

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

EP

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

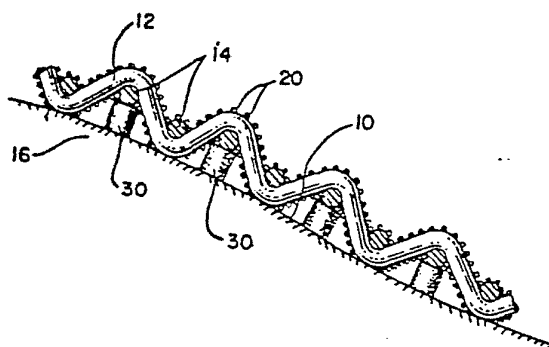
9499

(51) International Patent Classification: A41B 11/00, <i>A61K 7/155 A61K 9/30</i>		A1	(11) International Publication Number: WO 79/00577
			(43) International Publication Date: 23 August 1979 (23.08.79)
(21) International Application Number: PCT/US79/00051 (22) International Filing Date: 1 February 1979 (01.02.79) (31) Priority Application Number: 873,814 (32) Priority Date: 1 February 1978 (01.02.78) (33) Priority Country: US (71) Applicant: McGALLIARD, James, D.; 11171 Fenwick Place, Santa Anna, CA 92705, United States of America. (72) Inventor: Applicant is also the inventor.		(74) Agents: OLSON, Gordon, H.; KNOBBE, Louis, J.; MARTENS, Don, W.; HUBBARD, Grant, L.; BEAR, James, B.; 500 South Main Street, Suite 1013, North Tower, Union Bank Building, Orange, CA 92668, United States of America. (81) Designated States: CH (European patent), DE (European patent), FR (European patent), GB (European patent), JP, LU (European patent), SE (European patent). Published with: <i>International search report</i>	

(54) Title: DEPILATORY BEARING FABRIC

## (57) Abstract

A fabric garment (10) which automatically removes unwanted hair (30) while being worn against the skin (16) of the user (15). The garment (10) is coated with a pressure sensitive microencapsulated depilatory agent (20). Pressure exerted by a hair stubble (30) against the fabric (10) causes the microencapsulation to rupture and dispense the depilatory agent in a small localized area around the hair follicle. The depilatory agent dissolves the hair stubble without irritating the user's skin.



*FOR THE PURPOSES OF INFORMATION ONLY*

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT

AT	Austria	LU	Luxembourg
BR	Brazil	MC	Monaco
CF	Central African Empire	MG	Madagascar
CG	Congo	MW	Malawi
CH	Switzerland	NL	Netherlands
CM	Cameroon	SE	Sweden
DE	Germany, Federal Republic of	SN	Senegal
DK	Denmark	SU	Soviet Union
FR	France	TD	Chad
GA	Gabon	TG	Togo
GB	United Kingdom	US	United States of America
JP	Japan		

-1-

## DEPILATORY BEARING FABRIC

Technical Field

This invention relates to a fabric garment to be worn  
5 tightly against the skin of a user, which during use,  
automatically removes unwanted hair. More particularly,  
the invention relates to hosiery which is coated with a  
microencapsulated depilatory agent which automatically  
dispenses the depilatory to only a localized area around  
10 the hair follicle thereby dissolving the hair without  
irritating the user's skin.

Background Art

Throughout the ages, man has developed various devices  
and methods for removing unwanted body hair. These prior  
15 art devices have ranged from mechanical cutting edges  
which shave the hair stubble adjacent to the skin such as  
straight, safety, and electric razors, to modern depilatory  
agents which are applied directly to the skin to dissolve  
the hair stubble by a chemical process. Although these  
20 methods and devices have proven useful in many applications,  
there are inherent deficiencies in their use.

Since the cutting edge devices contact the hair stubble  
as they are pulled across the skin of the user, there is a  
tendency for the hair to bend, causing a failure to shave the  
25 hair close to the skin. Additionally, these mechanical  
devices suffer from the all too frequent cutting of the  
user's skin as well as the hair stubble.

Alternatively, the depilatory agents, although capable  
of chemically dissolving the hair close to the skin, in  
30 many instances cause minor skin irritation to the user  
or possess an obnoxious sulfide odor which is extremely  
difficult to mask.

