HYGIENIC NAIL BRUSH

A nail brush comprising: a handle section; a plurality of bristles, each of said bristles having an attached end, connected to said handle section, and a free end; each free end positioned, relative to its neighbours, to collectively define an envelope partially enclosing a volume; wherein said volume is structured to receive a portion of at least one human digit extending from a digit tip substantially to an eponychium of said digit.
HYGIENIC NAIL BRUSH

[0001] The present invention relates to a device for cleaning nails, in particular a brush for cleaning nails.

BACKGROUND

[0002] We wash our hands many times a day with varying degrees of thoroughness. The nail, particularly the cuticle, hyponychium, and paronychium (the channel between the nail bed and finger), can provide traps for dirt and germs which usual hand washing procedures do not always eliminate. Devices are available to attend specifically to cleaning nails, for example small brushes have been developed directed to cleaning the nail. A standard nail brush, although effective for removal of dirt from between and around the nail plate and the finger, has a number of disadvantages. Firstly, the bristles present on the brush are normally of uniform length on a flat surface, which means that although the gap under the nail plate, the hyponychium, is cleaned, the surface of the nails, including the cuticle, the paronychium, and the finger tips, are not cleaned at the same time. A partial solution to this problem is found in GB678406, which discloses a nail brush with a groove cut into the bristles which is either V-shaped or segmental in cross-section. This allows for improved cleaning of the finger tips, but does not represent a complete solution to the problem.

[0003] This prior art arrangement also does not address another serious problem associated with conventional nail brushes, namely that the brushing action results in a spray of debris and in particular bacteria throughout the surrounding environment. This issue is of such importance that nail brushes are not allowed for example in neo-natal units, due to the risk of spread of infection.

[0004] It would be advantageous to have a nail brush which provided all round cleaning action for nails and finger tips, whilst at the same time ensures the containment of bacteria.

SUMMARY OF THE INVENTION

[0005] Accordingly, in its broadest aspect, the invention a handle section, a plurality of bristles, each of said bristles having an attached end, connected to said handle section, and a free end, each free end positioned, relative to its neighbours, to collectively define an envelope partially enclosing a volume; wherein said volume is structured to receive a portion of at least one human digit extending from a digit tip substantially to an eponychium of said digit.

[0006] Optionally, the cross section of the volume is substantially the section of an ovoid.

[0007] Preferably, the brush comprises three sets of bristles, said attached ends of said bristles being located in planes set at an angle to each other.

[0008] Optionally, the volume comprises an arcuate channel.

[0009] Optionally, the volume is a spheroid section, shaped to receive a single finger.

[0010] Preferably, the nail brush comprises a cavity to contain soap or disinfectant.

[0011] Preferably the nail brush comprises flexible wall sections to allow dispensing of soap or disinfectant by application of pressure on the flexible sections.

[0012] Preferably the nail brush comprises a prime mover to power movement of the bristles.

[0013] Optionally, the nail brush comprises an ultraviolet lamp.

[0014] Optionally, the nail brush comprises an ultrasonic cleaner.

BRIEF SUMMARY OF THE DRAWINGS

[0015] The above and other aspects of the invention will now be described by way of example only with reference to the following figures:

[0016] FIG. 1 is a perspective view of a finger nail which the nail brush of the present invention seeks to clean;

[0017] FIG. 2 is a cross-sectional view of a nail brush according to an embodiment of the invention;

[0018] FIG. 3 is a cross-sectional view of the nail brush of FIG. 1 showing the cleaning volume and envelope of the bristle heads;

[0019] FIG. 4 is a cross-sectional view of the nail brush of FIGS. 1 and 2 showing the insertion of the human finger of FIG. 1 into the cleaning volume;

[0020] FIG. 5 is a cross-sectional view of an alternative arrangement of the bristles;

[0021] FIG. 6 is a plan view of yet another arrangement of bristles;

[0022] FIG. 7 is a cross sectional view of the nail brush across the section A-A' of FIG. 6;

[0023] FIG. 8 is a perspective view of the nail brush of FIGS. 5 and 6;

[0024] FIG. 9 is a perspective view of the preferred embodiment of the invention, with closed ends to prevent to dispersion of bacteria;

[0025] FIG. 10 is a perspective view of the non-bristle side of the embodiment of FIG. 8;

[0026] FIG. 11 is a cross-sectional view of a further arrangement of bristles;

