Internet에서 특허침해 정보찾기

- 면도날 제조업체 질레트(Gillette) -

특허청 심사3국 반용병 심사관

1. 서론

수많은 신문, 잡지, 저널에 소개되는 정보들을 접하다 보면, 너무 간략하기 때문에 더 많은 내용을 알고 싶은 욕구가 생길 때가 한 두 번이 아니다. 그러나 대부분이 요약된 듯한 내용 때문에 더 이상의 자료를 얻고자 노력해도 헛수고에 그친다. 이럴 때 세부적인 내용을 알아내서 전체적인 스토리를 이해해야만이 완전한 지식으로 만들 수가 있는데, 제한된 자료에 아쉬움만 남는 경우가 많다.

국내의 신문기사들이 지면상의 문제로 요약·보도하는 경우도 있지만, 전문잡지에서는 이것을 좀 폭넓게 조사해서 세부적이고 전문적으로 분석해주었으면 하는데, 국내에서는 이러한 경우는 거의 없다. 겨우 신문내용을 인용하는 정도에 그치는 것이 고작이다. 물론 속보가 중요하기는 하지만, 그외에 전문적인 잡지나 책에서는 심도 깊게 파헤쳐서 갈증을 풀어주어야 하는 것이 아닌가? 스스로 하는 일들이 없다. 다만 남의 것을 빼끼기에 급급하다.

아무튼 최근에 질레트(Gillette)사에 대한 특허침해판결이 보도되었다. 때를 맞추어서 상품광고도 TV에서 방영되는 것을 보았는데, 방영내용은 특허자체를 광고하는 신기술을 포함하고 있었다. 현재 침해로 판결되었는데도 불구하고, 광고는 새롭게 개발한 내용의 신기술내용을 담고 있으니 아이러니할 수밖에 없다. 침해사실을 모르는 일반소비자들은 질레트의 신기술로 오인할 수밖에 없고, 따라서 호기심에 물건을 살수도 있는 것이다. 실제는 신디아(Syndia)사의 특허권을 침해한 기술로 질레트는 배상을 할 위기에 처해 있는 실정이다. 그러나 미리 TV광고를 만들어 놓았고 그래서 잠시라도 방영을 해야하겠지만, 세계 최대의 면도날업체로서의 자존심은 망가질 수밖에 없는 것이다.

그러면 국내에서 보도한 짧은 글로부터 시작하여 추가적인 인터넷검색을 하

여 부족한 정보를 더 찾아봄으로 인해, 세부적인 기술내용까지 밝혀보는 것이 이번 글의 목적이다. 즉 관련된 특허의 번호가 과연 어떤 것이고 그 기술내용은 어떤 것이며, 나아가서는 배상은 어떻게 진행되고 있는 가를 인터넷상에서 찾아보자.

2. 질레트의 발명역사(?)

우선 질레트라는 회사를 모르는 남자 분들은 거의 없을 것입니다. 먼저 인터넷 검색을 통해 질레트라는 면도기가 어떻게 탄생했는 지를 찾아보도록 하겠습니다.

질레트는 매일 아침 면도를 해야만 하는 세일즈맨이었다. 그러나 어느 날 아침 무디어진 면도날로 얼굴을 벤다. 이 때 그에게 떠오른 생각이 쓰다가 칼날이 무디어지면 버리고 새것으로 갈아 끼우자는 것이었다. 면도에서 면도날을 분리시키는 분해와 대치의 아이디어였다. 그의 아이디어가 20세기 남성의 얼굴과 생각을 바꿔놓았다. (이어령)

19세기까지 남성 상징은 수염이었다. 그러나 20세기는 남성 얼굴에 수염이 없는 세기다. 이 같은 남성 혁명의 일등 공신은 인류 최초 안전 면도기를 발명한 킹 캠프 질레트(1855-1932)였다.

1901년 12월 2일 세일즈맨 출신 발명가 질레트는 동료 닉커슨과 공동으로 안전 면도기를 세상에 내놓았다. 1902년 대량 생산에 들어갔지만, 51개 면도기와 168개 면도날을 파는 데 그쳤다. 그러나 이듬해 질레트는 9만개 면도기와 1,240만개 면도날을 생산했다. 제1차 세계대전 당시 참호 속에서 생활했던 병사들에게 질레트 면도기가 지급됐고, 종전 후 귀환 병사들을 통해 본격적으로 대중화됐다. 오늘날 질레트사는 매일 1억2,000만명이 지구촌 각지에서 질레트 면도기를 사용한다고 자랑한다.

질레트 면도기는 세일즈맨의 시대인 20세기적 발명품이다. 질레트가 늘 깔끔한 용모를 유지해야하는 세일즈맨이었기에 편리하고 안전한 면도기를 꿈꾸었던 것. 하찮은 생활용품이지만 질레트 면도기에는 20세기 문명의 비밀이 숨어있다.

면도날을 언제든 갈아 끼울 수 있다는 것, 그것이 상징적으로 보여주는 것은 20세기적 분리-조립 시대의 정체성이다. 원래 동양은 전체를, 서양은 부분을 중시했다. 동양이 칼을 고집하고 있을 때 서양은 분해 조립되는 소총을 개발했다. 몸체와 부품이 분리되는 질레트 면도기는 그 같은 서양적 사고에서 나올 수밖에 없었다. 20세기가 부품 조립 생산 시대가 된 것은 질레트적 사고가 서양 사회에서 보편화된 결과다.

부품 사회는 '작은 것의 위대함'을 입증했다. 1920년대 미국에서 라디오 시대가 열렸다. 모든 전자 제품에 필수적인 회로 부품 '트랜스포머'(변압기/ 1879년 발명)가 실용화됐기에 가능했다. 한국인은 40년대에야 트랜스포머를 처음 만났다. 소형 모터 등장은 세탁기, 냉장고, 전자레인지, 컴퓨터, 호출기 생산을 촉진시켰다.

질레트 면도기가 발명된 해에 인스턴트 커피도 처음 등장했다. 소비자가 숙련된 솜씨 없이 사용할 수 있는 상품 시대가 열렸다. 초창기 질레트 면도기 광고는 갓난 아이가 면도하는 그림이었다. 질레트 면도기는 인류에게 '대체' 개념도 불어넣었다. 오늘날 장기 이식 수술은 그 같은 '대체 문명'의 최정점을 보여준다.

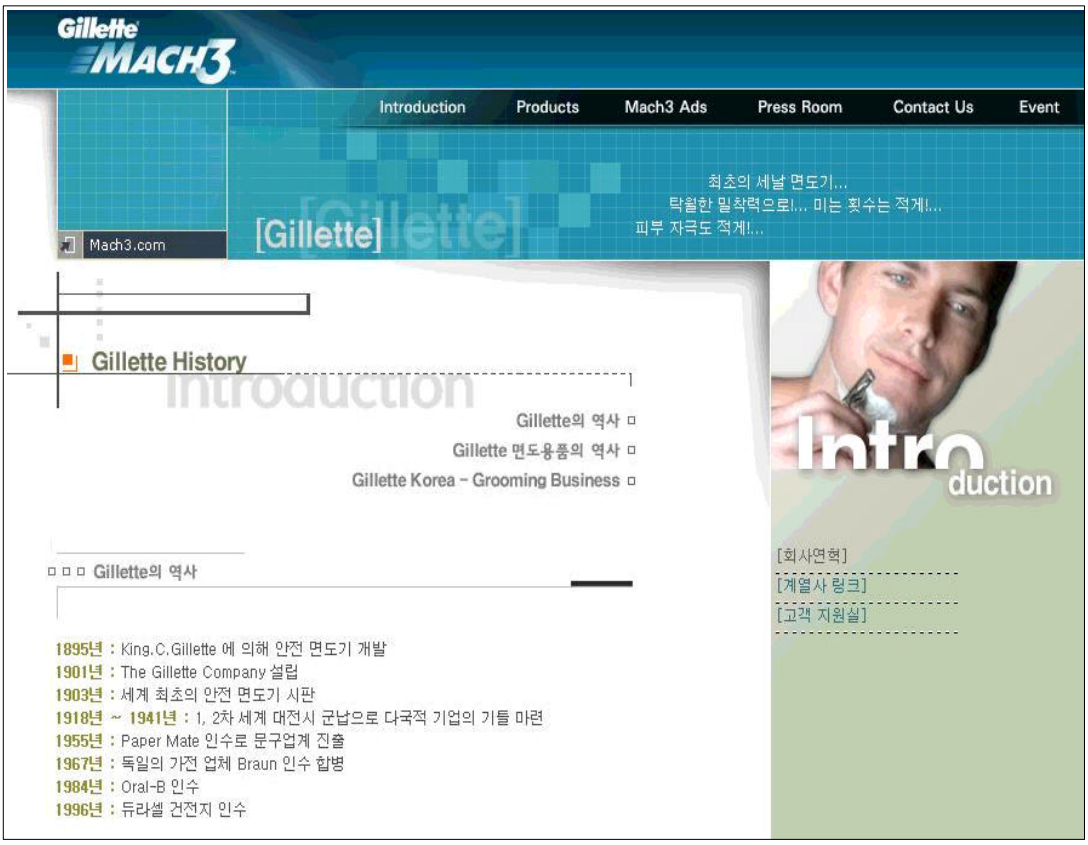
질레트는 면도기 발명가로만 생애를 마치지 않았다. 공상적 사회주의자였던 그는 '민중의 협동'(1924)이란 책을 통해 경쟁은 비합리적이라면서 민중이 모두 주주로 참여하는 거대 회사를 통해 제품을 생산하는 경제 체제를 주장했다. 하지만 그의 이상주의는 면도기만큼 인기를 얻지 못했고, 그 책은 일회용품처럼 잊혀졌다. (http:/ / arcady.com.ne.kr/ adieu/ out/ b10.htm)

