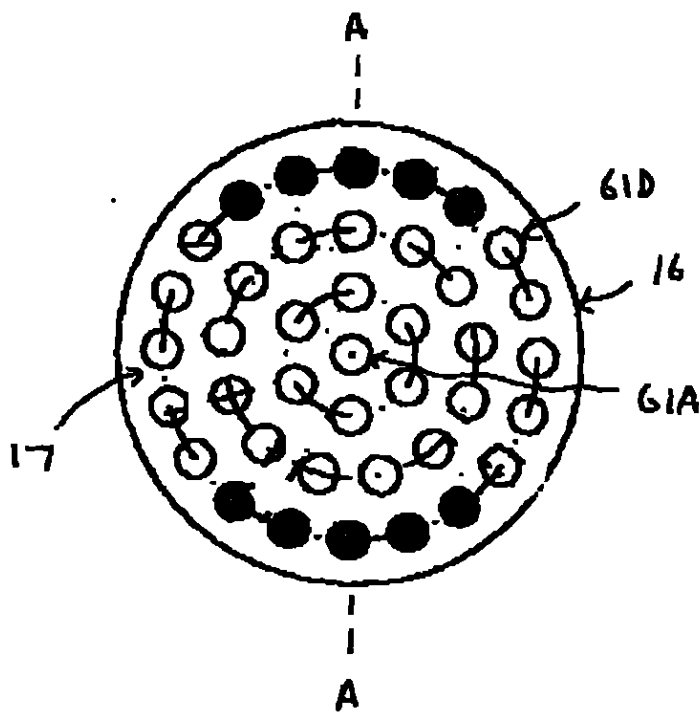
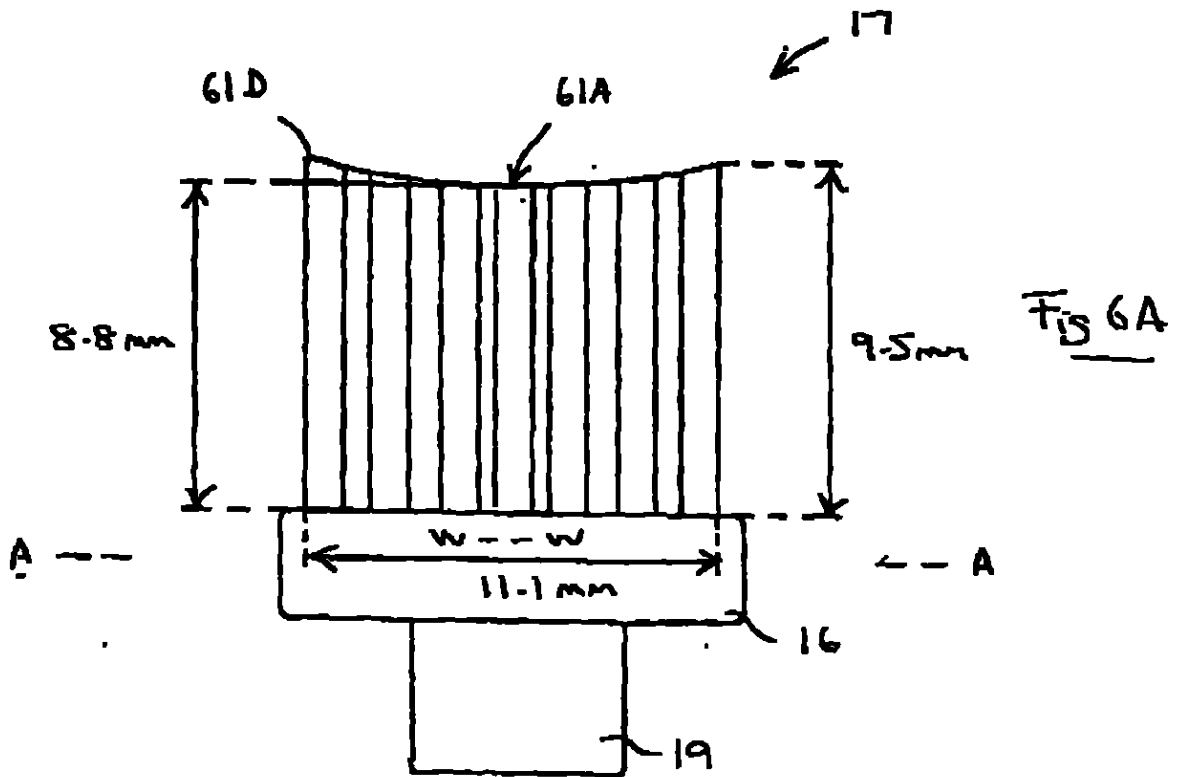


Fig. 5B

Fig. 6



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OFICINA DE PATENTES

SOLICITUD DE PATENTE

1. Su referencia: **RFW/EB/C70443**

2. Solicitud No. **0012574.0** **24 de mayo de 2000**

3. Nombre completo y código postal de cada solicitante:

Dirección: **SmithKline Beecham GmbH & Co KG.
Hermannstrasse 7, D-77815 Buhl/Baden,
Alemania.**

No. APD 7904782001

Si el solicitante es una entidad, indique el país/estado de constitución:

Alemania

4. **TITULO DE LA INVENCION:**

CEPILLO DE DIENTES

5. **NOMBRE DE SU AGENTE:**

Nombre del Agente: **CORPORATE INTELLECTUAL PROPERTY**

Dirección para notificaciones: **SMITHKLINE BEECHAM PLC
TWO NEW HORIZONS COURT
BRENTFORD
MIDDLESEX TW8 9EP**

NO. ADP Patentes 5800974004

6. **N/A**

7. **N/A**

8. **N/A**

0012574.0 - abr 01

3

9. Número de hojas radicadas (En inglés). Descripción: 09 Reivindicaciones: 1

Resumen : - Dibujos: -4

10. Solicitud de examen preliminar y búsqueda:

11. Solicitamos se nos adjudique una patente con base en esta solicitud.

R F Walker

24 de mayo de 2000

12. Nombre y teléfono del contacto en el Reino Unido Nombre y teléfono del contacto en el Reino Unido (FIRMA) R F Walker 020 8975 6336

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91

LEGALIZACIONES

OFICINA DE PATENTES

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

El suscrito, un funcionario debidamente autorizado conforme a los Artículos 74(1) y (4) de la Ley de Desreglamentación y Contratación de 1994 para firmar y expedir certificados en nombre del Contralor General, certifico que la copia adjunta es una copia correcta de los documentos archivados originalmente con respecto a la solicitud de patente que allí se identifica.