[0027] FIG. 12 is a plan view of an embodiment of the invention comprising an arcuate brush section;

[0028] FIG. 13 is a cross sectional view of the brush of FIG. 12;

[0029] FIG. 14 is a plan view of a brush with an opening suitable for a single finger;

[0030] FIG. 15 is a sectional view of a brush with an opening suitable for a single finger;

[0031] FIG. 16 is a cross-sectional view of an embodiment of the invention with a soap dispenser;

[0032] FIG. 17 is a sectional view through the line B-B' of FIG. 13;

[0033] FIG. 18 is a view of FIG. 13, showing the direction of applied pressure to dispense soap or disinfectant;

[0034] FIG. 19 is a side view of a motorised nail brush according to an embodiment of the invention;

DETAILED DESCRIPTION

[0035] In its broadest aspect, the present invention provides for all-round cleaning of one or more human finger tips, for example a finger tip as shown in FIG. 1, which shows the fingertip 101, the nail plate 102, the hyponychium 103, the eponychium 104, the cuticle 105, the lateral nail hold or paronychium 106 and the other side of the finger 107. This all-round cleaning may be achieved by the nail brush 200 of for example, FIG. 2, which shows a bristle arrangement in which points 202 of the free ends 203 of the bristles 201 provide for an “envelope” 301 defining a volume into which a top portion of a finger of FIG. 1, extending to the proximal fold 104 at the end of the nail plate 102 distal the fingertip 101 may be inserted. FIGS. 2 and 3 in particular show a cross
section of such a nail brush 200 according to an embodiment of the invention. In FIG. 2, a plurality of bristles 201 is attached to a handle section 205. FIG. 3 illustrates the "envelope" 301 of the bristle heads, representing a surface linking the points 204 provided by the free ends 203 of the bristles 201, by the shortest distances between them. This envelope extends from a top portion of the finger, for example from the eponychium 104, over the fingertip 101 and to the soft portion of the finger tip not protected by a nail 103, and also in a lateral direction, away from such a finger inserted into the envelope, along the length of the brush 200. The envelope defines a volume 302 into which fingertips may be inserted via opening 303. This volume is sufficient to substantially receive the volume of a human finger from the fingertip to the eponychium 104 of the nail when the finger is inserted through opening 303. The enveloping of the fingertip by the bristles enables all-round, and hence improved, cleaning of the whole nail and fingertips rather than merely the gap between the nail plate and the flesh of the finger, the hyponychium 104, as in a conventional nail brush. The depth of the opening 303 also distinguishes the present invention from prior art GB678406, since the latter provides merely a shallow groove for improving cleaning of the hyponychium. This depth of volume also assists in the containment of bacteria, fungi and other detritus remove from nails by the brushing action.

FIG. 4 is a view of the brush illustrated in FIG. 2, with human finger 301 inserted for cleaning. As can be seen, the dimensions of opening 203 are such that the fingertip is enveloped from tip 101 to eponychium 104. The person skilled in the art will appreciate that there is no requirement for the bristles 201 of the nail brush 200 to be in simultaneous contact with the nail plate 102, and the other side 107 of the finger. In use, all-round cleaning may be achieved by movement of the brush in the direction 401 in addition to the conventional motion of a nail brush in a direction substantially parallel to the surface of the nail plates.

An alternative embodiment of the invention is shown in FIG. 5, in which three sets of bristles are provided, positioned on a handle section of a brush, each set of bristles providing for a respective envelope and cleaning surface. The first set of bristles 501 is located relative to handle section 205 in the manner of a conventional nail brush. The two additional sets of bristles 502, 503 are located either transversely to the plane of the envelope of the first set of bristles or at an angle to the plane transverse the envelope of the heads of the first set of bristles. This latter arrangement is illustrated in FIG. 6.

In both alternative embodiments, the first set of bristles 501 is located on the handle of the brush in a conventional way. The additional sets of bristles are located on side sections 504, 505 of the handle 205. The respective envelopes of bristle heads thus form respective volumes 406 which, although differently shaped, serves the same purpose as volume 302 in FIG. 3.

FIG. 7 is a cross-sectional view across line A'-A' of FIG. 6, showing clearly the dimensions of the cleaning cavity 302, including width 701 and height 702, which are the order of the size of a human fingertip.