질레트의 홈페이지를 살펴보면 이 회사의 특징과 제품등을 알 수가 있다. 국내에서는 www.mach3.co.kr을 방문하면 되는데, 이곳을 구석구석 살펴보면 다음과 같은 내용을 발견할 수 있다. Contac Us - FAQ 중에서 04 에는...

*04 CLD(**다이아몬드 카본 코팅 공법**) **날 처리 기술이란 무엇이며, 왜 중요합니까**?*

ANSWER : **더욱 우수한 면도 성능을 제공하기 위해 질레트는 30년 만에 처음으로 면도날을 근본적으로 리엔지니어링 했습니다. 10년에 걸쳐 개발된 이 특허 기술은 질레트가 기존의 질레트 면도날보다 끝이 더 얇은 면도날을 생산하고 이 날 끝에 강도와 안정성을 제공하는 독자적인 코팅을 입힐 수 있게 해주었습니다. 그 결과 더 쉽게 수염을 깎아주는 전혀 새로운 면도날이 탄생하게 되었습니다. 마하3 이용자들은 면도기를 끌고 잡아당기는 동작이 줄어들어 매우 편안한 면도를 경험할 수 있게 되었습니다**

과연 이 다이아몬드 카본 코팅 공법이 질레트의 기술인가? 이 홈페이지에서는 자신만의 기술이며, 특허를 가지고 있다고 홍보하고 있지는 않다. 그렇치만 다음의 특허분쟁보도기사를 살펴보면 명백한 침해이다.



3. 국내외보도기사 및 인터넷 검색

질레트 특허침해 혐의로 유죄 판결
[속보, 세계] 2002년 06월 19일 (수) 09:05

발빠른 속보다. 하지만 허점 투성이다. 왜냐면 기사를 읽고나서 모르는 부분이 더 생긴 것이다. 궁금증을 풀어주어야 하는 데, 오히려 이 기사를 읽고나서 더 혼란에 빠지게 되고 모르는 것이 더 많아진 느낌이다.

이 기사를 보는 순간, 다음과 같은 의문이 들었다.

(1) 신디아(Syndia)라는 회사는 어떤 회사인가?
(2) 어떤 코팅기술이며, 구체적으로는 어떻게 침해했는가?
(3) 관련특허번호는 무엇인가?
(4) 시카고 연방법원의 구체적인 판결내용을 입수 할 수 있나?
(5) 개인발명가 제롬 레멀슨은 누구인가?

우선 이 기사의 원문이 될 수 있는 외국의 보도내용을 찾아보기로 했다. 정확하지는 않지만 다음 사이트의 내용과 동일하다고 볼 수 있다. 원문을 찾아내기 위해서는 www.lycos.com을 이용하였으며, 영어 키워드를 사용했다.
(http:/ / www.businesstoday.com/ business/ business/ gil06192002.htm)

Gillette must pay $10M patent judgment

by Greg Gatlin
Wednesday, June 19, 2002

A federal jury in Chicago has told Gillette Co. to pay patent company Syndia Corp. $10 million for infringing patents that cover a method for coating razor blades, a verdict Gillette says it will fight.

Syndia, a Chicago company that develops and markets products based on the patent portfolio of prolific inventor Jerome Lemelson, said it may ask U.S. District Court Judge Joan Lefkow to block Gillette from selling its Mach3 Turbo, Venus and other razor blades. Gillette said it doesn't expect any material impact on its business under any foreseeable outcome.

``The jury's findings do not prevent Gillette from manufacturing any of its blade and razor products,'' including Mach3 products, Gillette said in a statement.

Gillette, based in Boston, said it will immediately file a motion asking Lefkow to set aside the jury's findings, and it's prepared to appeal the verdict. The jury found two patents were infringed by Gillette's process of making coated razor blades.

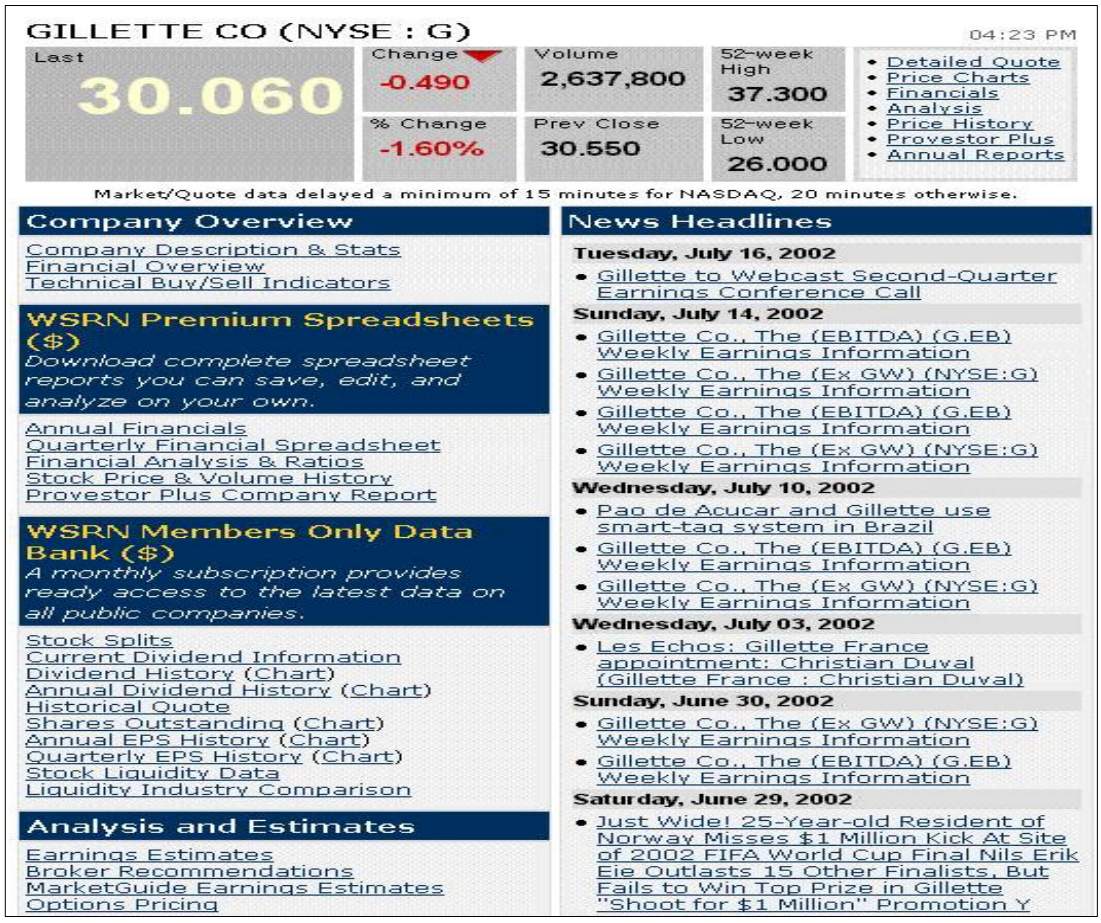
Gillette argued that Syndia's patent, covering a method for covering razor blades with diamondlike carbon to make them stronger, was invalid. Gillette yesterday called it ``a highly technical matter involving plasma physics and hard coatings on metal products.'' It said Syndia had

dropped two of four patent claims brought against Gillette. Syndia sent letters to about 250 other U.S. manufacturers seeking licensing deals for its various patents, Gillette said.

