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**Rudolph**

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[54] **FILE WITH SANITIZING AGENT AND METHOD**

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[\*] Notice: This patent is subject to a terminal disclaimer.

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**Related U.S. Application Data**

[63] Continuation-in-part of application No. 08/832,219, Apr. 4, 1997, Pat. No. 5,813,416.

[51] **Int. Cl.**<sup>7</sup> ..... **A45D 29/04**

[52] **U.S. Cl.** ..... **132/76.4**

[58] **Field of Search** ..... 132/76.4, 76.5; 451/344, 524, 525; 15/104.93, 104.94, 229.11

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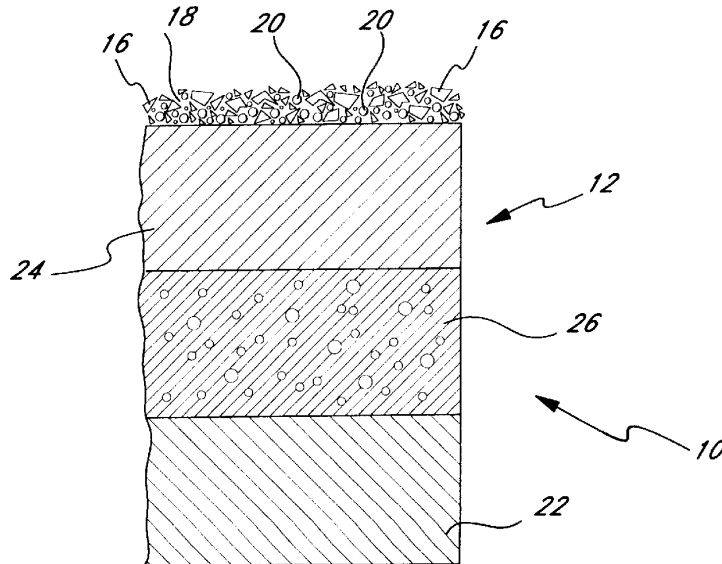
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[57] **ABSTRACT**

A file includes a support member having an abrasive surface treated with a sanitizing agent. The surface or the interstices between particles of abrasive hold the sanitizing agent which is released with use of the file. The sanitizing agent is either in a liquid carrier or contained within microcapsules. The microcapsules are frangible and break upon use of the file to release the sanitizing agent. The file surface may comprise granular abrasive particulates having a size ranging from 40 to 1200 grit which provide the interstices between at least some of the particulates. An aqueous coating having dispersed therein an adhesive and the microcapsules is applied to the granular particulates. The coating is dried to deposit in the interstices the microcapsules. The adhesive binds the microcapsules to the granular particulates. When a mixture of sanitizing agent and liquid carrier is used, the abrasive surface is coated with the mixture and then the carrier is removed to coat the surface with the sanitizing agent.