FIG. 8 is a perspective view of the embodiment of FIGS. 6 and 7 of the invention, showing, the three sets of bristles 401, 402, 403, handle 102, side sections 404, 405 and cleaning cavity 406. In this embodiment, the ends 301, 302 of the cavities are open. This embodiment provides for all round cleaning, but only limited containment of bacteria.

FIG. 9 shows a preferred embodiment, with closed cavity ends 901, 902. This arrangement provides for enhanced containment of bacteria which may have been removed from finger nails and finger tips by use of the nail brush. A perspective view of the non-bristle side of the nail brush is shown in FIG. 10.

The person skilled in the art will appreciate that there are alternative arrangements of bristles which will be equally effective. For example, in an alternative embodiment of the invention, illustrated in FIG. 11, the envelope provided by the ends of the bristles forms a section of an obround. The depth of the section is sufficient to accommodate the length of a human fingertip from tip 101, to eponychium 104, allowing the relevant portion of the fingertip to be enveloped by the bristles and providing all-round cleaning in a similar manner.

A further embodiment of the invention is shown in FIG. 12, which illustrates a circular nail brush with a cleaning channel 1201 which provides a cleaning volume with the same function as volume 302, in accordance with the invention. A circular handle section 1202 is provided to support the bristles defining the channel. FIG. 13 is a cross-sectional view of the embodiment of FIG. 12 across the line B-B. Yet another embodiment of the invention is illustrated in FIG. 14, which shows a "finger-sized" volume 1401 defined by the envelope of bristle heads. FIG. 15 is a cross sectional view of the embodiment of FIG. 14.

In a further embodiment of the invention, there is provided a reservoir, which may be used for containing soap for the convenience of the user, or, in the context of use of the nail brush for hospital hygiene, for disinfectant. FIG. 16 is a transverse cross section of a nail brush according to an embodiment of the invention comprising such a reservoir. There is provided a cavity 1601 for containment of a reservoir typically comprising a sachet 1602 constructed from flexible plastics material. The person skilled in the art will appreciate that other arrangements are possible, such as simply filling the cavity 1601 with soap or disinfectant. A nozzle 1603 is provided, which typically comprises a valve 1604 or other means to control the flow of the soap or disinfectant, such as a stopper.

FIG. 17 is a sectional view through line C-C' of FIG. 16. In order to enable a user to dispense soap or disinfectant from reservoir 1602, side sections 1701 comprising a flexible plastics material are provided in the sides of the brush adjacent to the reservoir. The user dispenses soap or disinfectant by applying pressure against the flexible side sections in the directions 1801, 1802 in FIG. 18 thereby urging soap or disinfectant out of the reservoir for use.

In another embodiment of the invention a flexible upper section, located on the opposite side to the bristles, is provided, wherein the user dispenses soap or disinfectant by pressure applied towards the fingers of the hand being cleaned. In a further embodiment, the entire handle section of the brush is constructed from flexible plastics material, forming a reservoir, allowing the user to squeeze the handle section in the palm of one hand to dispense soap or disinfectant onto the other hand, the hand being cleaned. The person skilled in the art will appreciate that many different arrangements,
which fall within the scope of the invention, are possible, some of which include the flexible plastics section extending to a greater or lesser extent across the surface opposite to the bristles or along the side sections of the brush handle.

A major advantage of the triple action cleaning provided by the "all-round" nature of the bristles in the preferred embodiment of the present invention is that the nail cuticle is cleaned and nail growth is stimulated, enhancing nail shine. About 25% of adults will at some point in their lives have nail infections or similar problems and rigorous brushing of the nails will remove bacteria, fungi and other detritus from the nail plates. It also helps remove "pterygium", excess cuticle growing over the nail plate.

The rigorous brushing of nails can be compared with the removal of plaque from teeth. An electric toothbrush is known to significantly increase oral hygiene by removing more plaque from teeth than brushing with an ordinary toothbrush. Likewise, brushing of nails can be improved by the use of a motorised nail brush.

Accordingly, in a further embodiment of the present invention, there is provided a motorised nail brush. A cross-sectional view of a motorised nail brush according to an embodiment of the invention is illustrated in FIG. 19. An electric motor 1901 provides reciprocating translational motion of a base section which holds the bristles. A handle 1902 is provided to hold the device in operation. In a first embodiment of the motorised version of the nail brush, a single base section 1903 is provided, which cause all the bristles to move in the same direction 1904 at the same time. In an alternative embodiment, multiple base sections are provided with banks of bristles, which move in opposing directions. In a further embodiment, the circular nail brush is motorised, with an electric motor providing rotational motion.