여기서 우리가 추가적으로 더 알아낼 수 있는 것은 다음과 같은데, 빨간색으로 표시한 부분이 이에 해당한다.

(1) 판사의 이름이 Joan Lefkow 라는 것이다.
(2) 질레트는 보스톤에 있다.
(3) 판사는 2개의 특허가 침해했다고 판단했다.
(2) 특허청구범위에 대한 구체적인 언급이 있다.

그러면 2개 특허의 등록번호가 무엇이며, 신디아의 기술은 어떤 것이고 왜 침해를 했는 지 이 기사로는 알 수가 없다. 또 다시 검색엔진을 사용하여 조사해 보았다. 우선 질레트 회사의 월스트리트 리서치 넷 정보를 살펴보자.



GILLETTE CO (NYSE : G)

04:23 PM

Last	Change	Volume	52-week High
30.060	-0.490	2,637,800	37.300
	% Change	Prev Close	52-week Low
	-1.60%	30.550	26.000

- Detailed Quote
- Price Charts
- Financials
- Analysis
- Price History
- Provestor Plus
- Annual Reports

Market/Quote data delayed a minimum of 15 minutes for NASDAQ, 20 minutes otherwise.

Company Overview

Company Description & Stats
Financial Overview
Technical Buy/Sell Indicators

WSRN Premium Spreadsheets ($)
Download complete spreadsheet reports you can save, edit, and analyze on your own.

Annual Financials
Quarterly Financial Spreadsheet
Financial Analysis & Ratios
Stock Price & Volume History
Provestor Plus Company Report

WSRN Members Only Data Bank ($)
A monthly subscription provides ready access to the latest data on all public companies.

Stock Splits
Current Dividend Information
Dividend History (Chart)
Annual Dividend History (Chart)
Historical Quote
Shares Outstanding (Chart)
Annual EPS History (Chart)
Quarterly EPS History (Chart)
Stock Liquidity Data
Liquidity Industry Comparison

Analysis and Estimates

Earnings Estimates
Broker Recommendations
MarketGuide Earnings Estimates
Options Pricing

News Headlines

Tuesday, July 16, 2002
- Gillette to Webcast Second-Quarter Earnings Conference Call

Sunday, July 14, 2002
- Gillette Co., The (EBITDA) (G.EB) Weekly Earnings Information
- Gillette Co., The (Ex GW) (NYSE:G) Weekly Earnings Information
- Gillette Co., The (EBITDA) (G.EB) Weekly Earnings Information
- Gillette Co., The (Ex GW) (NYSE:G) Weekly Earnings Information

Wednesday, July 10, 2002
- Pao de Acucar and Gillette use smart-tag system in Brazil
- Gillette Co., The (EBITDA) (G.EB) Weekly Earnings Information
- Gillette Co., The (Ex GW) (NYSE:G) Weekly Earnings Information

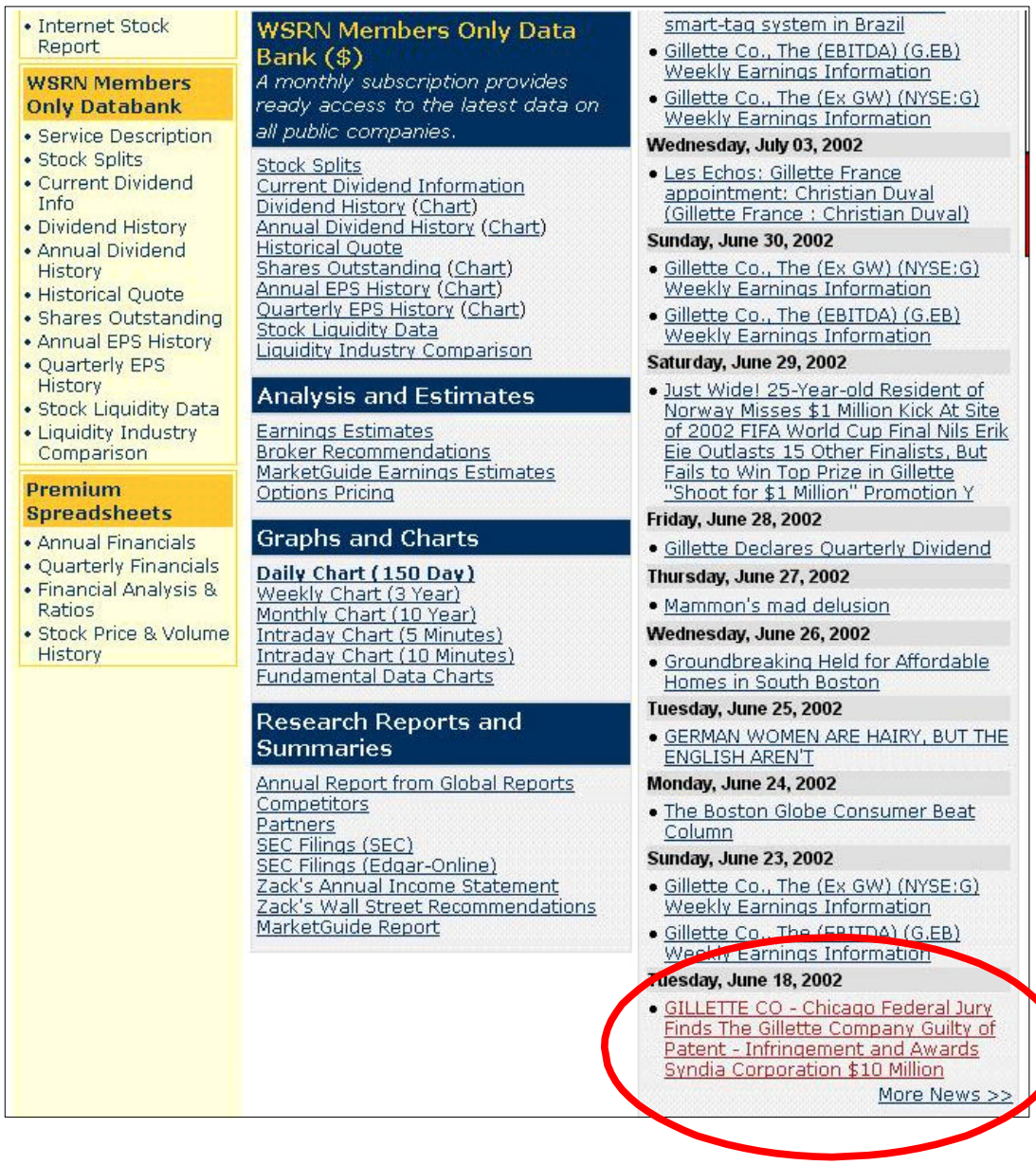
Wednesday, July 03, 2002
- Les Echos: Gillette France appointment: Christian Duval (Gillette France : Christian Duval)

Sunday, June 30, 2002
- Gillette Co., The (Ex GW) (NYSE:G) Weekly Earnings Information
- Gillette Co., The (EBITDA) (G.EB) Weekly Earnings Information

Saturday, June 29, 2002
- Just Wide! 25-Year-old Resident of Norway Misses $1 Million Kick At Site of 2002 FIFA World Cup Final Nils Erik Eie Outlasts 15 Other Finalists, But Fails to Win Top Prize in Gillette "Shoot for $1 Million" Promotion Y

http://www.wsrn.com/apps/links/index.xpl?s=G에서 보면 회사의 개요, 재정상태, 제품등등의 많은 정보를 알 수가 있으며, 특히 회사관련 기사(News Headline)를 우측에 날짜별로 제공하고 있다.

이 날짜를 자세히 살펴보면, 특허침해에 관한 기사를 발견하게 된다. 빨간색의 원으로 표시하였다.



이 내용을 클릭 해보면 아래와 같은 기사가 제공되는 데, 자세히 읽어보면 더 많은 정보를 입수할 수 있다. 특히 관련 특허가 미국 U.S. Patent No. 4,702,808 (Claims 12 & 17) 와 U.S. Patent No. 4,874,596 (Claim 18)이라는 것이 알게 되었으며, 신디아라는 회사명이 무슨 뜻인지도 알게 되는 등 많은 정보를 더 입수하게 되었다. 아래내용에서 빨간색으로 표시한 부분들이 추가적으로 알게된 정보이다.