De acuerdo con las Reglamentaciones de Patentes de 1982 (Re-registro de Compañías), si una compañía nombrada en este certificado y en los documentos adjuntos se ha vuelto a registrar según la Ley de Compañías de 1980 con el mismo nombre con el que fue registrada inmediatamente antes del re-registro, salvo la sustitución o inclusión como la última parte del nombre de las palabras "sociedad anónima" o su equivalente en galés, las referencias al nombre de la compañía y sus documentos adjuntos serán tratadas como referencias al nombre con el cual fue re-registrada.

De acuerdo con las reglas, las palabras "sociedad anónima" (o en inglés *public limited company*) pueden ser reemplazadas por las letras p.l.c, plc. P.L.C ó PLC.

El re-registro bajo la Ley de Compañías no constituye una nueva entidad legal sino simplemente somete a la compañía a ciertas normas de ley adicionales.

(FIRMA) (K.A. RICHARDS)

FECHA: 15 de febrero de 2001

(SELLO DE LACRE)

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CEPILLO DE DIENTES

REVINDICACIONES:

1. Se provee una parte de cepillo para un cepillo de dientes eléctrico, que comprende un soporte para cerdas con un conjunto de cerdas montado sobre el mismo y que por lo general, se extiende en dirección de las cerdas; el soporte de las cerdas se conecta a una empuñadura del cepillo que contiene un motor y que puede ser accionado de manera giratoria por el motor cuando está conectada al mismo alrededor de un eje de rotación generalmente transversal a un eje entre la parte del cepillo y la empuñadura, caracterizada en que:

los extremos de las cerdas distantes del soporte de las cerdas quedan en una superficie sustancialmente cilíndrica de la parte, la longitud del eje del cilindro está orientada sustancialmente perpendicular en dirección a las cerdas.

2. Una parte de un cepillo según la reivindicación 1, en donde la curva de la sección transversal de la superficie cilíndrica de la parte es tal que la diferencia en longitud entre las cerdas en el centro del conjunto y el borde del conjunto es entre 0,2 y 0,01 de ancho del conjunto a través del eje cilíndrico longitudinal.

3. Una parte de un cepillo según la reivindicación 2, en donde la diferencia en longitud es entre 0,05 y 0,08 del ancho.

4. Una parte de un cepillo según la reivindicación 3, en donde la diferencia en longitud es entre 0,06 y 0,07 del ancho.

5. Un cepillo eléctrico que tiene una parte del cepillo según la reivindicación 1.

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INVESTOR IN PEOPLE

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The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed

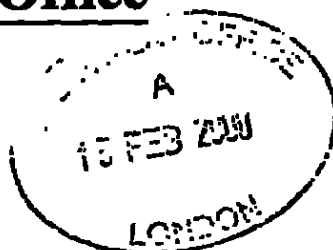
Dated 15 February 2001

An Executive Agency of the Department of Trade and Industry

35

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)



The Patent Office
Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference

RFW/EB/C70421

2. Patent application number

(The Patent Office will fill in this part)

0003514.7

15 FEB 2000

3. Full name, address and postcode of the or of each applicant (underline all surnames)

SmithKline Beecham GmbH & Co KG
Hermannstrasse 7, D-77815 Buhl/Baden, , Germany

Patents ADP number (if you know it) 72165/8002

German

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention

Toothbrush

5. Name of your agent (if you have one)

CORPORATE INTELLECTUAL PROPERTY

"Address for service" in the United Kingdom to which all correspondence should be sent
(including the postcode)

SMITHKLINE BEECHAM PLC
TWO NEW HORIZONS COURT
BRENTFORD
MIDDLESEX TW8 9EP

Patents ADP number (if you know it) 5800974004

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and (if you know it) the or each application number

Country Priority application number Date of filing
(if you know it) (day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer yes if:

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is named as an applicant, or
- c) any named applicant is a corporate body

See note (d)

36

9. Enter the number of sheets for any of the following items you are filing with this form.
Do not count copies of the same document

Continuation sheets of this form

Description

9

Claim(s)

3

Abstract

3

Drawings

3

10. If you are also filing any of the following, state how many against each item.

Priority Documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 1/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11.

We request the grant of a patent on the basis of this application

Signature

R F Walker

Date 14-Feb-00

12. Name and daytime telephone number of person to contact in the United Kingdom

R F Walker 020 8975 6336

Warning

After an application for a Patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission unless an application has been filed at least six weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505
- Write your answers in capital letters using black ink or you may type them.
- If there is not enough space for all relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered 'Yes' Patents Form 7/77 will need to be filed.
- For details of the fee and ways to pay please contact the Patent Office.

Toothbrush

This invention relates to toothbrushes, in particular to brush parts for electric toothbrushes.

Electric toothbrushes generally have a head which incorporates a brush part
5 which includes a cluster of bristles mounted in a bristle holder, and an electric drive motor located in the brush handle which drives the bristle holder so as to move the bristles in a way which cleans the teeth when the moving bristles are applied to the teeth. A common construction is a holder which is arranged to be rotatable about an axis substantially parallel to the direction of the bristles and passing through the
10 centre of the cluster of bristles.

Such constructions are for example disclosed in US 5,652,916 and US 4,479,516. Such rotary motion can be oscillatory about this axis, and it is known to move this axis around a conical surface, e.g. in US 5,862,558. It is also known for example from US 5,577,285 for the bristle holder to perform an alternating
15 oscillatory rotary motion and a reciprocal up and down motion in the direction of its axis of rotation, being parallel to the bristle direction. Various configurations of bristles, in terms of their cluster in plan as viewed along the bristle direction, are known for use in electric toothbrushes, ranging from simple rings or series of concentric rings of tufts of bristles, to more elaborate configurations. Some such
20 configurations are for example disclosed in US 5,625,916, WO 97/01307, US 5,652,990, US 5,467,495, WO 98/26730, and WO 99/03372.

It is an object of this invention to provide an improved brush part suitable for an electric toothbrush. Other objects and advantages of the invention will be apparent from the following description.

25 According to this invention a brush part for an electric toothbrush is provided, comprising a bristle holder having a cluster of bristles mounted thereon and extending generally in a bristle direction, the bristle holder being connectable to a toothbrush handle containing an electric drive motor and capable of being rotatably driven by the drive motor when connected thereto about a rotation axis
30 generally transverse to an axis between the brush part and the handle, characterised in that:

the ends of the bristles remote from the bristle holder lie in a substantially part-cylindrical surface, the length axis of the cylinder being oriented substantially perpendicular to the bristle direction.

The term "cylindrical" as used herein includes true cylinders i.e. a shape
 5 having straight longitudinal sides and a circular cross section, with the longitudinal axis of the cylinder passing through the centre of the circular section. The term also includes distorted cylinders, e.g. shapes with convex bulging longitudinal sides e.g. "barrel" shapes, and shapes with concave sides, i.e. wider at the cylinder ends than at a waist partway between the ends, provided however that the radius of curvature
 10 of the convex or concave sides is greater than the radius of curvature of the cross section shape. Also the term "cylinder" includes such shapes with oval or oblate circular, or polygonal, including polygonal with rounded corners or sides, cross section. A part true cylindrical surface is preferred.