Further, a major limitation of both the mechanical  
edge devices and depilatory agents are that they are  
35 time-consuming to use. When using cutting edge devices,  
pre-shave lotions or lather must first be applied to the  
skin to soften the hair stubbles and protect the skin



-2-

from abrasion. Then, subsequent to shaving, these lotions must be rinsed from the skin with water. Similarly, use of the depilatory agents require that a hair dissolving  
5 lotion be applied and left in contact with the skin for a period of time and then be removed by washing. In many instances, use of these prior art devices and methods require as much as thirty minutes be expended each day by the user in removing unwanted body hair.

10                   Disclosure of Invention

The applicant has discovered a convenient and economical device and method for automatically removing unwanted body hair which substantially eliminates these deficiencies of the prior art.

15           The present invention provides a garment which is coated with a microencapsulated depilatory agent which effectively and automatically removes unwanted body hair when worn by the user. The invention is extremely suitable for use in womens' hosiery which is typically  
20 worn tightly against the skin of the user.

The invention comprises hosiery which is coated with a pressure sensitive microencapsulated depilatory agent. This microencapsulation facilitates deposition of the liquid depilatory upon the hosiery in a capsule form  
25 without wetting or altering the original dry appearance of the fabric, and additionally allows the dispensing of the depilatory to only a localized area adjacent the hair stubble.

When the hosiery of the present invention is worn  
30 tightly over the skin of the user, the pressure exerted by the hair stubble against the fabric ruptures the microencapsulation, thereby selectively releasing the depilatory agent in the area surrounding the hair stubble. The depilatory agent quickly begins to break down the protein  
35 structure of the hair and completely dissolves the hair stubble during normal wearing of the garment.

As can be readily seen, the present invention



-3-

alleviates the time consumption deficiencies of the prior art by providing hosiery which automatically removes unwanted hair while being worn. Additionally, the present invention automatically removes hair close to the skin surface without the possibility of accidental cutting of the skin. Further, due to the localized area of contact between the depilatory and the hair, contact between the depilatory and the user's skin is minimized. This permits prolonged contact duration of the depilatory with the hair stubble, so that a moderate strength depilatory agent can be used which does not possess an unpleasant odor. The microencapsulation, by limiting skin contact with the depilatory (only the hair stubble ruptures the capsules), permits the user of depilatory chemicals which would be too harsh to apply directly to the skin for prolonged periods.

#### Brief Description of Drawings

These and other features of the present invention will become more apparent upon reference to the drawings wherein:

Figure 1 is a schematic view of a nylon hose coated with a microencapsulated depilatory and being worn tightly against the skin of the user;

Figure 2 is an enlarged pictorial representation of the nylon hose against the skin of the user showing the spacial relationship between the fabric, hair stubble and the microencapsulated depilatory; and

Figure 3 is an enlarged cross-sectional view showing a filament of the nylon hose with a microencapsulated depilatory thereon.

#### Best Mode For Carrying Out the Invention

Referring to Figure 1, there is shown the microencapsulated depilatory coated hosiery 10 of the present invention being worn around the legs of a user 15. As can be seen, it is advantageous if the fabric, in this case the hosiery 10, is capable of being tightly worn in direct



-4-

contact with the user's skin 15, yet be elastic enough to stretch and conform to normal body movement.

The hosiery 10 is preferably formed of a looped fabric knit and made from synthetic fibers such as nylon or rayon which are typically used in hosiery manufacturing. Such looped fabric construction is well known in the art and provides hosiery having high elastic and memory properties which easily stretch to accommodate body movement and quickly return to the prestretched configuration of the fabric after such movement. Additionally, the synthetic fibers possess high strength and are easily dyed to allow the hosiery to be manufactured in a variety of cosmetically pleasing colors.

The microencapsulation process utilized in the present invention is a relatively new technology which has been significantly developed in recent years. Basically, this microencapsulation process comprises the formation of a hard thin shell or film which coats a minute-sized liquid depilatory material, thereby forming a pressure sensitive depilatory capsule. Various microencapsulation processes suitable for use in the present invention are well known in the art and are disclosed in U.S. Patent No. 3,804,775 (gelatin phase change), U.S. Patent No. 3,607,775 (complex coacervation), U.S. Patent No. 2,800,458 (salt coacervation), and U.S. Patent No. 3,565,819 (wax-hydrophilic colloid), the descriptions thereof incorporated herein by reference.

These pressure-sensitive depilatory capsules 20 are schematically shown in Figure 3, and include a depilatory, liquid core 18 and a surrounding, typically spherical wall 22. The capsules 20 typically range from a few to several hundred microns in diameter, and are deposited upon the hosiery 10, thereby contacting the hair stubble 30 as well as the user's skin 16 during use.