**28 Claims, 3 Drawing Sheets**



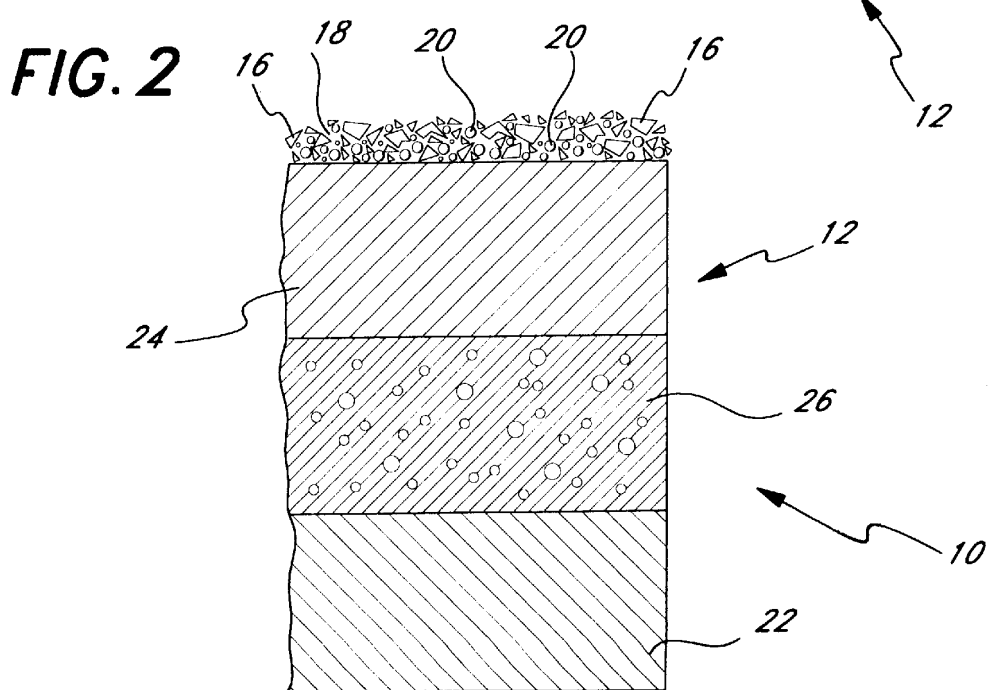
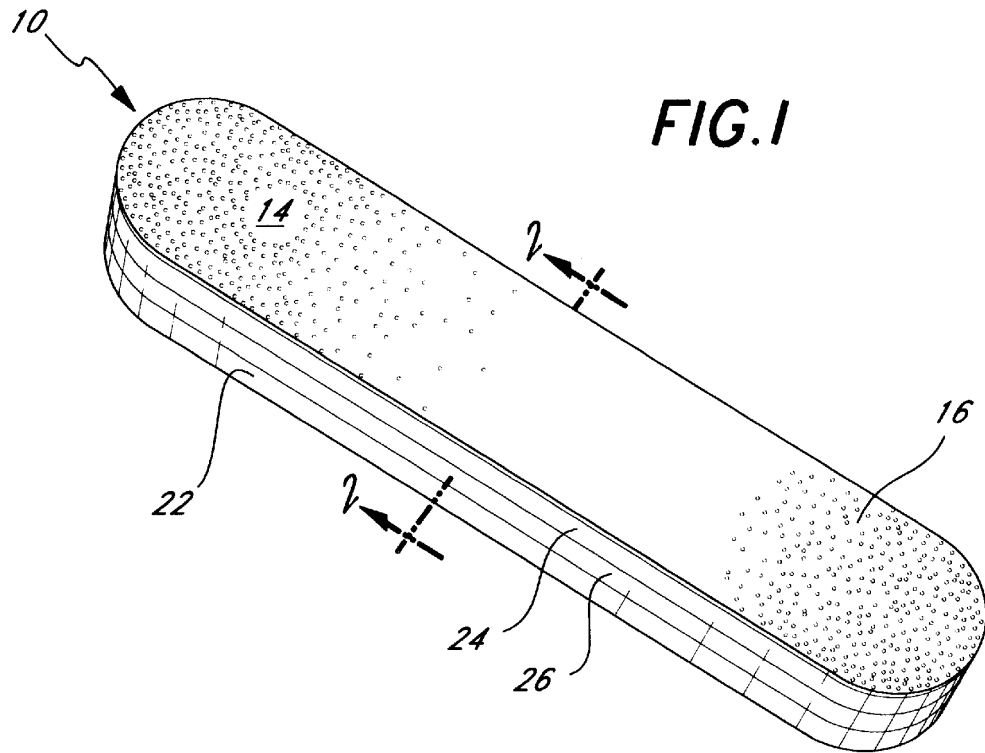


