실용신안 등록청구의 범위

청구항 1

사용자가 입에 대고 담배연기를 흡입하는 흡입캡;

상기 흡입캡과 연결되며 담배액을 저장하는 담배액카트리지;

상기 담배액카트리지를 감싸는 케이스;

상기 담배액 카트리지의 하부에 연결되며, 흡수부재 및 상기 흡수부재와 접촉된 발열부재를 구비한 무화기; 및,

상기 무화기의 하단에 연결되어 상기 발열부재에 전기를 공급하는 배터리유닛;을 포함하며,

상기 담배액카트리지의 저면에는 담배액이 공급되는 액배출파이프와, 상기 액배출파이프의 내부에 설치된 액유도부재를 포함하며, 상기 담배액이 상기 액배출파이프와 상기 액유도부재 사이를 통해 상기 흡수부재로 배출되는 것을 특징으로 하는 전자담배.

청구항 2

제 1 항에 있어서,

상기 담배액카트리지는 내부공간을 담배액저장공간과 연기생성공간으로 구분하는 분리막을 더 포함하며, 상기 흡수부재는 상기 액유도부재와 접촉된 것을 특징으로 하는 전자담배.

청구항 3

제 1 항에 있어서,

상기 담배액카트리지의 내부 일측에는 공기유입유로 및 공기입구를 더 포함하는 것을 특징으로 하는 전자담배.

청구항 4

제 3 항에 있어서,

상기 흡입캡의 일 측에는 오목부가 형성되고, 상기 흡입캡을 돌려 여닫아 조절함으로써 상기 공기입구의 개폐량을 조절하는 것을 특징으로 하는 전자담배.

청구항 5

제 1항 내지 제 4 항 중 어느 한 항에 있어서,

상기 담배액카트리지의 중앙부에는 연기흡입파이프가 설치되고, 상기 연기흡입파이프에는 확관부를 포함하는 것을 특징으로 하는 전자담배.

청구항 6

제 5 항에 있어서,

상기 케이스의 일측에는 투명창이 형성되어 있으며, 상기 담배액카트리지는 투명한 재질로 구성된 것을 특징으로 하는 전자담배.

명 세 서

NJOY Exhibit 1002.1791

기 술 분 야

[0001] 본 고안은 전자담배에 대한 것으로서, 담배액의 공급이 일정하고 구조가 개선된 전자담배에 관한 것이다.

배 경 기 술

[0002] 전자담배는 타르나 유해성분을 제거하고 니코틴과 각종 향 등을 첨가한 담배액을 가열하여 연기를 발생시킨 후 이를 흡입하는 제품이다.

[0003] 종래의 전자담배는, 니코틴이 함유된 담배액을 저장하는 담배액카트리지와, 액체를 연소시켜 연기를 발생시키는 무화기, 무화기의 발열체에 전기를 공급하는 배터리유닛으로 구성되며, 이와 같은 종래의 전자담배는 등록실용신안 제0453424호 및 공개실용신안 공개번호 제2011-0002227호 등에 개시되어 있다.

[0004] 그러나, 상기 개시된 종래의 전자담배들은 담배액을 저장하고 있는 담배액카트리지에 담배액이 많을 경우에는 한 번에 많은 담배액이 무화기로 공급되고 담배액이 적게 남은 경우에는 너무 적은 양의 담배액이 무화기로 공급되는 현상이 있어 담배액의 공급이 불규칙하여 담배연기의 발생이 원활하지 못한 단점이 있었다.

[0005] 또한, 공기구멍으로 담배액이 누수되는 현상이 발생되는 경우가 있고, 가열된 담배연기가 사용자의 입으로 배출되는 과정에서 결로된 물방울이 사용자의 입으로 들어가면서 전자담배 사용자에게 불쾌감을 유발하는 문제점이 있었다.

고안의 내용

해결하려는 과제

[0006] 본 고안의 목적은 상술한 문제점을 해결하기 위한 것으로서, 항상 일정하고 규칙적으로 담배액이 공급되는 전자담배를 제공하는 데 있다.

[0007] 또한, 본 발명의 다른 목적은 공기구멍을 통한 담배액의 누수가 없으며 결로된 물방울이 사용자의 입으로 상승되는 문제점이 해결된 전자담배를 제공하는 데 있다.

과제의 해결 수단

[0008] 상술한 목적을 달성하기 위한 본 고안의 전자담배는, 사용자가 입에 대고 담배연기를 흡입하는 흡입캡, 상기 흡입캡과 연결되며 담배액을 저장하는 담배액카트리지, 상기 담배액카트리지를 감싸는 케이스, 상기 담배액 카트리지의 하부에 연결되며 흡수부재 및 상기 흡수부재와 접촉된 발열부재를 구비한 무화기 및, 상기 무화기의 하단에 연결되어 상기 발열부재에 전기를 공급하는 배터리유닛을 포함하며, 상기 담배액카트리지의 저면에는 담배액이 공급되는 액배출파이프와, 상기 액배출파이프의 내부에 설치된 액유도부재를 포함하며, 상기 담배액이 상기 액배출파이프와 상기 액유도부재 사이를 통해 상기 흡수부재로 배출되는 것을 특징으로 한다.