The dispersion of depilatory capsules 20 is preferably sprayed or coated upon the hosiery 10 immediately after the microencapsulation process is accomplished. At this



-5-

stage in the process, the outer walls of each capsule are wetted and substantially pliable. This wetted, soft condition allows each capsule to adhere and conform to the shape of the hosiery fabric. Referring to Figure 3, it can be seen that at the interface of the microcapsule 20 and the hose filament 12, the generally spherical shaped wall 22 of the microcapsule deforms into a substantially flat surface 32 which effectively bonds the microcapsule 20 to the hosiery 10. Subsequently, the hosiery 10 with the dispersion of capsules 20 thereon is dried at an elevated temperature and the capsule walls hardened around the fabric, thereby adhering each capsule to the hosiery 10. Alternatively, depositing of the capsules 20 may be accomplished by initially drying the capsules to form a powder-like substance and then spraying the capsules upon the hosiery 10 with a moderate, water insoluble adhesive.

The liquid depilatory agent is contained within the microcapsules 20 must be inert to the microcapsule wall material, and still reduce the disulfide cross-links of body hair, preferably without causing substantial irritation to the user's skin. Solutions having a moderate concentration of calcium thioglycolate or 1,4 dimercapto-2,3 butane diol have been found to be preferable over sulfate or sulhydrate solutions due to their non-obnoxious odor and non-skin irritant properties. Such calcium thioglycolate and dimercapto butane diol depilatories are disclosed in U.S. Patent No. 3,527,559 and U.S. Patent No. 3,865,546, respectively, which are incorporated herein by reference.

The automatic hair removing process of the present invention can now be described. Referring to Figure 2, it can be seen that the hosiery 10 is composed of length-wise and cross-wise extending nylon filaments 12 and 14, respectively, which form a looped fabric knit. Depending upon the desired sheerness, these filaments typically measure .003 to .012 of an inch in diameter.



-6-

The hosiery 10 is coated with a dispersion of microcapsules 20. A hair stubble 30 which initiates from a hair follicle (not shown) extends outward from the skin surface 16.

In use, the hosiery 10 is tightly worn over the user's skin 16 and is in direct contact with the hair stubble 30. Due to the outward protrusion of the hair stubble 30, increased pressure in the area adjacent the hair stubble 30 is exerted upon the outer walls 22 of the depilatory microcapsules 20. This pressure causes the walls 22 to rupture, thereby releasing the depilatory 18 in a localized area at the hair stubble 30. Upon contact with the hair stubble 30, the depilatory 18 immediately begins to reduce the disulfur cross-links of the hair and completely dissolves the stubble 30 within the normal course of wearing, for example, a day.

It is advantageous to select a microencapsulation material and thickness which ruptures in response to either abrasion by the hair stubble, or the increased pressure at the stubble but which will not ordinarily rupture when pressed against the user's skin.

As can be easily recognized, due to the hosiery being typically worn throughout the day, the hair removal process can extend over a period of hours, thereby allowing the user of a more moderate strength depilatory which is less irritating to the user's skin. Additionally, since the depilatory is only released in a localized area at the hair stubble, rather than over the entire leg area, these skin irritation effects are further reduced.

In the preferred embodiment, the hosiery is designed for single usage and is easily disposed of after wearing. However, with careful handwashing and air drying, multiple usage of the hosiery may be accomplished.

35





-7-

1. A device for automatically removing hair from the skin of a user including a fabric material worn tightly against the skin of a user, said device characterized by:

5 plural microcapsules attached to said fabric;  
a depilatory agent contained within said plural microcapsules; and  
said microcapsules rupturing and releasing  
said depilatory agent in a localized area surrounding  
10 a hair stubble in response to pressure exerted by  
said hair stubble against said microcapsules.

2. The device of Claim 1 further characterized in that said microcapsules each comprise a pressure sensitive thin shell.

15 3. The device of Claim 1 further characterized in that said depilatory agent chemically reduces the disulphur cross links of said hair stubble upon contact with said hair stubble.

4. The device of Claim 1 further characterized in  
20 that said depilatory agent removes said hair stubble without irritating the skin of the user.

5. The device of Claim 1 wherein said fabric material comprises a stocking worn against the skin of the user.

25 6. The device of Claim 2 further characterized in that said depilatory agent is inert with respect to said thin shell.