FIG. 3

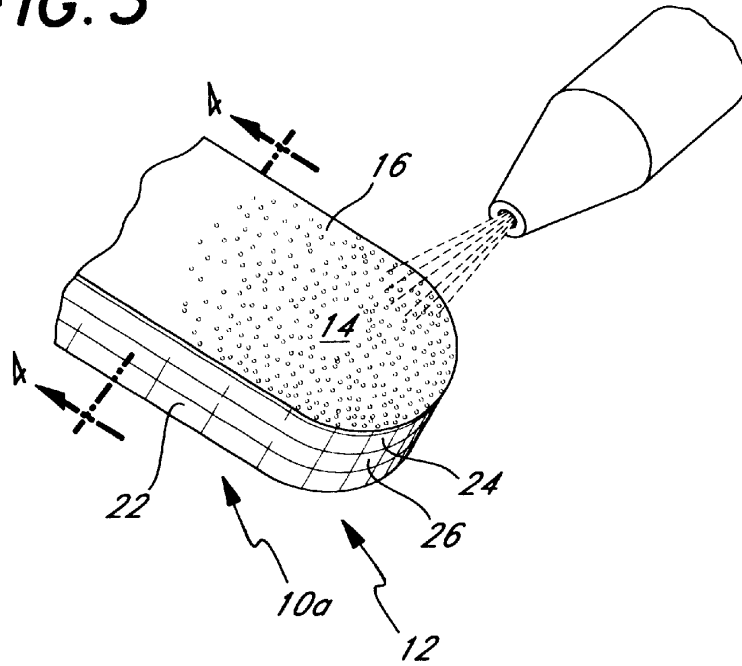
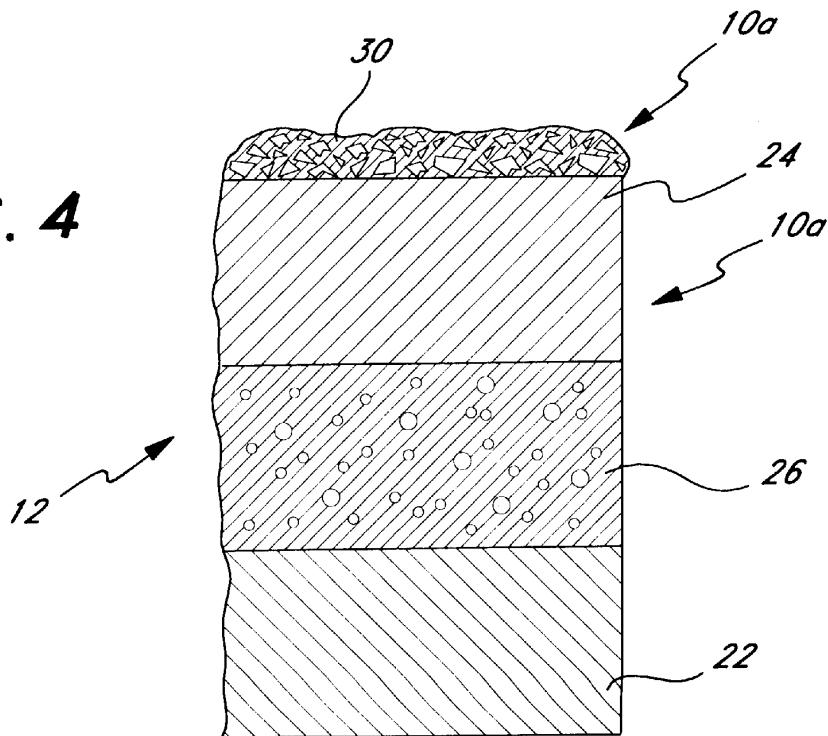
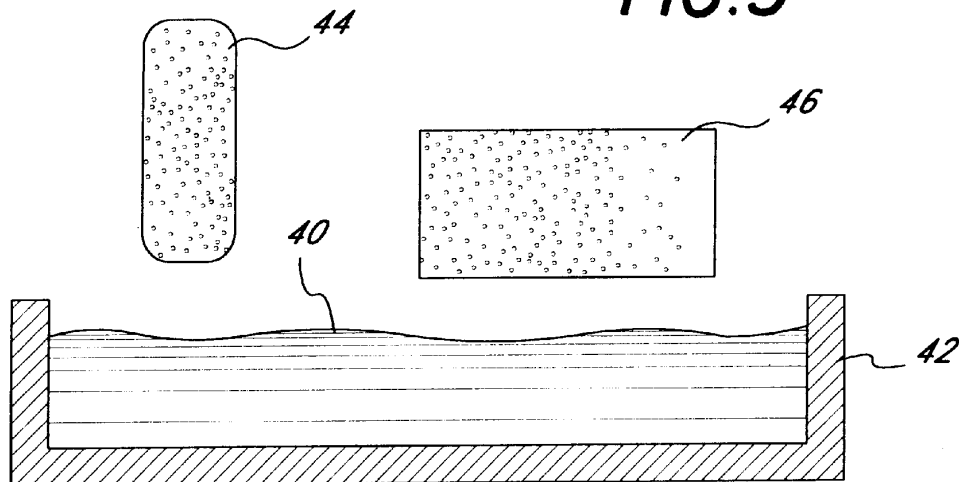