In addition to the physical removal of dirt and germs, two further hygiene techniques may be used to enhance cleaning. These are Ultraviolet Germicidal Irradiation (UVGI) and ultrasonic cleaning.

UVGI is a disinfection technique, used in a variety of applications, such as food, air and water purification, which uses short wavelength ultraviolet (UV) light to kill microorganisms. The UV light destroys the nucleic acids in microorganisms, so that their Deoxyribonucleic acid (DNA) is disrupted, leaving the organisms unable to perform vital cellular functions. In a further embodiment of the invention, a UV lamp is included in the brush, to provide disinfection.

Ultrasonic cleaning uses high frequency (usually from 20-400 kHz) sound waves create agitation in water, which in turn removes contaminants from the surface of the item to be cleaned. In a further embodiment of the invention, the nail brush includes an ultrasonic cleaner.

The nail brush of the present invention may be used by a person as part of their general hygiene, or in industry or a caring environment to ensure proper and thorough hygiene is maintained. An individual wishing to clean their hands may first wash their hands as usual and then select the nail brush to clean their nails. One digit may be inserted into the volume enclosed by the free ends of the bristles and the nail brush moved in the plane of the nail plate, such that some bristles will be urged into the hyponychium in a brushing action to remove dirt, germs and general debris. Other bristles will brush against the cuticle, the eponychium, and the paronychium in a general cleaning action. The nail plate will also be polished by this action. The nail brush may then be moved to brush the bristles first against the nail plate and then against the soft portion of the finger opposite the nail plate in a further cleaning action.

The fingers may be entered into the volume one by one or all the fingers may enter into the volume at once. The nail brush will provide a cleaning action on those fingers inserted into the volume.

In accordance with one embodiment of the invention the nails are cleaned and debris and dirt removed from the nails is substantially contained within the volume. In the embodiment in which there is an open end in the brush some debris may spray out from this open end. In the embodiment in which the nail brush ends are closed such spray is avoided and such nail brushes may be suitable for more sensitive locations where it is essential that contamination and infection is avoided, such as hospitals, care homes, or sensitive industrial environments.

The second and third volumes provided in the preferred embodiment of the present invention may also be used to provide a comprehensive and thorough clean of the finger tips and nails.

The invention is not restricted to details of the foregoing embodiments. For example it is contemplated that the nail brush relates to and is suitable for cleaning toes and toenails in addition to fingers and finger nails.

1. A nail brush comprising:
   a handle section;
   a plurality of bristles, each of said bristles having an attached end, connected to said handle section, and a free end;
   each free end positioned, relative to its neighbours, to collectively define an envelope partially enclosing a volume;
   wherein said volume is structured to receive a portion of at least one human digit extending from a digit tip substantially to an eponychium of said digit.

2. A nail brush as claimed in claim 1, wherein a cross-section of said volume is substantially a section of an obround.

3. A nail brush as claimed in claim 1, wherein said volume comprises three sets of bristles, said attached ends of said bristles being located in planes set at an angle to each other.

4. A nail brush as claimed in any preceding claim, wherein said volume comprises an arcuate channel.

5. A nail brush as claimed in claim 1 wherein said volume is a spheroid section, shaped to receive a single finger.

6. A nail brush as claimed in any preceding claim, further comprising a cavity to contain soap or disinfectant.

7. A nail brush as claimed in claim 6, further comprising flexible sections to allow dispensing of said soap or disinfectant by application of pressure against said flexible sections.

8. A nail brush as claimed in any preceding claim, further comprising a prime mover to power movement of bristles.

9. A nail brush as claimed in claim 9, wherein said prime mover provides reciprocating translational motion for said brush.

10. A nail brush as claimed in claim 9, wherein said prime mover provides rotational motion for said brush.

11. A nail brush as claimed in any preceding claim, further comprising an ultraviolet lamp.

12. A nail brush as claimed in any preceding claim, further comprising an ultrasonic cleaner.

13. A nail brush substantially as described herein with reference to the accompanying drawings.

14. A nail brush substantially as described herein with reference to the accompanying description.