GILLETTE CO - Chicago Federal Jury Finds The Gillette Company Guilty of Patent - Infringement and Awards Syndia Corporation $10 Million

Tuesday, June 18, 2002 04:11:23 PM - Market News Publishing

New York, New York, Jun 18, 2002 (Market News Publishing via COMTEX) -- Permanent Injunctive Relief Contemplated Against Future Sales of Mach3, Mach3 Turbo, and venus Razor Blades

In patent litigation brought by Syndia Corporation against The Gillette Company, a Chicago federal jury rendered a verdict in Syndia's favor on all issues of liability, validity, and damages. In its verdict, the jury unanimously found that Gillette's process of manufacturing its "DLC"-coated razor blades for the Mach3, Mach3 Turbo, and Venus products infringes U.S. Patent No. 4,702,808 (Claims 12 & 17) and U.S. Patent No. 4,874,596 (Claim 18). The '808 and '596 patents were issued to the late Jerome H. Lemelson and are now owned by Syndia Corporation, which is headquartered in Chicago. The patents cover Gillette's process of coating its razor blades with diamond-like carbon, or DLC, which permits Gillette to make thinner, yet stronger blades. The jury also rejected Gillette's defense that the '808 patent was invalid based on the prior art. In an important development prior to trial, Gillette abandoned a number of defenses which previously had been asserted by manufacturers of bar coding equipment against certain of Mr. Lemelson's other patents, including the defense of prosecution history laches.

The jury awarded Syndia $10 million in damages for past infringement. Damages and injunctive relief for any future infringement by Gillette have yet to be finally determined. Syndia's attorneys have indicated that they intend to seek permanent injunctive relief against Gillette barring future sales of Mach3, Mach3 Turbo, and Venus products if Gillette does not agree to a license from Syndia covering future sales of its DLC-coated razor blade products.

Syndia filed suit against Gillette on April 9, 2001 and the jury trial was presided over by U.S. District Judge Joan Humphrey Lefkow between May 15, 2002 and June 14, 2002. Ed Foote and Peter McCabe of the Chicago law firm of Winston & Strawn led Syndia's legal team. Gillette was represented by the patent firm of Fish & Neave, of New York City.

Entrepreneur Roger Hickey, Professor James Conley of Northwestern University, and the late inventor Jerome Lemelson founded Syndia in 1994. Initially founded with 16 patents, Syndia (an acronym for synthetic diamond) now owns 33 patents with broad applications in synthetic diamond, chemical vapor deposition, and other coating technologies used throughout the electronics, semiconductor, and other industries.

For further information, contact Syndia's president Roger Hickey at (312) 251-5910 or Peter McCabe of Winston & Strawn at (312) 558-5954.

CONTACT:
TEL: 312/ 251-4400 FAX: 312/ 251-5201 Syndia Corporation
Roger P. Hickey, Hickey@chipar.com

새로운 추가 정보를 정리해 보면 다음과 같다.
(1) **관련특허정보** US Patent No. 4,702,808 **와** US Patent No. 4,874,596.
(2) 2001.4.9.**에 질레트를 상대로 특허침해소송을 하였다. 이때 사건담당 판사와** Law Firm **회사명을 알 수 있다.**

(3) 신디아라는 회사를 1994년에 설립하였고 설립자는 Roger Hickey(현재 사장이다)와 Jerome Lemelson 이고 16개의 특허로 시작해서 현재는 33개의 반도체 및 전기전자분야에 응용되는 합성다이어몬드, 화학적 증착, 코팅 기술관련 특허를 가지고 있다.
(4) Syndia는 Synthetic Diamond의 합성어이다.

마지막으로 미국특허원문을 www.uspto.gov(Patent Number Search)에서 2개 특허를 찾아서 Gillette의 특허내용과 비교해서 세부기술내용을 살펴보았다. 막연히 생각하기에는 Gillette는 면도기에 관한 것이고 Syndia는 다이어몬드 증착 코팅기술에 관한 것인데, 어떻게 해서 서로 침해를 하게 되었는가? 일반적으로는 같은 제품류에서 특허분쟁 또는 침해사건이 발생하는 데, 이 경우에는 원천기술(다이아몬드 코팅기술)을 질레트가 면도기날에 응용한 점이 침해로 인정된다는 결론이었던 것이다. 즉 원천기술의 중요성을 다시 한번 일깨워준 사례라고 볼 수 있다.

참고로 Gillette는 마하3에 관련된 특허, diamond-like carbon coating(DLC) 기술을 이용한 기술을 출원하지 않았을까? 궁금해졌다. 그래서 특허검색을 해 본 결과 여러 개의 특허가 있었으나, 그중 US Patent 5,799,549호가 제일 적합한 것으로 판단되었는 데, 이는 필자의 개인적인 생각이다. 즉 이 특허를 살펴보면 Lemelson의 화학적 증착기술(Syndia)을 Gillette 면도기날에 응용하였다는 것이 쉽게 알 수가 있다. 다만 원천기술을 면도기날에 응용하게 된 사실에 새로운 구성의 차이는 없나? 발명자 Lemelson은 그 당시 이러한 기술이 면도기날에 적용되리라고는 생각조차도 안했을 것으로 추측되는데, 이를 면도기날에 적용한 Gillette의 특허는 어는 정도 인정가능한 것이 아닌가? 단지 Syndia의 특허를 침해한 것이지 Gillette의 특허 5,799,549호 자체가 무효가 된 것은 아니니까, 특허성에 대한 논란은 추후에 남겨 놓자.

Syndia 특허	Gillette 특허
USP 4,702,808 (Claims 12 & 17) USP 4,874,596 (Claim 18).	필자가 검색을 통해서 찾아낸 특허로 신문기사등에서 언급된 내용은 아님. 다만 Syndia의 특허기술이 포함되어 있는 Gillette 특허를 찾아 본 것에 지나지 아니함(USP 5,799,549호)

Syndia(Lemelson) USP 4,702,808호

United States Patent [19]

Lemelson

[11] **Patent Number: 4,702,808**

[45] **Date of Patent: Oct. 27, 1987**

[54] **CHEMICAL REACTION APPARATUS AND METHOD**

[76] Inventor: **Jerome H. Lemelson**, 85 Rector St., Metuchen, N.J. 08840

[21] Appl. No.: **712,411**

[22] Filed: **Mar. 15, 1985**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 592,968, Mar. 23, 1984, Pat. No. 4,666,678, and a continuation of Ser. No. 737,446, Oct. 29, 1976, which is a continuation of Ser. No. 165,445, Jul. 26, 1971, abandoned, and a continuation-in-part of Ser. No. 12,082, Feb. 17, 1970, abandoned, which is a continuation-in-part of Ser. No. 710,518, Mar. 5, 1968, Pat. No. 3,566,645, which is a continuation-in-part of Ser. No. 501,395, Oct. 22, 1965, Pat. No. 3,371,404, which is a continuation-in-part of Ser. No. 668,561, Jun. 27, 1957, abandoned.

[51] **Int. Cl.**⁴ **B01J 19/12**

[52] **U.S. Cl.** **204/157.41**; 204/157.42; 204/157.61; 204/157.62; 422/186

[58] **Field of Search** ..... 204/157.1 R, 157.1 L, 204/158 R, 158 L, 193, 157.41, 157.42, 157.62, 157.61; 422/186

[56] **References Cited**

U.S. PATENT DOCUMENTS

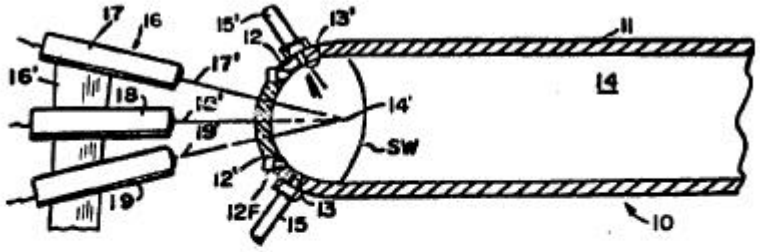
3,405,045	10/1968	Hoskins	204/158 L
3,528,897	9/1970	Scheiner	204/158 L
4,012,301	3/1977	Rich et al.	204/158 L

Primary Examiner—Howard S. Williams

[57] **ABSTRACT**

This invention concerns an apparatus and method for reacting on matter, particularly to change its chemical properties and to create chemical reactions with respect to such matter by introducing the matter into a reaction chamber as one or more streams of particles, gas, liquid or plasma or a combination of such forms of matter and reacting on such matter by directing one or more beams of radiant energy, such as coherent light energy generated by a laser or a plurality of lasers wherein such radiant energy serves to initiate or complete the desired chemical reaction.