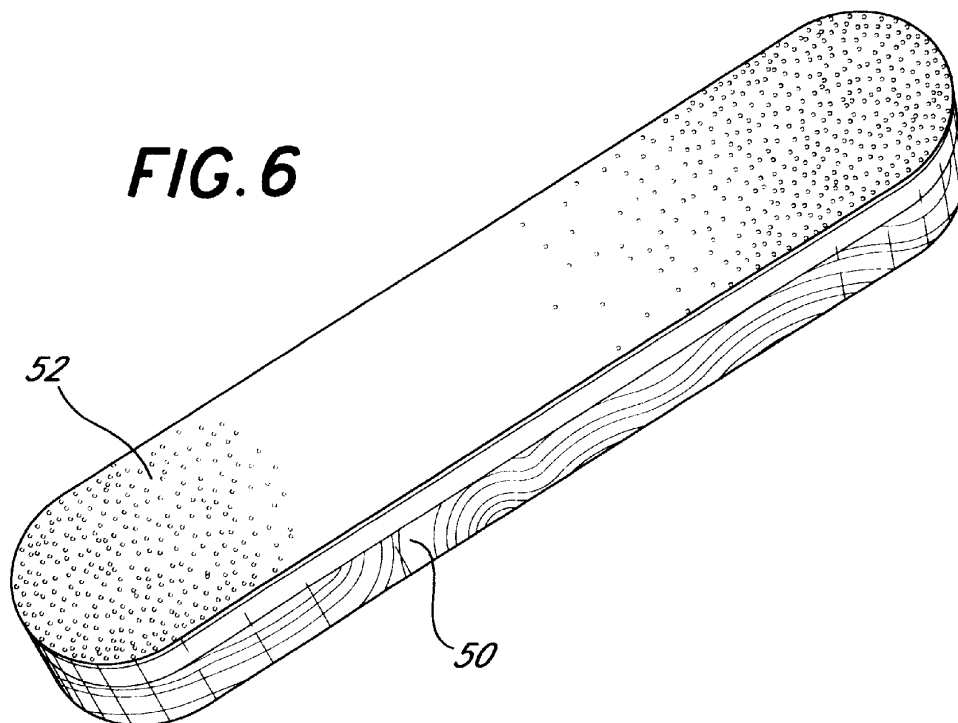
FIG. 4



**FIG. 5**



**FIG. 6**



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## FILE WITH SANITIZING AGENT AND METHOD

### RELATED PATENT APPLICATION

This application is a continuation-in-part application of U.S. Ser. No. 08/832,219, entitled "File With Sanitizing Agent & Method," filed Apr. 4, 1997 now U.S. Pat. No. 5,813,416. This related application is incorporated herein by reference and made a part of this application.

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention relates to files used for filing human nails or callouses, and particularly, a file which has on its abrasive surface a sanitizing agent that is released during filing.