[0009] 상기 담배액카트리지는 내부공간을 담배액저장공간과 연기생성공간으로 구분하는 분리막을 더 포함하며, 상기 흡수부재는 상기 액유도부재와 접촉되는 것이 바람직하다.

[0010] 상기 담배액카트리지의 내부 일측에는 공기유입유로 및 공기입구를 더 포함할 수 있다.

[0011] 상기 흡입캡의 일 측에는 오목부가 형성되고, 상기 흡입캡을 좌우로 돌려 조절함으로써 상기 공기입구의 개폐량을 조절하도록 구성할 수 있다.

[0012] 상기 담배액카트리지의 중앙부에는 연기흡입파이프가 설치되고, 상기 연기흡입파이프에는 확관부를 포함하는 것이 바람직하다.

[0013] 상기 케이스의 일측에는 투명창이 형성되어 있으며, 상기 담배액카트리지는 투명한 재질로 구성될 수 있다.

NJOY Exhibit 1002.1792

고안의 효과

[0014] 본 고안의 전자담배는, 담배액카트리지 저면에 액배출파이프와 액유도부재를 두어 담배액의 양에 상관없이 항상 일정한 양이 규칙적으로 무화기에 공급되므로 항상 충분하고 일정한 담배연기가 생성되는 효과가 있다.

[0015] 또한, 본고안의 전자담배는, 공기입구가 담배액카트리지의 상부에 있고 공기가 상부에서 하부로 유입되는 구조이므로, 담배액이 공기입구를 통해 누수되는 현상이 발생되지 않는다.

[0016] 또한, 본 고안의 전자담배는, 연기흡입파이프에 확관부를 두어 결로된 물방울이 사용자의 입까지 상승되지 못하도록 하므로, 사용자의 만족감을 높일 수 있다.

[0017] 또한, 본 고안의 전자담배는, 공기가 흡입되는 공기흡입구의 개폐량을 조절하여 공기의 양을 조절할 수 있는 장점이 있다.

도면의 간단한 설명

[0018] 도 1은, 본 고안의 일 실시 예에 따른 전자담배의 분해사시도이고,

도 2는, 도 1에 도시된 전자담배가 조립된 상태에서의 단면도이고,

도 3 은, 도 1에 도시된 전자담배의 액배출파이프를 잘라 하부에서 상부방향으로 바라본 단면도이다.

고안을 실시하기 위한 구체적인 내용

[0019] 이하, 첨부된 도면들을 참조하여 본 고안의 일 실시 예에 따른 전자담배(10)를 자세히 설명한다.

[0020] 도 1 및 도 2를 참조하면, 본 고안의 일 실시예에 따른 전자담배(10)는, 흡입캡(20), 케이스(30), 담배액카트리지(40), 무화기(70) 및 배터리유닛(80)을 포함한다.

[0021] 흡입캡(20)은 수직으로 통기공(22)이 형성되어 있고, 통기공(22)을 통해 담배연기가 사용자의 입으로 유입된다. 흡입캡(20)의 일측 하부에는 오목하게 들어간 오목부(21)형성되어 있다.

[0022] 케이스(30)는, 내부를 들여다 볼 수 있는 투명창(31)이 형성되어 있으며, 투명창(31)을 제외한 나머지 부분은 불투명하게 구성된다.

[0023] 담배액카트리지(40)는, 공기흡입유로(33), 공기입구(32), 분리막(52), 액배출파이프(41), 액유도부재(42), 연기흡입파이프(44), 확관부(45)를 포함한다. 공기흡입유로(33)는 담배액카트리지(40)의 내부 일측에 수직 파이프 형상으로 형성되어 있으며, 공기입구(32)는 공기흡입유로(33) 상부 일측 즉 담배액카트리지 상부에 상하 방향으로 길게 형성된다. 분리막(52)은 담배액저장공간(51)과 연기생성공간(49)으로 담배액카트리지 내부공간을 구획한다. 액배출파이프(41)는 담배액카트리지(40)의 저면 즉 분리막(52)에 형성된 액배출구(55, 도 3참조)와 연결되어 있고 분리막(52)의 하방으로 일정길이 연장되어 있다. 액유도부재(42)는 액배출파이프(41)의 내부에 중심에 설치되어 있으며 지지부재(43)에 의해 액배출파이프(41)와 연결된다. 액유도부재(42)는 액배출파이프(41)의 길이 보다 길며, 하단부가 후술되는 흡수부재(71)와 접촉된다. 연기흡입파이프(44)는 담배액카트리지(30) 중앙에 배치되어 있으며, 하부는 연기생성공간(49)과 연통되고 상부는 통기공(22)과 연통된다. 확관부(45)는 연기흡입파이프(44)의 상단에서 파이프의 내경이 갑자기 확대되는 부분으로서 상승되는 담배연기의 속도 및 온도를 급격하게 낮춘다.