20 Claims, 12 Drawing Figures



which receive the molten particles. Such deposition may be accompanied by a chemical reaction between the fluid of the stream and either or both the molten particles or material of the substrate on which the particles are deposited. In addition to depositing, the operation may include machining or eroding material from the substrate.

What is claimed is:

1. Chemical reaction apparatus comprising in combination:

(a) first means for forming a first stream of first matter and flowing said first matter in a given direction along a selected path,

(b) second means for generating a beam of collimated coherent radiation,

(c) third means for directing said collimated radiation beam along a path to cause it to intersect said stream of matter and to transfer sufficient energy of said beam to a quantity of said matter so as to effect a chemical change in said matter,

(d) fourth means for controlling the conveyance of said first matter after it has undergone a reaction as a result of the transfer of energy thereto from said radiation beam to carry the products of reaction to a select location.

2. Chemical reaction apparatus in accordance with claim 1 wherein said first means is operable to direct said beam at an angle to the path said first matter is conveyed along.

3. Chemical reaction apparatus in accordance with claim 1 wherein said third means is operable to direct said beam in the direction of said first stream and parallel to the path of flow of said first matter.

4. Chemical reaction apparatus in accordance with claim 1 including fifth means for forming a second stream of second matter which is different from said first matter and causing said second stream of second matter to intersect, mix and flow with the first matter in said first stream at a location upstream of the location where said beam intersects said stream of first matter so as to permit said beam to react on the mixture of said first and second matter.

5. Chemical reaction apparatus in accordance with claim 4 including sixth and seventh means for respectively controlling the operation of said first and fifth means to control the flow of said streams of said first and second matter and master control means operable to selectively control the operation of said sixth and seventh means in effecting a chemical reaction.

6. Chemical reaction apparatus in accordance with claim 1 including fifth means for forming a second stream of second matter which is different from said first matter and causing said second stream of second matter to intersect the stream of said first matter at the location where said beam intersects said first matter so as to permit said second matter to combine with said first matter and to partake in a reaction effected by said beam of collimated radiation.

7. Chemical reaction apparatus in accordance with claim 1 including fifth means for controlling the rate of flow of said stream of said first matter, sixth means for controlling said second means to generate said beam of coherent radiation, and master control means connected to said fifth and sixth means in a manner to control the chemical reaction effected by said beam when it reacts on the matter flowing in said first stream.

8. Chemical reaction apparatus in accordance with claim 7 wherein said sixth means is operable to control said second means to cause it to generate pulses of coherent beam radiation which are intermittently directed to intersect said stream of said first matter, said master control means being operable to control the timing of the radiation pulses generated during the operation of said second means.

9. Chemical reaction apparatus in accordance with claim 1 wherein said first means is operable for forming and flowing a stream of gas defining at least part of said first matter.

10. Chemical reaction apparatus in accordance with claim 1 wherein said first means is operable to form said stream of said first matter as a gas or vapor, and dispose particles of solid matter therein to define said first stream of matter.

11. Chemical reaction apparatus in accordance with claim 1 wherein said first means is operable to intermittently form and direct matter defining said first stream along said predetermined path.

12. A method for creating a chemical reaction comprising:

controllably directing a fluid as a stream of fluent material along a select path, which path intersects a reaction zone, so as to present molecules of said fluent material in a flow thereof through said reaction zone, and

as said fluent material passes through said reaction zone, generating and directing a collimated beam of intense radiation along a path which intersects said reaction zone such that the radiation of said beam passes through said reaction zone while molecules of said fluid are present in said reaction zone and transferring sufficient radiation from said beam to said molecules while in said reaction zone to cause said molecules to partake in a chemical reaction while located in said reaction zone.

13. A method in accordance with claim 12 wherein said fluid is continuously flowed at a constant rate of flow to and through said reaction zone.

14. A method in accordance with claim 13 wherein said radiation beam is generated for an extended period of time while fluid is flowing through said reaction zone.

15. A method in accordance with claim 12 wherein said fluid is flowed intermittently to said reaction zone.

16. A method in accordance with claim 15 wherein said radiation beam is generated intermittently in a manner to intersect respective quantities of said flow which are intermittently flowed to said reaction zone.

17. A method for creating a chemical reaction comprising:

(a) generating a beam of collimated radiation having sufficient intensity and energy for effecting a chemical reaction with respect to matter when said beam is caused to intersect said matter and directing said beam along a select path,

(b) controllably flowing a stream of fluent material containing particles of matter along at least a portion of the select path along which said beam is directed, such that radiation of said beam will be transferred to particles of said matter during a substantial portion of the travel of said particles along said select path, and

(c) causing radiation of said collimated beam to react on said particles in said stream as said particles travel said select path and to change the state of said particles and cause said particles to partake in a chemical reaction.

Syndia(Lemelson) USP 4,874,596호

United States Patent [19]

Lemelson

[11] **Patent Number: 4,874,596**

[45] **Date of Patent: Oct. 17, 1989**

[54] **PRODUCTION OF CRYSTALLINE STRUCTURES**

[76] Inventor: **Jerome H. Lemelson**, 85 Rector St., Metuchen, N.J. 08840

[21] Appl. No.: **625,197**

[22] Filed: **Jun. 28, 1984**

Related U.S. Application Data

[63] Continuation of Ser. No. 302,644, Sep. 15, 1981, abandoned, which is a continuation-in-part of Ser. No. 110,477, Jan. 8, 1980, abandoned, which is a continuation of Ser. No. 815,692, Jul. 14, 1977, abandoned, which is a continuation of Ser. No. 547,733, Feb. 6, 1975, which is a continuation-in-part of Ser. No. 93,779, Nov. 30, 1970, Pat. No. 4,207,154, said Ser. No. 302,644, is a continuation-in-part of Ser. No. 74,388, Sep. 10, 1979, Pat. No. 4,385,880, Ser. No. 958,514, Nov. 7, 1978, abandoned, and Ser. No. 165,445, Jul. 26, 1971, which is a continuation of Ser. No. 710,517, Mar. 5, 1970, which is a continuation of Ser. No. 501,695, Oct. 22, 1965.

[51] **Int. Cl.**[4] **B01J 3/06**; G21B 1/00

[52] **U.S. Cl.** **423/446**; 376/103; 376/146; 376/152; 423/659; 423/DIG. 11; 219/121.85; 204/157.15

[58] **Field of Search** ..... 376/101, 103, 105, 146, 376/152; 219/121 L, 121 LM; 204/157.15; 423/446, 659, DIG. 11

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,793,282	5/1957	Steigerwald	219/121.1 L
2,861,166	11/1958	Cargill, Jr.	219/121 LM
2,968,723	1/1961	Steigerwald .	
3,207,582	9/1965	Inoue	423/446
3,346,458	10/1967	Schmidt	176/1
3,378,446	4/1968	Whittlesey	176/1
3,489,645	1/1970	Darber et al.	176/1
3,702,573	11/1972	Nemeth	423/446 X
3,714,332	1/1973	Rasquin et al.	423/446
3,967,215	6/1976	Beliak	176/9
4,161,436	7/1979	Gould .	
4,228,142	10/1980	Holcombe, Jr. et al.	423/446 X

FOREIGN PATENT DOCUMENTS

1061592	4/1954	France .	
1240668	8/1960	France	176/1
7244438	11/1972	Japan	423/446
106513	7/1982	Japan	423/446
195094	10/1985	Japan	423/446
774052	5/1957	United Kingdom	176/1
825026	12/1959	United Kingdom	176/1
841387	7/1960	United Kingdom	176/1
1482526	8/1977	United Kingdom	376/101

OTHER PUBLICATIONS

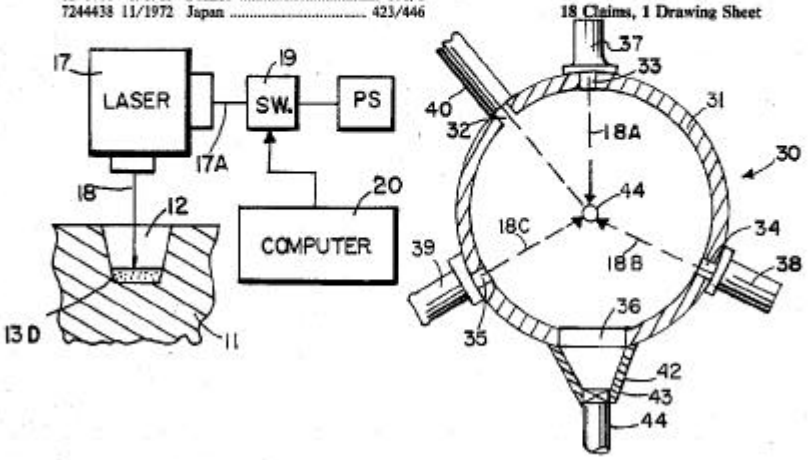
Physics Todsy, Aug. 1973, pp. 46-53, Nuckolls et al., "Laser Induced Thermonuclear Fusion".
Trans. of the A.N.S., 6/77, pp. 12-15.