#### 2. Background Discussion

A major problem encountered by professional nail care specialists and manicurists is fungal or other types of infection of a client's nails. The general public isn't even aware of this potential risk of infection, and nail files which they purchase have no means for avoiding or minimizing this risk of infection. Sometimes professional nail care specialists and manicurists, in order to avoid or minimize the likelihood of spreading any infection, immerse the nail files in a solution containing a sanitizing agent. An example of a suitable sanitizing solution is an aqueous product sold under the trademark Benz-All. A jar filled with this solution and having a moveable tray is used to hold several files. The files are supported by the tray so that they are completely emersed below the surface of the solution. The tray is manually lifted from the solution and a file removed for use. This file must then be dried prior to use with the sanitizing agent evaporating. This is a messy procedure. Typically, a nail file comprises a support member made of rigid plastic or wood and covered with a water-proof or non-water proof sand paper. Such files are subject to attack by the solution which chemically corrodes the file, substantially shortening the useful life of the file. A similar hazard of infection occurs with foot files used to remove unwanted skin and file toe nails.

### SUMMARY OF THE INVENTION

It is the objective of this invention to provide a file which contains a sanitizing agent which is released upon use of the file.

This invention has several features, no single one of which is solely responsible for its desirable attributes. Without limiting the scope of this invention as expressed by the claims which follow, its more prominent features will now be discussed briefly. After considering this discussion, and particularly after reading the section entitled, "DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT," one will understand how the features of this invention provide its benefits, which include minimizing the likelihood of fungal or other infection of nails, prolonging the useful life of the file, and avoiding messy or inconvenient storage procedures for files.

The first feature of the file of this invention is that it includes a support member having an abrasive surface. The support member may be made of paper, plastic, plastic foam, metal, wood, or fabric. When wood is used a film of plastic, paper, or other material is glued to the wooden surface of the support. This film carries granular particulates which provide the abrasive surface. It may be in the shape of a disk, board or block, and may be multi-layered, for example,

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comprising a rigid plastic board covered with a sand paper and having a foam layer between the board and the sand paper. A foam layer of polyurethane foam is commonly employed.

The second feature is that the abrasive surface, or its interstices, or both, are at least partially coated or filled with a sanitizing agent that is released upon using the file. This sanitizing agent maintains its effective sanitizing activity for at least 3 months after the coating. The sanitizing agent is applied in several ways. First, it may be incorporated into a liquid carrier, for example water, alcohol, or an organic solvent, which is sprayed onto the abrasive surface, or the file or a sheet of file material may be dipped into the agent-carrier mixture. The file is then dried to remove the carrier, leaving a residual coating of sanitizing agent that is released as the file is used. The sanitizing agent comprises from 1 to 100 weight percent of the mixture and the liquid carrier comprises from 99 to 0 weight percent of the mixture. Second, the sanitizing agent may be incorporated in a slurry of adhesive and granular abrasive particulates which are applied to the support member. Thus, the sanitizing agent is part of the bonding material or adhesive. Third, the sanitizing agent may be incorporated into microcapsules. These microcapsules are frangible and break upon use of the file to release the sanitizing agent. The microcapsules comprises a generally hollow, spherical shell having a thin, frangible wall with a thickness ranging between 1/50 and 1/200 micron. The microcapsules typically have a diameter ranging between about 12 and about 50 microns. The shell should be inert with respect to the sanitizing agent.

The third feature is that the abrasive surface may comprise granular abrasive particulates and the interstices are between at least some of the particulates. Typically, the particulates have a size ranging from about 40 to about 1200 grit, preferably 80 to 400 grit. The preferred particulates are silicon carbide, aluminium oxide, silica, or zirconia. Using any suitable adhesive, these particulates are bonded to the surface of a support sheet of, for example, plastic or paper, covering substantially the entire surface of the support sheet. This support sheet is then glued to the surface of a rigid support member such as, for example, a plastic board or block, either a foam or non-foam material. Preferably, the support sheet and glue are carrier resistant, so that when the sanitizing agent-liquid carrier mixture is applied, the support sheet is not damaged.