Preferably the central longitudinal axis of the cylinder passes through a
 15 constructed axis aligned in the bristle direction and passing through the centre of the bristle cluster.

Suitably the curve of the cross section of the part cylindrical surface is such that the ratio of the difference in length (i.e. from the surface of the holder) between the bristles at the centre of the cluster and the edge of the cluster : width of the
 20 cluster across the longitudinal cylindrical axis is in the range 1 : 5 to 1 : 10, suitably in the range 1 : 7 to 1 : 8, for example ca. 1 : 7.5.

A typical width for the cluster of the brush part of this invention is ca. 10 - 12.5mm measured perpendicular to the bristle direction. With such a width a suitable radius of curvature of the cross section of the cylindrical surface is ca. 8 -
 25 12 mm, e.g. 10 - 11 mm.

Typically the part cylindrical surface may comprise ca. 50 - 75° of the 360° complete circle of the circular cross section of a cylinder, preferably ca. 60 - 70°, for example ca. 65°.

It is preferred that if the bristles are disposed in discrete tufts, e.g. of
 30 circular cross section as defined by mounting holes in the holder into which the tufts are fitted, the ends of the bristles remote from the holder in a tuft follow the said part cylindrical shape, e.g. these ends may be cut to follow this shape. Alternatively

but less preferred these ends may be cut perpendicular to the bristle direction, e.g. parallel to the face of the holder from which the bristles project, so that these ends follow the part cylindrical surface only in a stepwise manner.

In a second aspect of this invention it has unexpectedly been discovered that
5 the use of bristles longer than the commonly used 8 - 8.5 mm provides an advantageous tooth cleaning effect. Possibly this is due to the greater flexibility of such longer bristles.

Therefore the invention further provides a brush part for an electric toothbrush, comprising a bristle holder having a cluster of bristles mounted thereon
10 and extending generally in a bristle direction, the bristle holder being connectable to a toothbrush handle containing an electric drive motor and capable of being rotatably driven by the drive motor when connected thereto about a rotation axis capable of being rotatably driven by the drive motor when connected thereto about a rotation axis generally transverse to an axis between the brush part and the handle,
15 characterised in that the bristles extend from the holder, i.e. have a length, of 9.0 mm or greater, e.g. up to 10mm, suitably ca. 9.5mm. Such longer bristles may be provided on the holder together with shorter bristles, i.e. of a length less than 9.0mm, e.g. 8.0 - 8.5mm. Suitably such longer bristles may be provided at the edge of a bristle cluster, with shorter bristles in the inner region, e.g. at the centre of the
20 cluster.

For example in the brush part of the first aspect of this invention the longer bristles at the edge of the cluster may have a length 9.0 - 10.0mm, e.g. ca 9.5mm, and shorter bristles at the centre of the cluster and/or across the centre of the cluster in the cylindrical longitudinal axis direction may have a length 8.0 - 9.0mm, e.g.
25 8.0 - 8.5 mm. Typically therefore in the brush part of the invention the difference in length between longest and shortest bristles may be 1.0 - 2.0mm, e.g. ca. 1.5mm. A typical width for the cluster of the invention is again ca. 10 - 12.5mm measured perpendicular to the bristle direction. Preferably the ends of the bristles of this second aspect of the invention are provided in a part circular surface as in the
30 first aspect of the invention.

The brush part of this invention appears to be suitable for use with most known bristle patterns, i.e. the arrangement of bristles in plan on the holder as

viewed down the bristle direction. For example the bristles may be disposed in discrete tufts arranged in concentric rings of tufts or polygons with a tuft at each angle of the polygon, optionally with a single tuft at the centre of the pattern.

One preferred pattern comprises three concentric polygons of tufts, being an
 5 inner triangle (preferably equilateral) of tufts surrounded by a first, preferably regular, polygon of 7 to 9, preferably 8 tufts, which is surrounded by a second, preferably regular, polygon of 12 to 16 tufts, preferably 14 tufts. The pattern is preferably symmetrical about the width of the pattern, particularly about the longitudinal axis of the part cylindrical surface.

10 Another preferred pattern comprises a single tuft at the centre of the pattern, a first, preferably regular, polygon of 5 to 7, preferably 6, tufts surrounding this central tuft, a second, preferably regular, polygon of 12 to 14, preferably 13, tufts surrounding the first polygon, and a third, preferably regular, polygon of 18 to 22, preferably 20 tufts surrounding this second polygon. The pattern is again preferably
 15 symmetrical about the width of the pattern, particularly about the longitudinal axis of the part cylindrical surface.

The brush part of this invention appears to be suitable for all electric toothbrushes in which the bristle holder is mounted for and moveable in rotary motion about an axis transverse to, preferably substantially perpendicular to, the
 20 longitudinal head - handle axis of the toothbrush, substantially parallel to the bristle direction, and passing through or close to the centre of the bristle pattern. Preferably the rotary motion is oscillatory, i.e. involving rotation through an angle in one rotary direction, alternating with rotation through substantially the same angle in the opposite rotational direction. Preferably this rotary motion is combined
 25 with reciprocal motion of the bristles along the bristle direction, i.e. up and down the bristle direction. For example the motion of the bristle holder, combining such oscillatory rotary and reciprocal motion, may be reciprocally helical. Suitable drive mechanisms to drive the bristle holder in this way are known, for example in US 5, 577, 285 and the drive speeds, amplitudes, and oscillation frequencies, e.g. ca.
 30 3000- 6000 rpm achievable by means of such known drive mechanisms are believed to be suitable for the brush part of the present invention.

Therefore the invention further provides an electric toothbrush having a brush part as described above. For example the brush part of this invention may be connectable, preferably replaceably connectable, to a toothbrush handle containing an electric drive motor. For this purpose the brush part suitably comprises part of a toothbrush head which is itself provided with connection means by which the brush part may be connected to the handle and to the motor. The brush part may for example be rotatably mounted on the toothbrush head, for example by known means, such as an axle mounting, many types of which are known. The connection means may comprise a hollow neck part extending longitudinally between the head and the handle and enclosing a drive shaft by which the motor can drive the brush part via suitable transmission means. The neck part may itself be connectable, preferably replaceably, at its end remote from the head, to the handle in a manner which also connects the drive shaft to the motor. Alternatively the head may itself be connectable, preferably replaceably, to the neck part at its end remote from the handle, to the neck part in a manner which also connects the drive shaft to the brush part. Many means by which the motor can drive the shaft and the shaft drive the brush part are known.