Primary Examiner—John S. Maples

[57] **ABSTRACT**

An apparatus and method for reacting on material by means of intense radiation employed to change the physical and, in certain instances, the chemical characteristics of such material. In one form, an intense radiation beam is directed into a cavity of a die or support for a small quantity of material to be reacted on and the intense heat of the beam as well as the shock wave generated in the material in the die cavity by the rapid heat of the beam react on such material to change its physical characteristics. In another form, two or more intense radiation beams, such as generated by one or more lasers or electron guns as intense pulses of radiation, are directed against a particle or pellet of material directed along a predetermined path into a reaction chamber, intensely heat and transmit shock wave energy thereto from opposite directions which shock waves collapse against the material transforming it into another form. In still another form of the invention, pellets or small containers of material to be reacted on are supported by filaments, rods or other structures disposed in a reaction chamber and are reacted on by one or more intense radiation beams. In yet another form, one or more intense pulses of radiation are directed against a solid member compressing a quantity of material in a die and generate one or more shock waves in such solid member which are transmitted therethrough to the compressed material. The pellet or particles may comprise carbon which is converted to diamond by the intense heat and force of the shock wave or shock waves or other material including such other material mixed with carbon.

18 Claims, 1 Drawing Sheet



containing material against said operating surface portion and simultaneously forming said hard diamond-like material from carbon thereof and bonding said diamond-like material to said operating surface portion of said die.

18. A method of forming a composite article having a hard wear resistant surface portion comprising:

disposing a carbon containing material against a surface of an article defined by a solid substrate and adapted to form part of a composite article,

generating and directing intense radiation against said carbon containing material disposed against the surface of said article, and

heating said carbon containing material and said substrate with said intense radiation while said carbon containing material is disposed adjacent said surface of said article in a manner to effect the conversion of at least a portion of said carbon containing material to a hard diamond-like material while it is disposed against the surface of said article so as to form a hard stratum of said diamond-like material on said surface, and

bonding said diamond-like material to the surface of said substrate to form a composite article of said substrate and said diamond-like material wherein said diamond-like material forms at least a portion of the surface of said composite article.

* * * * *

Gillette USP 5,799,549호

US005799549A

United States Patent [19]

Decker et al.

[11] Patent Number: 5,799,549

[45] Date of Patent: Sep. 1, 1998

[54] **AMORPHOUS DIAMOND COATING OF BLADES**

[75] Inventors: **Thomas G. Decker**, Arlington, Mass.; **Gregory P. Lundie**, Westminster, Colo.; **David L. Pappas**, Waltham, Mass.; **Richard P. Welty**, Boulder, Colo.; **C. Robert Parent**, Westwood, Mass.

[73] Assignee: **The Gillette Company**, Boston, Mass.

[21] Appl. No.: **825,405**

[22] Filed: **Mar. 27, 1997**

Related U.S. Application Data

[63] Continuation of Ser. No. 232,928, Apr. 25, 1994, abandoned.

[51] **Int. Cl.**[6] **B26B 21/30**

[52] **U.S. Cl.** **76/104.1**; 30/346.54; 76/DIG. 8

[58] **Field of Search** 76/101.1, 104.1, 76/DIG. 8; 30/346.54

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,720,918	1/1988	Curry et al.	30/346.55
4,724,058	2/1988	Morrison .	
4,933,058	6/1990	Bache et al.	204/192.3
5,032,243	7/1991	Bache et al.	204/192.34
5,037,522	8/1991	Vergason .	
5,088,202	2/1992	Boland et al.	30/346.54
5,129,289	7/1992	Boland et al.	76/104.1
5,142,785	9/1992	Grewal et al.	30/32
5,232,568	8/1993	Parent et al.	204/192.3
5,279,723	1/1994	Falabella et al.	204/192.38
5,295,305	3/1994	Hahn et al.	30/50

FOREIGN PATENT DOCUMENTS

A-0 207 467	1/1987	European Pat. Off. .
A-0 509 875	10/1992	European Pat. Off. .
1097839	4/1989	Japan .
WO 87/04471	7/1987	WIPO .
WO 93/09921	5/1993	WIPO .

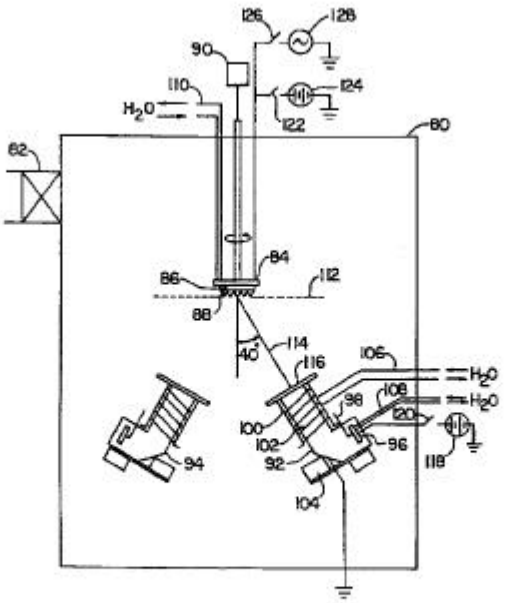
Primary Examiner—Douglas D. Watts

Attorney, Agent, or Firm—Davis, Graham & Stubbs

[57] **ABSTRACT**

Improved razors and razor blades and processes for producing razor blades or similar cutting tools with sharp and durable cutting edges, by hard-carbon coating of blades with amorphous diamond, preferably using a filtered cathodic arc plasma source. A coating of amorphous diamond having at least 40 percent sp3 carbon bonding, a hardness of at least 45 gigapascals and a modulus of at least 400 gigapascals is applied to the sharpened edge of a substrate. The substrate may be mechanically honed, and there is no interlayer between the substrate and the amorphous diamond coating. The coating imparts stiffness and rigidity to a thin blade while maintaining a high aspect ratio.

13 Claims, 2 Drawing Sheets



AMORPHOUS DIAMOND COATING OF BLADES

This application is a continuation of application Ser. No. 08/232,928, filed on Apr. 25, 1994 now abandoned.

FIELD OF THE INVENTION

This invention relates to improved razors and razor blades and to processes for producing razor blades or similar cutting tools with sharp and durable cutting edges, and in particular to amorphous diamond coating of blades using a filtered cathodic arc plasma source. The invention has particular utility for forming a very hard and rigid coating of high aspect ratio on very thin cutting edges of razor blades.

BACKGROUND OF THE INVENTION

A razor blade typically is formed of suitable substrate material such as metal or ceramic, and an edge is formed with wedge-shape configuration with an ultimate edge or tip that has a radius of less than about 1,000 angstroms, the wedge shaped surfaces having an included angle of less than 30°. As shaving action is severe and blade edge damage frequently results and to enhance shavability, the use of one or more layers of supplemental coating material has been proposed for shave facilitation, and/or to increase the hardness and/or corrosion resistance of the shaving edge.

A number of such coating materials have been proposed, such as polymeric materials and metals, as well as other materials including diamond-like carbon (DLC) material. Each such layer or layers of supplemental material must have adhesion compatibility so that each layer remains firmly adhered to the substrate throughout the useful life of the razor blade, and desirably provide characteristics such as improved shavability, improved hardness and/or corrosion resistance while not adversely affecting the geometry and cutting effectiveness of the shaving edge.