The fourth feature is the manner in which the microcapsules are applied to the abrasive surface. Typically, they are first dispersed in an aqueous medium with an adhesive that is water soluble. This mixture of microcapsules, adhesive, and water comprises from about 30 to 40 percent by weight solids. It is applied as a thin coating to the abrasive surface, and allowed to dry. It may be heated above ambient temperature to about 200 to about 225° F. to facilitate removal of the water. The microcapsules remain in the interstices of the abrasive surface, with the adhesive securing them to this surface.

The fifth feature is that the sanitizing agent is a fungicide, a germicide, or a mixture of both. A wide variety of sanitizing agents are available and new ones are constantly being developed with improved properties. Suitable fungicides are itraconazole, terbinafine, and fluconazole. Itraconazole, terbinafine, and fluconazole are being investigated for ingestion by a patient suffering from onychomycosis (fungal infection), but may be used as an externally applied agent as contemplated in the present invention. Suitable germicides are dimethyl benzyl, ethyl benzyl, gasoline, or pine oil.

The sixth feature is that the sanitizing agent is a non-metallic organic antimicrobial compound. Preferably, it is naturally occurring rather than synthetic and is non-toxic by oral ingestion and is not a primary skin irritant or a corrosive. An example is citrus fruit extract such as, for example, grape fruit extract sold under the trademark Citricide by Bio-Chem Research. This citrus fruit extract, preferably grape fruit extract which is an oily material but it is soluble in water or alcohol. Synthetic compounds, however, may be used.

This invention also includes a method of treating a human nail to inhibit or prevent infection. This method includes:

- (a) filing the nail with a file including a support member having an abrasive surface, said surface having interstices which are at least partially filled with a sanitizing agent that is released upon use of the file, and
- (b) applying sufficient pressure during filing to release the sanitizing agent, so that said sanitizing agent contacts the nail being filed.

#### DESCRIPTION OF THE DRAWING

The preferred embodiment of this invention, illustrating all its features, will now be discussed in detail. This embodiment depicts the novel and non-obvious file and method of this invention as shown in the accompanying drawing, which is for illustrative purposes only. This drawing includes the following figures (FIGS.), with like numerals indicating like parts:

FIG. 1 is a perspective view of a nail file embodying the present invention.

FIG. 2 is a cross-sectional view taken along line 2—2 of FIG. 1, greatly enlarged and schematically illustrating microcapsules deposited between interstices in the abrasive surface of the file.

FIG. 3 is a side elevational view showing a file being sprayed with a sanitizing agent—liquid carrier mixture.

FIG. 4 is a cross-sectional view taken along line 4—4 of FIG. 3, showing the file with the carrier removed, leaving a film of sanitizing agent on the abrasive surface.

FIG. 5 is a schematic view illustrating dipping a file and a file sheet into a solution of sanitizing agent to apply the agent to the abrasive surface of the file and sheet.

FIG. 6 is a perspective view of a nail file embodying the present invention using a wooden support member.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As depicted in FIGS. 1 and 2, a nail file 10 of this invention includes a support member 12 having an abrasive surface 14. The abrasive surface 14 comprises granular abrasive particulates 16 with interstices 18 (FIG. 2) between the particulates. Silicon dioxide particulates having a size ranging between 80 and 400 grit are preferred and they may be the same or different sizes. The interstices 18 are at least partially filled with microcapsules 20 (FIG. 2) that contain a sanitizing agent (not shown).

Microencapsulation processes have commonly been used to encapsulate perfumes and these processes are discussed in an article published in the February 1997 edition of the magazine DCI. This well known process is simply modified by replacing the perfume with the sanitizing agent. The sanitizing agent is in the form of an oil based product. It is mixed with an aqueous solution of low molecular weight, water soluble polymers and stirred vigorously to form

minuscule oleaginous droplets of the sanitizing agent. A suitable polymer material is, for example, polyoxymethylene urea. A catalyst is added to the aqueous solution which causes the low molecular weight polymer to increase in weight and become water insoluble. As this occurs, the droplets of the sanitizing agent are encased within a shell composed of the higher molecular weight polymer to form the microcapsules 20 which precipitate from the aqueous solution. The microcapsules are then washed and dispersed in an aqueous based coating, including an adhesive, for application to the support member 12. A suitable adhesive is, for example, rubber cement.