Generally an electric toothbrush is an elongate structure which comprises a head (including the brush part) and handle disposed along a head - handle axis being the length of the toothbrush, and for example if the bristle holder performs oscillatory rotary motion the longitudinal axis of the part cylindrical surface may oscillate about a mean alignment perpendicular to the length of the electric toothbrush.

The toothbrush bristle holder and the bristles themselves of the brush part of this invention may be made of materials which are conventional in the field of electric toothbrush manufacture, e.g. respectively of plastics materials and nylon fibres. The plastics material parts of the bristle holder and other plastics material parts of the toothbrush may be made by an injection moulding process, and accordingly the invention further provides a process for making a toothbrush as described herein, comprising injection moulding of plastics material. Further the invention provides an injection mould suitable for use in such a process. The

invention will now be described by way of example only with reference to the accompanying drawings in which:

Fig. 1 Shows the overall layout of an electric toothbrush of this invention.

Fig. 2 Shows a plan view of the brush part of the toothbrush of Fig. 1

5 Fig. 3 Shows a side view of and a cross section through the bristle holder and bristle cluster of the brush part of Fig. 2.

Fig. 4 Shows a plan view of another brush part of the toothbrush of Fig. 1.

Fig. 5 Shows a side view of and a cross section through the bristle holder and bristle cluster of the brush part of Fig. 4

10 Referring to Fig. 1 an electric toothbrush is shown overall in side view 10.

The toothbrush 10 comprises a handle 11 by which it may be held, and which includes a drive motor, batteries, controls etc. (not shown). The handle 11 is replaceably connected at link 12, suitably a bayonet connection, to a replaceable section 13 including a head 14 at the end of the section 13 remote from handle 11
15 and a neck part 15. The assembly of handle 11 replaceable section 13 and head 14 are disposed along the length direction A--A of the toothbrush 10. In the head 14 is mounted a brush part comprising a bristle holder 16, from which a cluster of bristles 17 extend in a general bristle direction B--B generally perpendicular to length A--A. The holder 16 is driven by the motor (not shown) via drive shaft 18
20 (shown generally) extending along inside the neck part 15. The bristle holder 16 is mounted on an axle (not shown) in head 14 for oscillatory rotation about an axis passing through the centre of the bristle cluster 17 and parallel to the bristle direction B--B and for simultaneous reciprocal movement up and down this axis as shown by the arrows.

25 In use the holder 16 performs simultaneously an oscillatory, i.e. reversing, rotary motion about an axis of rotation parallel to bristle direction B--B and passing through the centre in plan of the cluster of bristles 17, and a reciprocal motion up and down along the bristle direction B--B. The amplitude of the oscillatory rotary motion is ca. 30° either side of a mean position, and the amplitude of the reciprocal
30 motion is ca. 1.0mm. Numerous drive mechanisms are known in the art to achieve such motion.

Referring to Fig. 2, a plan view of the bristle cluster 17 is shown, looking down onto the holder 16 in the bristle direction B--B. The orientation of the toothbrush length direction A--A is shown. The bristles 17 are disposed in discrete circular section tufts 21, each ca. 1.4mm diameter, set in corresponding mounting holes (not shown) in a conventional manner in the holder 16, which is circular in plan, and rotatable about an axis passing through its centre. The tufts 21 are arranged in a pattern comprising an innermost equilateral triangle of tufts 21A, surrounded by a regular octagon of tufts 21B, which is in turn surrounded by an outermost regular polygon of 14 tufts 21C. The pattern is symmetrical about an axis C--C, which is perpendicular across the brush length A--A, and which passes through an apex of the triangle of tufts 21A and the outer polygon of tufts 21C, and through a side of the octagon of tufts 21B. As will be more clearly seen in Fig. 3 the ends of the tufts 21 remote from the holder 16 lie in a cylindrical surface with the length axis of the cylinder being aligned in the direction C--C.

Referring to Fig. 3 a side view of the bristle cluster 17 of Fig. 2 is shown in Fig. 3A, looking in the direction C--C across the length A--A of the toothbrush 10, and Fig. 3B shows a cross section through the cluster 17 looking along the length direction A--A and across the direction C--C of the toothbrush 10.

From Figs. 3A and 3B it is seen that the ends of the bristles 17 remote from the holder 16 lie in a cylindrical surface. Fig. 3A shows the ends of the bristles 17 following the arc of the part circular cross section of the cylindrical surface, the ends of the tufts being profiled, e.g. cut to follow this arc. In Fig. 3B it is seen that the ends of the bristles lie along the straight line of the length axis of the cylindrical surface. Sections through the cluster 17 along other lines, e.g. C'--C', parallel to the direction C--C, i.e. also along the length direction of the cylindrical surface would also show the ends of the bristles of the cluster 17 lying in a straight line. The minimum height of the tufts 21A of the central triangle is ca. 8.0 mm, and the maximum height of the tufts 21C, i.e. at their outer edge, is ca. 9.5 mm as shown in Fig. 3A. The width of the cluster 17, i.e. the dimension between opposite outermost surfaces of the tufts 21C, is ca. 11.0mm. Therefore the ratio of the difference in length (i.e. from the surface of the holder) between the bristles at the centre of the cluster and the edge of the cluster : width of the cluster across the

longitudinal cylindrical axis is ca. 1 : 7.5. From these dimensions the radius of curvature of the arc of the part cylindrical surface can also be calculated, being in one example ca. 10.5 mm. The arc of the part-cylindrical surface in which the ends of the bristles 21 lie as shown in Fig 3A occupies ca. 65° of the 360° complete circle of the circular cross section shown of the part cylindrical surface.

Fig 3A also shows generally a transmission part 19 containing an axle hole 110 by which the holder 16 may be mounted for the above mentioned oscillatory rotation and reciprocal motion in head 14 on a pin axle (not shown).

Referring to Fig. 4, a plan view of another bristle cluster 17 is shown, again looking down onto the holder 16 in the bristle direction B—B. The orientation of the toothbrush length direction A—A is again shown. The bristles 16 are again disposed in discrete circular section tufts 41, each ca. 0.7mm diameter, set in corresponding mounting holes (not shown) in a conventional manner in the holder 16, which is circular in plan, and rotatable about an axis passing through its centre. As shown in Fig. 4 the pattern comprises a single tuft 41A at the centre of the pattern, a first regular hexagon of 6 tufts 41B surrounding this central tuft, a second polygon of 13 tufts 41C surrounding the hexagon 41B, and a third polygon of 20 tufts 41D surrounding this second polygon 41C. The pattern is again symmetrical about an axis C—C, which is perpendicular to the brush length A—A. As will be more clearly seen in Fig. 5 the ends of the tufts 41 remote from the holder 16 lie in a cylindrical surface with the length axis of the cylinder being aligned in the direction C—C.