U.S. Pat. No. 5,032,243 of Bache et al. describes blade substrate materials sharpened by ion bombardment from ion sources having the axes of their beams directed at the edges of the razor blades. U.S. Pat. No. 5,232,568 of Parent et al. and U.S. Pat. No. 5,295,305 of Hahn et al. show blades which have an interlayer interposed between the substrate and the diamond-like coating, wherein the interlayer is deposited on the substrate and then the diamond-like coating is deposited on the interlayer.

The prior solutions are not entirely successful, and it would be desirable simply to use mechanical honing processes to form the sharpened substrate (rather than the ion beam formation shown in Bache et al.) followed by a direct deposition of amorphous diamond coating on the substrate (without the intervening step of depositing an interlayer). It would be desirable, therefore, to be able to start with a thin blade substrate produced by mechanical honing and to impart both rigidity and hardness to the substrate by depositing an amorphous diamond coating directly on the substrate.

SUMMARY OF THE INVENTION

According to this invention, the cutting edges of razor blades are provided with improved mechanical properties by applying to the sharpened edge of the substrate a coating of an amorphous diamond material. Such materials may be characterized as having at least 40 percent sp3 carbon bonding, a hardness of at least 45 gigapascals and a modulus of at least 400 gigapascals. In addition, such materials are not corroded by hot aqueous solutions and compounds commonly used in shaving. Materials having these characteristics will be denoted as amorphous diamond in the further course of this disclosure. In contrast to the amorphous diamond material of this invention, traditional diamond-like carbon coatings (DLC) produced by such traditional methods as sputtering do not exhibit such high hardnesses. Unlike the amorphous diamond of this disclosure, DLC coatings typically have hardnesses not exceeding 30 gigapascals.

The extreme hardness and rigidity of the applied amorphous diamond coating can provide strength to a very thin razor blade edge. U.S. Pat. No. 4,720,918 of Curry et al. describes edges of this type, and they are included here as examples and need not be considered limiting. A very thin blade edge can provide increased shaving comfort, but is practical only if the edge is strong enough to withstand shaving. A thin edge, including but not limited to those described in U.S. Pat. No. 4,720,918, strengthened by 400 to 2000 angstroms of amorphous diamond will comprise a finished edge which is significantly thinner than edges presently used for shaving, coupled with sufficient strength to withstand shaving, this due to the extraordinary strength of the amorphous diamond coating.

Further contributing to a thin edge is the large aspect ratio attainable by the particular cathodic arc deposition process used in this invention for manufacture of amorphous diamond coatings. The "aspect ratio" is explained in greater detail with reference to FIG. 3 in the discussion which follows, but may be understood for purposes of this summary as being the ratio of (a) to (b) where (a) is a first distance from the tip of the coating to the tip of the substrate, and (b) is a second distance from a surface of the coating to the tip of the substrate.

The aspect ratio provides a useful measure of the effect of a coating on the underlying blade edge geometry of the substrate—the larger or higher the aspect ratio of the coating, the "sharper" is the coated blade compared to a blade coated at a lower aspect ratio. As a further consequence of the extraordinary strength of the amorphous diamond coatings of this invention, application of such a coating to a razor blade of normal cross-section will be expected to provide longer shaving life.

In accordance with one aspect of the invention, there is provided a wedge-shaped edge and a layer of amorphous diamond on the tip and flanks of the wedge-shaped edge, preferably with a thickness of at least 400 angstroms, which defines a tip radius of less than about 500 angstroms and an aspect ratio of 2:1 to 4:1. The blade exhibits excellent shaving properties and long life.

In preferred embodiments, the razor blade substrate is steel, the amorphous diamond coating is at least four times as hard as the steel substrate; the wedge-shaped edge is formed by a sequence of mechanical abrading steps; and the layer of amorphous diamond is formed of carbon ions provided from a graphite target used as a filtered cathodic arc source.

In accordance with another aspect of the invention, there is provided a process for forming a razor blade that includes the steps of providing a substrate; forming on an edge of the substrate a wedge-shaped sharpened edge that has an included angle of less than 30° and a tip radius (i.e. the estimated radius of the largest circle that may be positioned within the ultimate tip of the edge when such ultimate tip is viewed under a scanning electron microscope at magnifications of at least 25,000) preferably of less than 1,200

may be disposed in a carousel, or otherwise; the layered concept involves either (i) using at least two sources so that the deposition rate is instantaneously equal on both sides of the cutting edge, or (ii) employing a movement of the blade set (stack or carousel) relative to a single source (a cyclic alternation of the presentation of the blades with respect to the source, as by a flipping of the stack, a rotation of the carousel, or other sequential presentation) in order that a coating will be laid down on both sides of the cutting edge of each razor at an approximately equal rate over time.

That is, in order to apply a coating of 1000 angstroms in thickness, a preferred method of this invention would not lay down all 1000 angstroms on the first side and then lay down all 1000 angstroms on the second side of a blade stack—instead, it would be either (i) a simultaneous deposition on both sides or (ii) a cyclic alteration in a range of 3 to 500 angstroms on the first side then 3 to 500 angstroms on the second side, and so on until the 1000 angstrom or other desired thickness is built on both sides of the cutting edge of each blade. While the foregoing is a preferred method, the invention is not to be understood as so limited, and may be practiced with an uneven or unbalanced layering.

It should be understood that the angle of presentation is of some concern. The low pressure (high vacuum) conditions produce a highly directional plasma stream of ionized carbon. The blades are presented at an angle measured from a line normal to the plane formed by the tips of the stacked blades (or measured from the line bisecting the angle enclosed by the tip and the first and second inclined surfaces of the cutting edge of an unstacked blade) that is greater that 20° but less than 90°. The angle of presentation is intended to direct the plasma stream more directionally against one or the other sides of the cutting edges of the blades.

As is conventionally known, the deposition process of this invention may be operated with or without a process gas such as argon; cleaning of the chamber may be accomplished with RF or DC glow discharge; and biasing of the substrate may be done with DC or RF sources (and such biasing may be used to shape the tip of the blade).

It should now be seen that this invention permits the strengthening of a thin blade while maintaining sharpness (that is, imparting stiffness and rigidity to the thin blade without ruining the acuteness or sharpness of the tip). Where a more conventional razor blade might be coated to a thickness in the order of a magnitude of about 100 to 350 angstroms, the method of this invention will deposit an amorphous diamond coat perhaps as high as 3,000 angstroms in thickness (as measured on the blade surface disposed away from the tip) and as high as 5,000 angstroms measured at the tip. As previously mentioned, all of this is achieved while maintaining a high aspect ratio.

It might be noted that the razor blades intended to be coated by this method are expected to be thinner than the usual razor blade, and sharper, and that the 2:1 and higher aspect ratios permitted by the process of this invention, coupled with the enormous strength of the amorphous diamond hard carbon coating, puts the blade in a class by itself.

What is claimed is:

1. A process for forming a razor blade comprising the steps of:

(a) providing a substrate;

(b) forming a wedge-shaped sharpened edge on said substrate that has an included angle of less than thirty degrees and a tip radius of less than 1,200 angstroms; and

(c) depositing a layer of amorphous diamond on said sharpened edges; applying an initial high bias to the substrate during deposition, and then applying a second lower bias to the substrate during deposition.

2. The process of claim **1** wherein said step of forming a wedge-shaped sharpened edge includes the step of mechanically abrading the substrate in a sequence of honing steps to form said sharpened edge.

3. The process of claim **1** and further including, after the step of depositing a layer of amorphous diamond on the sharpened edge, the step of applying an adherent polymer coating on said amorphous diamond coated cutting edge.

4. The process of claim **1** wherein said step of depositing an amorphous diamond coating on said cutting edge includes the step of depositing said coating to a thickness of at least 400 angstroms from the wedge shaped sharpened edge of said substrate to a distance of forty micrometers from the sharpened edge.

5. The process of claim **1** wherein said step of providing a substrate includes selecting a metal substrate and said amorphous diamond coating is at least four times as hard as said metal substrate.

6. The process of claim **1** wherein said step of applying an initial high bias to the substrate includes applying an initial high bias in the range of 200 to 2,000 volts, and said step of applying a second lower bias to the substrate includes applying a second lower bias in the range of 10 to 200 volts.

7. The process of claim **1** wherein said step of depositing a layer of amorphous diamond includes the step of making the deposition in a vacuum or an inert atmosphere in an evacuated chamber in which a graphite target is located.