The support member comprises a rigid plastic board 22 and the abrasive surface 14 is provided by a water proof sand paper type sheet 24. Preferably, a polyurethane foam layer 26 is sandwiched between the board 22 and the sheet 24. The board 22, layer 26, and sheet 24 are assembled as a unit after applying to the abrasive surface 14 of the sheet 24 the aqueous coating containing the microcapsules 20. Upon drying of the coating, the adhesive bonds the microcapsules 20 to the abrasive surface 14, which are lodged in the interstices 18.

The file 10 is used in the normal fashion by rubbing the abrasive surface 14 against a human nail or callous. This rubbing causes the microcapsules 20 to fracture and release the sanitizing agent which contacts the nail or callous being filed to inhibit or prevent infection. Advantageously, only the very uppermost microcapsules 20 at the surface 14 are fractured, leaving behind unfractured microcapsules that are eventually fractured as the surface 14 is gradually worn away with continued use of the file 10.

As shown in FIG. 6, another embodiment of the invention uses a wooden support member with a sand paper sheet having its surface coated with a sanitizing agent.

In an alternate embodiment, the file 10a is similar to file 10 except that the sanitizing agent is applied to the abrasive surface 14 by mixing the agent with a carrier such as water and spraying the sanitizing agent-water mixture on the abrasive surface as depicted in FIG. 3. Contrary to conventional practice, the abrasive surface 14 is not washed. Rather, the water carrier is removed, for example, by blow drying in air at a temperature of ambient for about two or more hours or at 120 degrees Fahrenheit for 3 to 8 minutes to remove the water. If an alcohol carrier is used, the carrier is removed at ambient temperature with suitable venting. The removal of the carrier leaves a film 30 of sanitizing agent coating the particles as depicted in FIG. 4. The following is the preferred way of making a file in accordance with this invention:

#### EXAMPLE

A solution 40 comprising 5 weight percent grapefruit extract (Citricide) dissolved in distilled water is placed in an open top container 42 as shown in FIG. 5. Either individual files 44 or, prior to cutting into individual files, a sheet 46 comprising a support member with abrasive particles bonded thereto is dipped into the solution. The file 44 or sheet 46 is removed from the container 42 and dried at room temperature for approximately 3 hours. This leaves a coating of the grapefruit extract sanitizing agent on the abrasive surface and in the interstices of the file 44 or sheet 46. This oil based sanitizing agent retains its effective activity to kill microbes and other infectious bacteria for at least 3 months after applying the sanitizing agent to the abrasive surface.

#### SCOPE OF THE INVENTION

The above presents a description of the best mode contemplated of carrying out the present invention, and of the

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manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains to make and use this invention. This invention is, however, susceptible to modifications and alternate constructions from that discussed above which are fully equivalent. Consequently, it is not the intention to limit this invention to the particular embodiment disclosed. On the contrary, the intention is to cover all modifications and alternate constructions coming within the spirit and scope of the invention as generally expressed by the following claims, which particularly point out and distinctly claim the subject matter of the invention:

I claim:

1. A file including a support member with an abrasive surface at least partially coated with a sanitizing agent that is released upon using the file and maintains its effective sanitizing activity for at least 3 months after the coating, said sanitizing agent being incorporated in a slurry of adhesive and granular abrasive particulates that is applied to the support member.

2. The file of claim 1 where the sanitizing agent is oil based.

3. The file of claim 1 where the sanitizing agent is a citrus fruit extract.

4. The file of claim 1 where the sanitizing agent is contained within microcapsules that are frangible and break upon use of the file to release the sanitizing agent.