Referring to Fig. 5 a side view of the bristle cluster 17 of Fig. 4 is shown in Fig. 5A, looking in the direction C—C across the length A—A of the toothbrush 10, and Fig. 5B shows a cross section through the cluster 17 along the direction A—A across the direction C—C of the toothbrush 10.

From Figs. 5A and 5B it is seen that the ends of the bristles 16 remote from the holder 16 lie in a cylindrical surface. Fig. 5A shows the ends of the bristles 16 following the arc of the part circular cross section of the cylindrical surface, the ends of the tufts being profiled to follow this arc. In Fig. 5A the shortest tuft is the central tuft 41A, with a maximum length of 8.0mm, and the longest tufts are those 41D of the outer polygon, having a maximum length of 9.5mm. The width of the

cluster 17, i.e. the dimension between opposite outermost surfaces of the tufts 41D is ca. 11.0mm, and the curvature of the arc of the cylindrical surface can be calculated from this, again in one example being ca. 10.5 mm. In Fig. 5B it is seen that the ends of the bristles lie along the straight line of the length axis of the
5 cylindrical surface. Sections through the cluster 17 along other lines, e.g. C"-C", parallel to the direction C-C, i.e. also along the length direction of the cylindrical surface would also show the ends of the bristles of the cluster 17 lying in a straight line. The arc of the part-cylindrical surface in which the ends of the bristles 21 lie as shown in Fig 5A occupies ca. 65° of the 360° complete circle of the circular
10 cross section shown of the part cylindrical surface.

Fig 5A also shows generally a transmission part 19 containing an axle hole 110 by which the holder 16 may be mounted for the above mentioned oscillatory rotation and reciprocal motion in head 14 on a pin axle (not shown).

Claims.

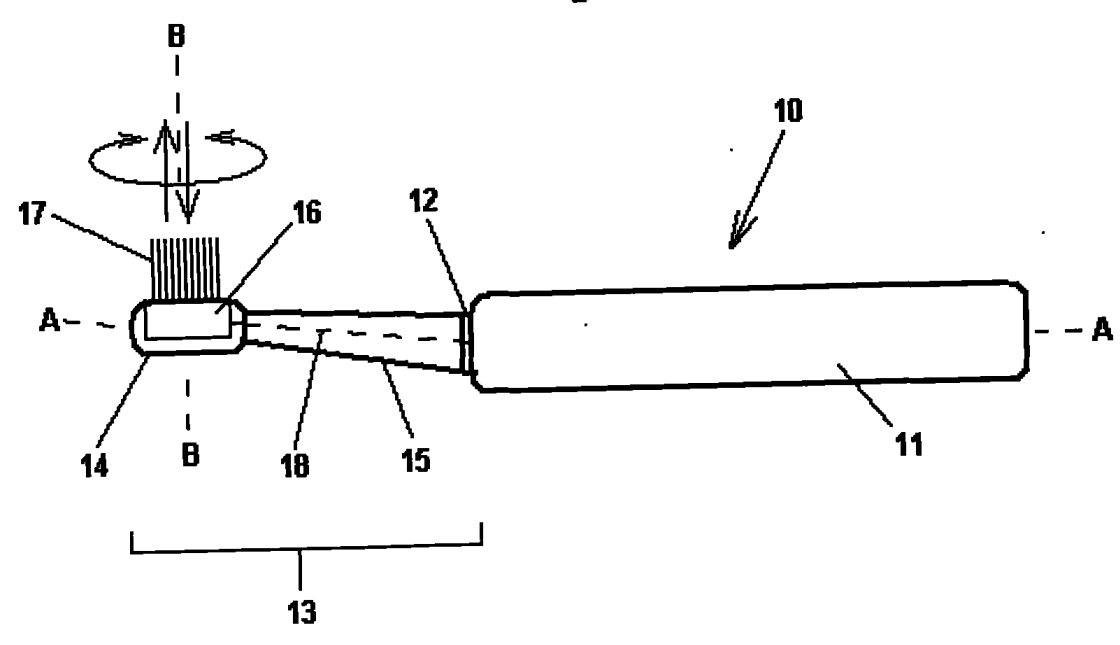
1. A brush part for an electric toothbrush is provided, comprising a bristle holder having a cluster of bristles mounted thereon and extending generally in a
5 bristle direction, the bristle holder being connectable to a toothbrush handle containing an electric drive motor and capable of being rotatably driven by the drive motor when connected thereto about a rotation axis generally transverse to an axis between the brush part and the handle, characterised in that:
the ends of the bristles remote from the bristle holder lie in a substantially
10 part-cylindrical surface, the length axis of the cylinder being oriented substantially perpendicular to the bristle direction.
2. A brush part according to claim 1 characterised in that the central longitudinal axis of the cylinder passes through a constructed axis aligned in the
15 bristle direction and passing through the centre of the bristle cluster.
3. A brush part according to claim 1 or claim 2 characterised in that the curve of the cross section of the part cylindrical surface is such that the ratio of the difference in length from the surface of the holder between the bristles at the centre
20 of the cluster and the edge of the cluster : width of the cluster across the longitudinal cylindrical axis is in the range 1 : 5 to 1 : 10.
4. A brush part according to claim 1, 2 or 3 characterised in that the part cylindrical surface comprises ca. 50 - 75° of the 360° complete circle of the
25 circular cross section of a cylinder.
5. A brush part according to any preceding claim characterised in that the bristles are disposed in discrete tufts, and the ends of the bristles remote from the holder in a tuft are cut to follow the part cylindrical shape.

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6. A brush part according to any preceding claim characterised in that the bristles are disposed in discrete tufts arranged in concentric rings, or polygons with a tuft at each angle of the polygon.
- 5 7. A brush part according to claim 6 characterised in that the bristles are disposed in a pattern which comprises three concentric polygons of tufts, being an inner triangle of tufts surrounded by a first polygon of 7 to 9 tufts, which is surrounded by a second polygon of 12 to 16 tufts.
- 10 8. A brush part according to claim 6 characterised in that the bristles are disposed in a pattern which comprises a single tuft at the centre of the pattern, a first polygon of 5 to 7 tufts surrounding this central tuft, a second polygon of 12 to 14 tufts surrounding the first polygon, and a third polygon of 18 to 22 tufts surrounding this second polygon.
- 15 9. A brush part according to claim 6, 7 or 8 characterised in that the pattern is symmetrical about the longitudinal axis of the part cylindrical surface.
- 20 10. A brush part according to any preceding claim characterised in that the brush part is mounted for and moveable in rotary motion about an axis substantially perpendicular to the longitudinal head - handle axis of the toothbrush, substantially parallel to the bristle direction, and passing through or close to the centre of the bristle pattern.
- 25 11. A brush part according to claim 10 characterised in that the rotary motion is oscillatory involving rotation through an angle in one rotary direction, alternating with rotation through the same angle in the opposite rotational direction.
- 30 12. A brush part according to claim 10 or 11 characterised in that the rotary motion is combined with reciprocal motion of the bristles along the bristle direction, up and down the bristle direction.