8. The process of claim **1** wherein said sharpened edge has an included angle bounding a first inclined surface (first blade facet) and a second inclined surface (second blade facet), and said step of depositing a layer of amorphous diamond includes generating a directional beam of carbon ions and presenting a blade facet on said sharpened edge to the beam wherein the angle between the plasma beam and a line bisecting said included angle is greater than 20 degrees.

9. A process for forming a razor blade comprising the steps of:

(a) providing a substrate,

(b) forming on said substrate a wedge-shaped edge that has an included angle of less than 30 degrees bounding a first blade facet and a second blade facet, and a tip radius of less than 1,200 angstroms and

(c) depositing a layer of amorphous diamond on said first blade facet and second blade facet, while controlling the deposition so that the layer of amorphous diamond is deposited on the first blade facet and second blade facet at an approximately equal average rate of deposition: applying an initial high bias to the substrate during deposition, and then applying a second lower bias to the substrate during deposition.

10. The process of claim **9** wherein said amorphous diamond material is deposited by cathodic arc generating a beam of carbon ions.

11. The process of claim **9** wherein said step of depositing an amorphous diamond coating on said first blade facet and second blade facet includes the step of depositing said coating on each of the first and second blade facets to a thickness of at least 200 angstroms.

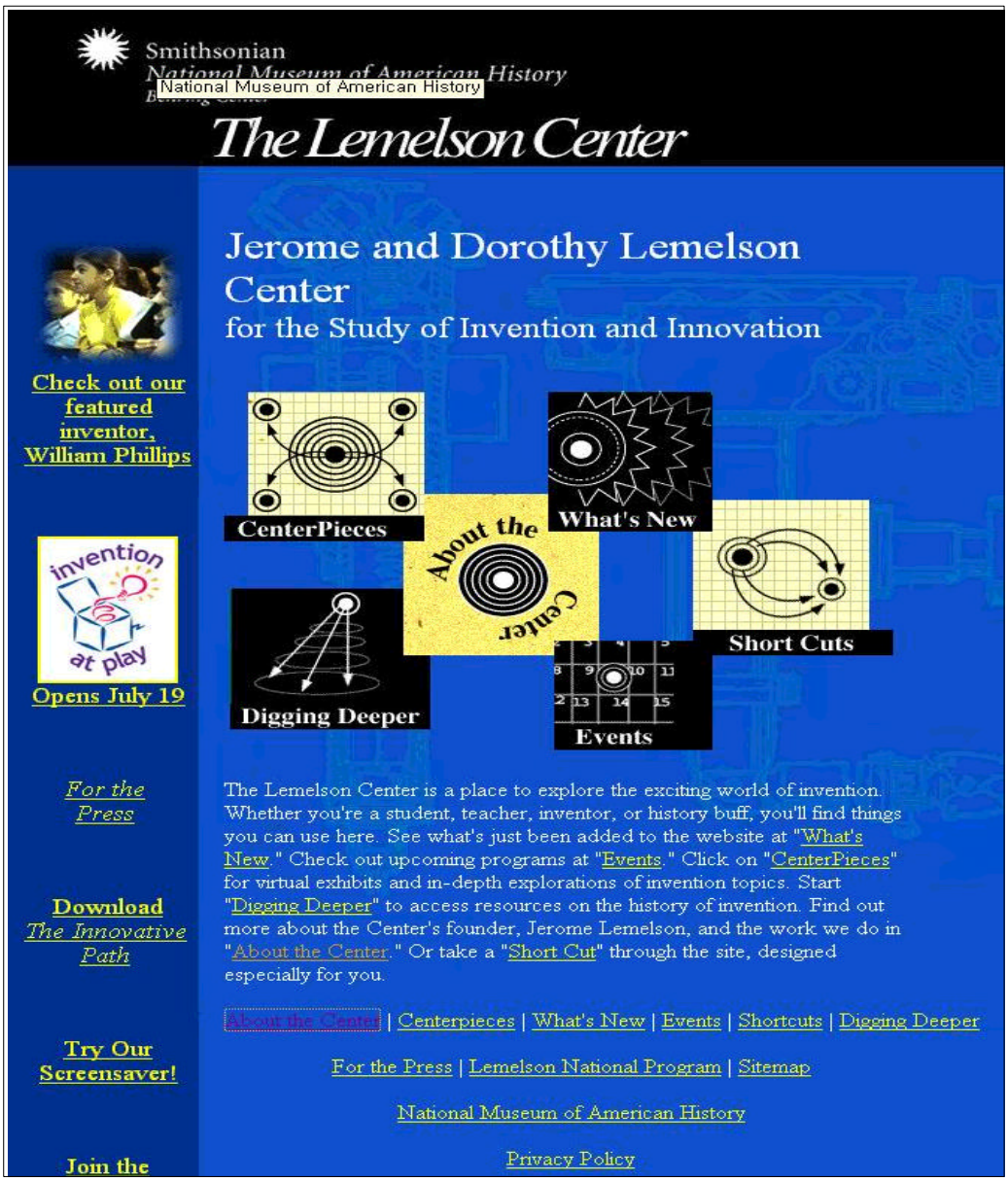
12. The process of claim **11** and further including, after the step of depositing a layer of amorphous diamond on the first blade facet and second blade facet, the step of applying an adherent polymer coating on said amorphous diamond coated cutting edge.

13. The process of claim **12** wherein said step of depositing an amorphous diamond coating on said first blade facet and second blade facet includes the step of depositing said coating to a thickness of about 2,000 angstroms.

* * * * *

추가로 Jerome Lemelson에 대한 인물정보를 찾아보았는데, 의외로 많은 인터넷정보가 있었고 대단한 발명가였음을 알 수 있었다.

Jerome Lemelson(1923-1997)은 미국의 개인발명가로 500개 이상의 로봇, VCR, Camcorder, FAX등의 특허를 가지고 있었다. 발명에 대한 교육이나 연구차원에서 1995년에 워싱톤의 Smithsonian Institution(National Museum of American History) 설립되게 되었으며 현재 수많은 발명품들이 수집되어 전시되어 있어서 학생들의 현장교육자료로 활용되고 있다. 발명의 전당으로 볼 수 있는 이 센터의 홈페이지는 (http://www.si.edu/lemelson/) 이다.



4. 결론

최근 빈번히 발생하고 있는 특허분쟁 또는 특허침해는 다양한 방법을 통해서 자료가 제공되고 있으며, 때로는 번역이나 전송수단의 차이로 인하여 내용들이 빠지거나 심지어는 잘못 전달되는 경우도 발생하게 된다. 그래서 오히려 전하고자 하는 내용을 더욱 모르게 되기도 하고 오히려 잘못된 사고를 가지게 될 수도 있어서 인터넷상에 올라오는 정보를 100% 믿기가 어려운 실정이다.

이번 사례를 보아도 국내의 보도기사는 매우 간단하고 내용전달이 부족한 점이 많았다. 신디아라는 회사는 국내에 전혀 알려지지 않은 업체로 왜 세계최대 면도기업체 질레트와 특허침해가 일어났는지 알 수가 없었고, 어떤 기술인지 구체적인 언급이 부족했으며, 즉 관련특허번호가 제시되지 못하였기 때문이다. 막연히 간략한 정보만을 제공하는 데 그치지 않고 관련된 특허와 업체를 조금 더 조사해서, 원천기술의 중요성, 그리고 이것이 어떤 기술이었고, 그래서 면도기 날에 적용한 코팅기술에 이미 개인발명가에 의해 특허등록된 것이라는 점, 국내기업들은 배워야 할 점이나 개선할 점등을 제시해주어야지만 진정한 언론정보매체로써의 기능을 하는 것이 아닌가?

많은 기사들이 매일같이 보도되지만, 과연 쓸모있고 독자로 하여금 느끼게 해주는 기사는 얼마나 될까? 오늘날 우리는 단순한 기사전달이 아니라 내용이 전달되어 지식이 쌓이고 발전할 수 있는 마음의 양식을 원한다. 자극적이고 폭로성 기사만이 대접받는 풍토보다는 가벼우면서도 아기자기한 알짜정보가 더욱 필요한 분위기가 조성되었으면 한다.

간단한 소식위주가 아니라 폭넓은 정보를 찾아서 보충하여 기사를 작성해준다면, 수많은 사람들의 시간을 절약해줄 수 있고 실속있고 정확한 정보전달로 인해 각 기술분야에 시너지효과도 만들어 낼 수 있을 것으로 사료된다.

<END>