30



1 / 1

FIG. 1.

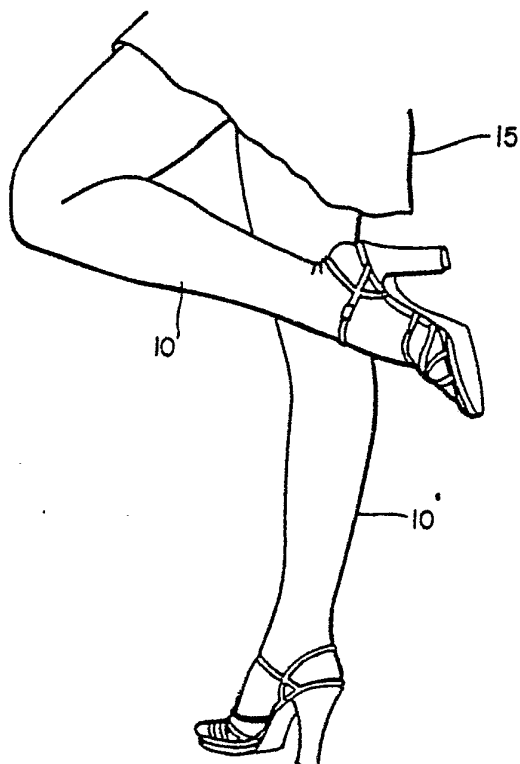


FIG. 2.

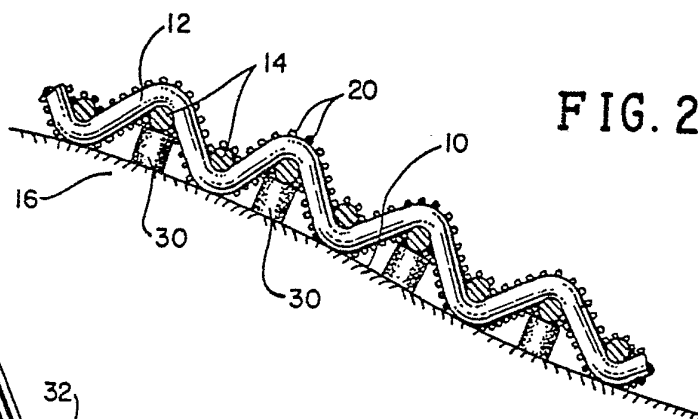
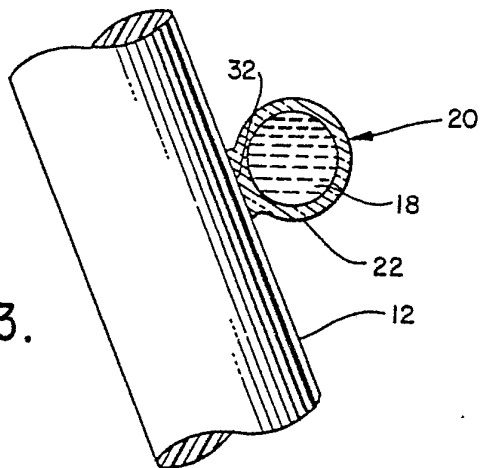


FIG. 3.



# INTERNATIONAL SEARCH REPORT

International Application No PCT/US79/00051

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>3</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC Int. Cl. A 41 B 11/00 U. S. Cl. 2/239; 2/409		
<i>no 79/000517</i>		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>4</sup>		
Classification System	Classification Symbols	
U.S.	2/239, 240, 409, 243R 128/355, 272.3, 272.R, 260 252/316; 8/161	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>5</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup>		
Category <sup>*</sup>	Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
X	US, A, 2,372,664 published 03 April 1945 Duane	1-6
X	US, A, 3,565,819 published 23 February 1971 Gragger	1-6
A	US, A, 3,470,877 published 07 October 1969 Morgan	1-6
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>*</sup> Special categories of cited documents: <sup>15</sup></p> <p>"A" document defining the general state of the art</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document cited for special reason other than those referred to in the other categories</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> </div> <div style="width: 45%;"> <p>"P" document published prior to the international filing date but on or after the priority date claimed</p> <p>"T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search <sup>2</sup>		Date of Mailing of this International Search Report <sup>2</sup>
22 May 1979		11 JUN 1979
International Searching Authority <sup>1</sup>		Signature of Authorized Officer <sup>20</sup>
ISA/US		