13. A brush part for an electric toothbrush, comprising a bristle holder having a cluster of bristles mounted thereon and extending generally in a bristle direction, the bristle holder being connectable to a toothbrush handle containing an electric drive motor and capable of being rotatably driven by the drive motor when connected thereto about a rotation axis generally transverse to an axis between the brush part and the handle, characterised in that the bristles extend from the holder 9.0 mm or greater.
14. A brush part according to claim 13 characterised in that the bristles provided on the holder together with bristles of a length less than 9.0mm.
15. A brush part according to claim 14 characterised in that the longer bristles are provided at the edge of a bristle cluster, with shorter bristles in the inner region of the cluster.
16. An electric toothbrush having a brush part according to any preceding claim.
17. An electric toothbrush according to claim 16 characterised in that the bristle holder is mounted to perform oscillatory rotary motion such that the longitudinal axis of the part cylindrical surface oscillates about a mean alignment perpendicular to the length of the electric toothbrush.

Fig. 1



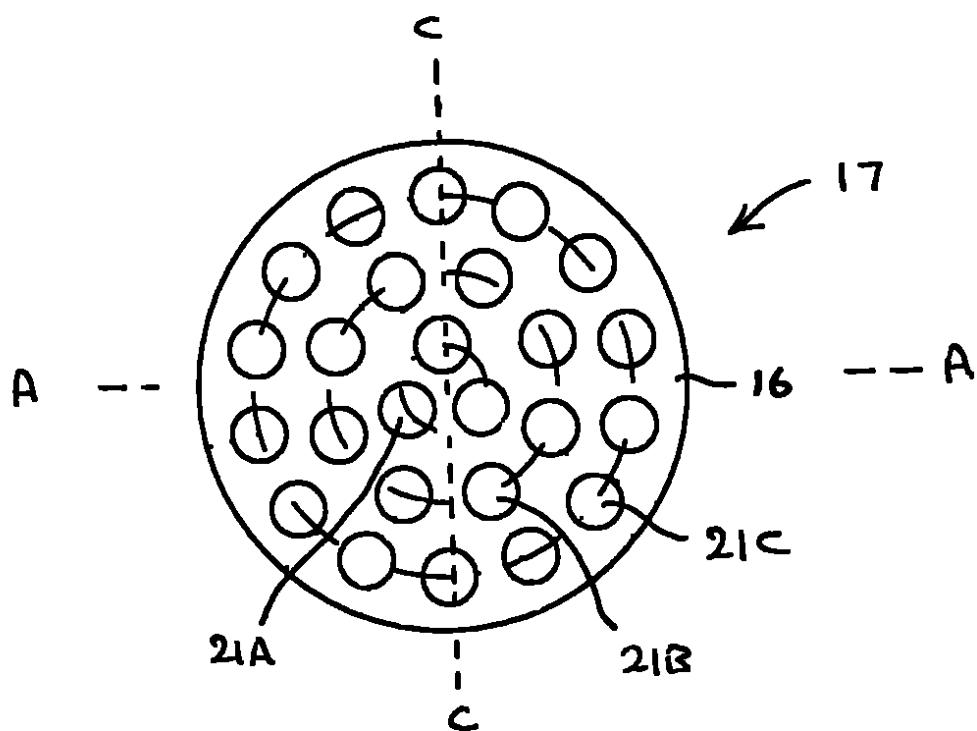


Fig 2

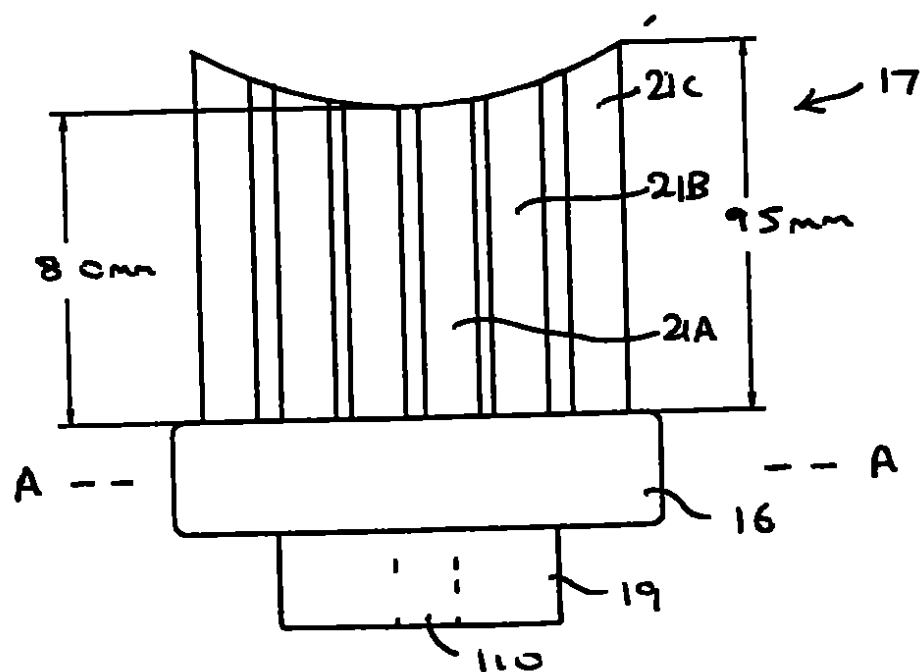


Fig 3A

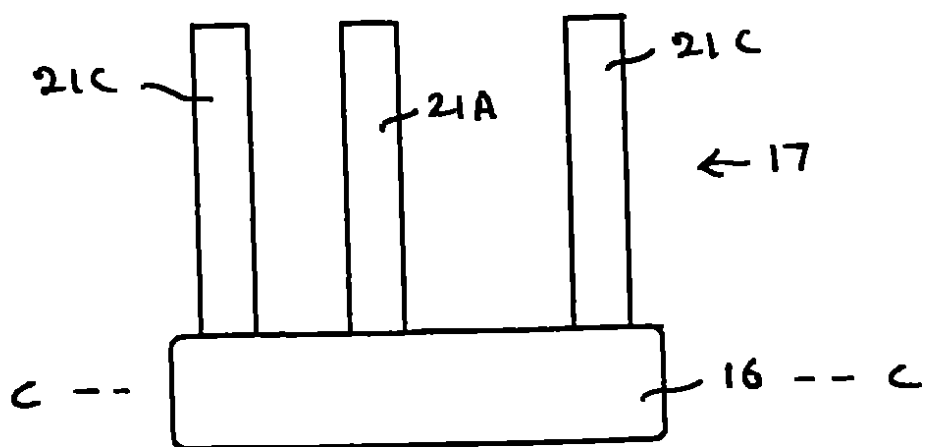


Fig 3B

ucp

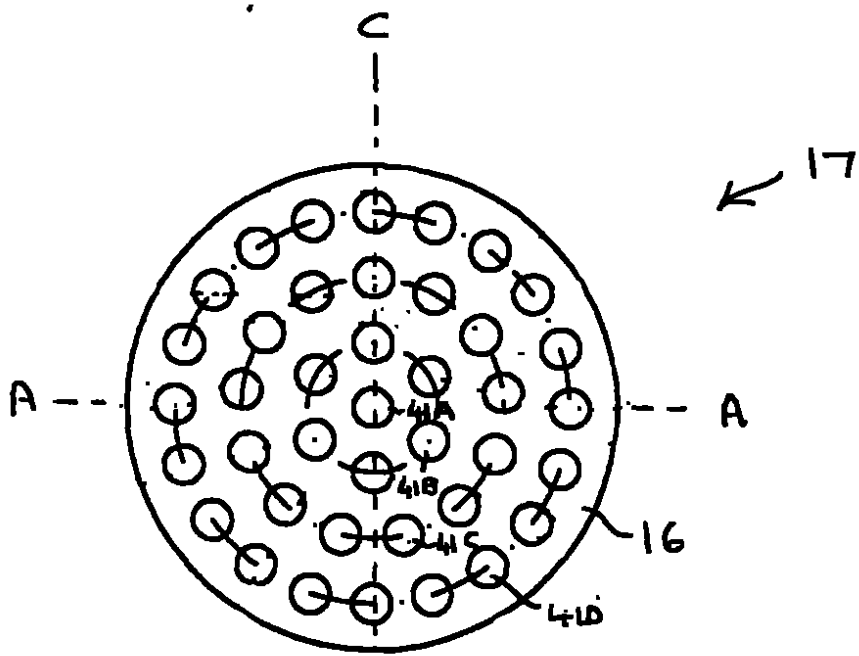


Fig. 4

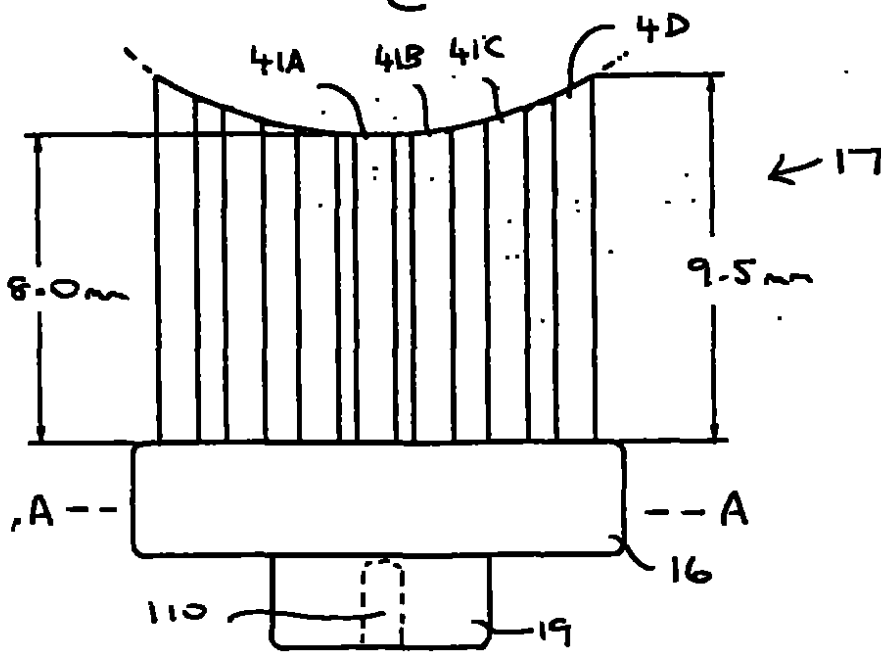


Fig. 5A

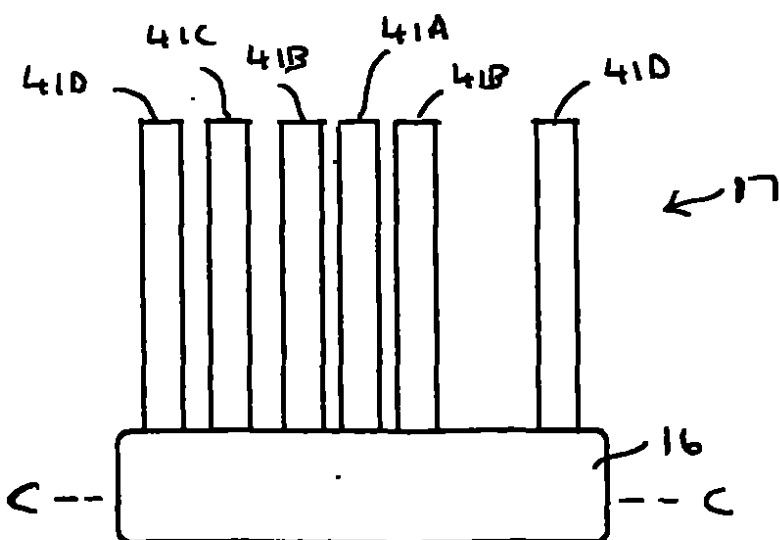


Fig. 5B

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OFICINA DE PATENTES

SOLICITUD DE PATENTE

1. Su referencia: **RFW/EB/C70445**