5. The file of claim 4 where the microcapsules have a diameter ranging between 12 and 50 microns.

6. The file of claim 4 where the microcapsules comprises a generally hollow spherical shell having a wall with a thickness ranging between 1/50 and 1/200 microns.

7. The file of claim 1 where the abrasive surface comprises granular abrasive particulates with interstices between the particulates that are filled with the sanitizing agent.

8. The file of claim 7 where the particulates have a size ranging from 40 to 1200 grit.

9. The file of claim 7 where the particulates are silicon carbide, aluminium oxide, silica, or zirconia.

10. The file of claim 1 where the support member is paper, plastic film, plastic foam, metal, or fabric.

11. The file of claim 1 where the sanitizing agent is a fungicide.

12. The file of claim 11 where the fungicide is itraconazole, terbinafine, or fluconazole.

13. The file of claim 1 where the sanitizing agent is a germicide.

14. The file of claim 13 where the germicide is dimethyl benzyl, ethyl benzyl, gasoline, or pine oil.

15. A file including a support member with an abrasive surface at least partially coated with a sanitizing agent that is released upon using the file, where

(a) the sanitizing agent is mixed with a liquid carrier which dissolves the sanitizing agent,

(b) the sanitizing agent-liquid carrier is applied to the abrasive surface, and

(c) the carrier is removed to leave a residual coating of sanitizing agent on the abrasive surface.

16. A nail file including a rigid support member with an abrasive surface having as a dry residual coating on said surface a sanitizing agent releasably bonded to said surface so that said sanitizing agent is released upon using the file.

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17. A file including

a support member having a surface to which adhere granular abrasive particulates having a size ranging from 40 to 1200 grit to provided interstices between at least some of the particulates, and

a coating applied to said surface which has dispersed therein an adhesive and microcapsules that contain a sanitizing agent, said coating being dried to deposit in said interstices the microcapsules, with the adhesive binding the microcapsules to said surface,

said microcapsules being frangible and breaking upon use of the file to release the sanitizing agent.

18. The file of claim 17 where the sanitizing agent is a fungicide, a germicide, or a mixture of both.

19. A file including

a support member having a surface to which adhere granular abrasive particulates having a size ranging from 40 to 1200 grit, and

a coating comprising a mixture of sanitizing agent is mixed with a liquid carrier, said coating being applied to said surface and then removing the carrier to leave sanitizing agent on the abrasive surface, with said sanitizing agent being released upon using the file.

20. The file of claim 19 where the sanitizing agent is a fungicide, a germicide, or a mixture of both.

21. The file of claim 19 where the sanitizing agent comprises from 1 to 20 weight percent of the mixture and the liquid carrier comprises from 99 to 80 weight percent of the mixture.

22. A file including a wooden support member having a film with an abrasive surface at least partially coated with a sanitizing agent, said sanitizing agent being releasably bonded to the abrasive surface so that it is released upon using the file and maintains its effective sanitizing activity for at least 3 months after the coating.

23. A method of treating a human nail to inhibit or prevent infection comprising

(a) filing the nail with a file including a support member having an abrasive surface, said surface coated with a sanitizing agent that is released upon use of the file, and

(b) applying sufficient pressure during filing to release the sanitizing agent, so that said sanitizing agent contacts the nail being filed,

the abrasive surface being coated with a mixture comprising the sanitizing agent and a liquid carrier and then the carrier is removed to leave the sanitizing agent on the abrasive surface.

24. The method of claim 23 where the sanitizing agent is contained within microcapsules that are frangible and break upon use of the file to release the sanitizing agent.

25. The method of claim 23 the sanitizing agent is a fungicide, a germicide, or a mixture of both.

26. The method of claim 25 where the fungicide is itraconazole, terbinafine, or fluconazole.

27. The method of claim 25 where the germicide is dimethyl benzyl, ethyl benzyl, gasoline, or pine oil.

28. The method of claim 23 where the sanitizing agent comprises from 1 to 100 weight percent of the mixture and the liquid carrier comprises from 0 to 99 weight percent of the mixture.

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