2. Solicitud No. **0003514.7** **15 de febrero de 2000**

3. Nombre completo y código postal de cada solicitante:

Dirección: **SmithKline Beecham GmbH & Co KG,
Hermannstrasse 7, D-77815 Buhl/Baden,
Alemania.**

No. APD 7216518002

Si el solicitante es una entidad, indique el país/estado de constitución:

Alemania

4. **TITULO DE LA INVENCION:**

CEPILLO DE DIENTES

5. **NOMBRE DE SU AGENTE:**

Nombre del Agente: **CORPORATE INTELLECTUAL PROPERTY**

Dirección para notificaciones: **SMITHKLINE BEECHAM PLC
TWO NEW HORIZONS COURT
BRENTFORD
MIDDLESEX TW8 9EP**

NO. ADP Patentes 5800974004

6. **N/A**

7. **N/A**

8. **N/A**

0003514.7 - abr 01

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105

9. Número de hojas radicadas (En inglés). Descripción: 09 Reivindicaciones: 3

Resumen : - Dibujos: -4

10. Solicitud de examen preliminar y búsqueda:

11. Solicitamos se nos adjudique una patente con base en esta solicitud.

R F Walker

14 de febrero de 2000

12. Nombre y teléfono del contacto en el Reino Unido Nombre y teléfono del contacto en el Reino Unido (FIRMA) R F Walker 020 8975 6336

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LEGALIZACIONES

OFICINA DE PATENTES

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Cardiff Road
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El suscrito, un funcionario debidamente autorizado conforme a los Artículos 74(1) y (4) de la Ley de Desreglamentación y Contratación de 1994 para firmar y expedir certificados en nombre del Contralor General, certifico que la copia adjunta es una copia correcta de los documentos archivados originalmente con respecto a la solicitud de patente que allí se identifica.

De acuerdo con las Reglamentaciones de Patentes de 1982 (Re-registro de Compañías), si una compañía nombrada en este certificado y en los documentos adjuntos se ha vuelto a registrar según la Ley de Compañías de 1980 con el mismo nombre con el que fue registrada inmediatamente antes del re-registro, salvo la sustitución o inclusión como la última parte del nombre de las palabras "sociedad anónima" o su equivalente en galés, las referencias al nombre de la compañía y sus documentos adjuntos serán tratadas como referencias al nombre con el cual fue re-registrada.

De acuerdo con las reglas, las palabras "sociedad anónima" (o en inglés *public limited company*) pueden ser reemplazadas por las letras p.l.c, plc. P.L.C ó PLC.

El re-registro bajo la Ley de Compañías no constituye una nueva entidad legal sino simplemente somete a la compañía a ciertas normas de ley adicionales.

(FIRMA) (K.A. RICHARDS)

FECHA: 15 de febrero de 2001

(SELLO DE LACRE)

CEPILLO DE DIENTES

REIVINDICACIONES:

1. Se provee una parte de cepillo para un cepillo de dientes eléctrico, que comprende un soporte para cerdas con un conjunto de cerdas montado sobre el mismo y que por lo general, se extiende en dirección de las cerdas; el soporte de las cerdas se conecta a una empuñadura del cepillo que contiene un motor y que puede ser accionado de manera giratoria por el motor cuando está conectada al mismo alrededor de un eje de rotación generalmente transversal a un eje entre la parte del cepillo y la empuñadura, caracterizada en que:

los extremos de las cerdas distantes del soporte de las cerdas quedan en una superficie sustancialmente parcialmente cilíndrica; la longitud del eje del cilindro está orientada sustancialmente perpendicular en dirección a las cerdas

2. Una parte de un cepillo según la reivindicación 1, caracterizada en que el eje longitudinal central del cilindro pasa a través de un eje construido alineado en dirección de las cerdas y pasa a través del centro del conjunto de las cerdas.

3. Una parte de un cepillo según la reivindicación 1 o 2, caracterizada en que la curva de la sección transversal de la superficie cilíndrica de la parte es tal que la relación de la diferencia en longitud desde la superficie de la empuñadura entre las cerdas en el centro del conjunto de las cerdas y el borde del conjunto: ancho del conjunto de cerdas a través del eje cilíndrico longitudinal es entre 1:5 y 1:10

4. Una parte de un cepillo según la reivindicación 1, 2 o 3, caracterizada en que la superficie cilíndrica de la parte comprende ca. 50 – 75° del círculo completo de 360° de la sección transversal circular de un cilindro.

5. Una parte de un cepillo según cualquiera de las reivindicaciones anteriores, caracterizada en que las cerdas están colocadas en crestas separadas y los

extremos de las cerdas distantes de la empuñadura en una cresta están cortadas para seguir la forma cilíndrica de la parte.

6. Una parte de un cepillo según cualquiera de las reivindicaciones anteriores, caracterizada en que las cerdas están colocadas en crestas separadas dispuestas en anillos concéntricos o polígonos, con una cresta en cada ángulo de polígono.

7. Una parte de un cepillo según la reivindicación 6, caracterizada en que las cerdas están colocadas en un patrón que comprende tres polígonos concéntricos de crestas, formando un triángulo interior de crestas rodeado por un primer polígono de 7 a 9 crestas, el cual está rodeado por un segundo polígono de 12 a 16 crestas.

8. Una parte de un cepillo según la reivindicación 6, caracterizado en que las cerdas están colocada en un patrón que comprende una sola cresta en el centro del patrón, un primer polígono de 5 a 7 crestas alrededor de esta cresta central, un segundo polígono de 12 a 14 cerdas alrededor del primer polígono, u un tercer polígono de 18 a 22 crestas alrededor de este segundo polígono.

9. Un parte de un cepillo según la reivindicación 6, 7 u 8, caracterizada en que el patrón es simétrico alrededor del eje longitudinal de la superficie cilíndrica de la parte.

10. Una parte de un cepillo según cualquiera de las reivindicaciones anteriores, caracterizado en que la parte del cepillo está montada y se mueve en movimiento rotatorio alrededor de un eje sustancialmente perpendicular de la cabeza longitudinal – eje de la empuñadura del cepillo, sustancialmente paralelo a la dirección de las cerdas, y pasa a través o cerca del centro del patrón de cerdas.

11. Una parte de un cepillo según la reivindicación 10, caracterizado en que el movimiento rotatorio es oscilatorio que implica rotación alrededor de un ángulo en una dirección rotatoria, alternando con rotación a través del mismo ángulo en dirección opuesta de rotación.

12. Una parte de un cepillo según la reivindicación 10 u 11, caracterizada en que el movimiento rotatorio es combinado con movimiento recíproco de las cerdas a lo largo de la dirección de las cerdas, hacia arriba y hacia abajo de la dirección de las cerdas.

13. Una parte de un cepillo de dientes eléctrico, que comprende un soporte para cerdas con un conjunto de cerdas montado sobre el mismo y que por lo general, se extiende en dirección de las cerdas; el soporte de las cerdas se conecta a una empuñadura del cepillo que contiene un motor y que puede ser accionada de manera giratoria por el motor cuando está conectada al mismo alrededor de un eje de rotación generalmente transversal a un eje entre la parte del cepillo y la empuñadura, caracterizada en que las cerdas se extienden 9,0 mm o más desde la empuñadura.

14. Una parte de un cepillo según la reivindicación 13, caracterizada en que las cerdas son provistas en el soporte junto con cerdas de una longitud menor de 9,0 mm.

15. Una parte de cepillo según la reivindicación 14, caracterizada en que las cerdas más largas se proveen en el borde del conjunto de cerdas, y las cerdas más cortas en la región interior del conjunto.

16. Un cepillo de dientes eléctrico que tiene una parte según cualquiera de las reivindicaciones anteriores.

17. Un cepillo de dientes eléctrico según la reivindicación 16, caracterizado en que el soporte de las cerdas está montado para hacer un movimiento oscilatorio rotatorio de modo que el eje longitudinal de la superficie cilíndrica de la parte oscile alrededor de una alineación media perpendicular a la longitud del cepillo de dientes eléctrico.