[0024] 무화기(70)는 배터리유닛(80)으로부터 전기를 공급받아 담배액(48)을 가열하여 담배연기를 생성하는 것으로서, 흡수부재(71)와 발열부재(72)를 포함한다. 흡수부재(71)는 도 1 및 도 2를 참조하면, 유리섬유로 구성되고, 발열부재(72)는 유리섬유를 감싸는 발열코일로 구성되어 있다. 유리섬유(71)는 경사지게 배치되고, 발열코일(72)은 배터리(미도시)와 전기적으로 연결된다.

[0025] 배터리유닛(80)에는 내부에 배터리(미도시)가 내장되어 있고, 측면에 무화기(70)로 전기공급을 온/오프하는 스위치(81)가 배치되어 있다. 발열코일(72)과 배터리유닛(80) 간의 전기적인 연결 및 스위치(81)의 배치 및 작동관계는 이미 잘 알려진 종래의 기술이며 본 고안의 요지가 아니므로 자세한 설명을 생략한다.

[0026] 이하에서는 도 1 내지 도 3을 참조하여, 상술한 본 고안의 일 실시 예에 따른 전자담배(10)의 작동관계를 자세

NJOY Exhibit 1002.1793

히 설명한다.

[0027] 담배액카트리지(40)에 저장된 담배액(48)은 중력에 의해 액배출구(55)를 통해 액배출구에 연결된 액배출파이프(41)와 액유도부재(42) 사이의 공간으로 유입되면서 담배액(48)의 표면장력에 의해 담배액의 낙하속도는 현저히 저하된다. 표면장력과 중력 간의 힘에 의해 담배액은 액배출파이프(41)와 액유도부재(42) 사이의 공간과 액유도부재(42)의 외주면에 머물러 있으며, 도 2의 확대부분의 도면과 같이 액유도부재(42)의 단부에서 유리섬유(71)에 의해 일정한 액만큼씩 흡수된다. 표면장력에 의해 담배액은 액유도부재의 단부에서 스스로 낙하되지 못하고, 접촉되어 있는 유리섬유(71)의 흡수력(삼투압)과 흡입압(압력)에 의해 유리섬유(71)로 흡수되는 것이므로 흡입을 할 경우에만 유리섬유에 흡수되고 사용을 하지 않을 시에는 거의 흡수되지 않는다.

[0028] 사용자가 스위치를 누르면 발열코일(72)이 가열되고 유리섬유(71)에 흡수된 담배액이 가열되어 담배연기(47)가 생성되고 유리섬유(71)에는 증발된 만큼 담배액이 줄어들게 된다. 생성된 담배연기를 사용자가 빨아들이면, 빨아들이는 흡입력과 유리섬유(71)의 흡수력에 의해 담배액은 액유도부재(42) 단부로부터 유리섬유(71)로 이동하게 되며, 유리섬유(71)에 어느정도 담배액이 흡수되면 더 이상의 흡입력이 제공되지 않는 한 담배액은 더 이상 유리섬유(71)로 흡수되지 않는다. 따라서, 항상 일정한 양의 담배액이 유리섬유(71)에 공급되고 저장된 담배액의 많고 적음에 거의 영향을 받지 않는다.

[0029] 사용자가 담배연기를 빨아들일 때, 공기는 담배액카트리지(40)에 형성된 공기입구(32) 및 공기흡입유로(33)를 통해 연기생성공간(49)으로 유입된후, 담배연기(47)와 함께 연기흡입파이프(44), 확관부(45) 및 통기공(22)을 통해 사용자의 입으로 유입된다. 담배생성공간(49)에서 온도가 높았던 담배연기(47)는 상승하면서 온도가 내려가게 되고 물방울로 응결되는 결로현상이 발생한다. 그러나 결로된 물방울은 공간이 넓어지는 확관부(45)에 와서는 물방울 자중에 의해 더이상 상승하지 못하고 확관부(45)의 내벽에 맺히게 되고 담배연기만 통기공(22)을 통해 사용자의 입으로 들어간다.

[0030] 도 2는 흡입캡(20)을 좌로 돌려 닫음으로써 공기입구에 유입되는 공기량을 줄인 것이나, 흡입캡(20)을 좀 덜 닫을 경우 공기입구(32)로 유입되는 공기량이 늘어난다. 즉, 사용자는 흡입캡(20)이 담배액카트리지(30) 공기입구의 규격을 조절함으로써 유입되는 공기량을 조절할 수 있다.

[0031] 이상, 본 고안의 원리를 예시하기 위한 바람직한 실시 예와 관련하여 도시하고 또한 설명하였으나, 본 고안은 그와 같이 도시되고 설명된 그대로의 구성 및 작용으로 한정되는 것이 아니다. 오히려 첨부된 실용신안등록청구범위의 사상 및 범주를 일탈함이 없이 본 고안에 대한 다수의 변경 및 수정 가능함을 당업자들은 잘 이해할 수 있을 것이다. 따라서, 그러한 모든 적절한 변경 및 수정과 균등물들도 본 고안의 범위에 속하는 것으로 간주 되어야 할 것이다.

부호의 설명

[0032] 10: 전자담배

20: 흡입캡

30;케이스

32:공기입구

33:공기흡입유로

40;담배액카트리지

41:액배출파이프

42:액유도부재

44:연기흡입파이프

45;확관부

52:분리막

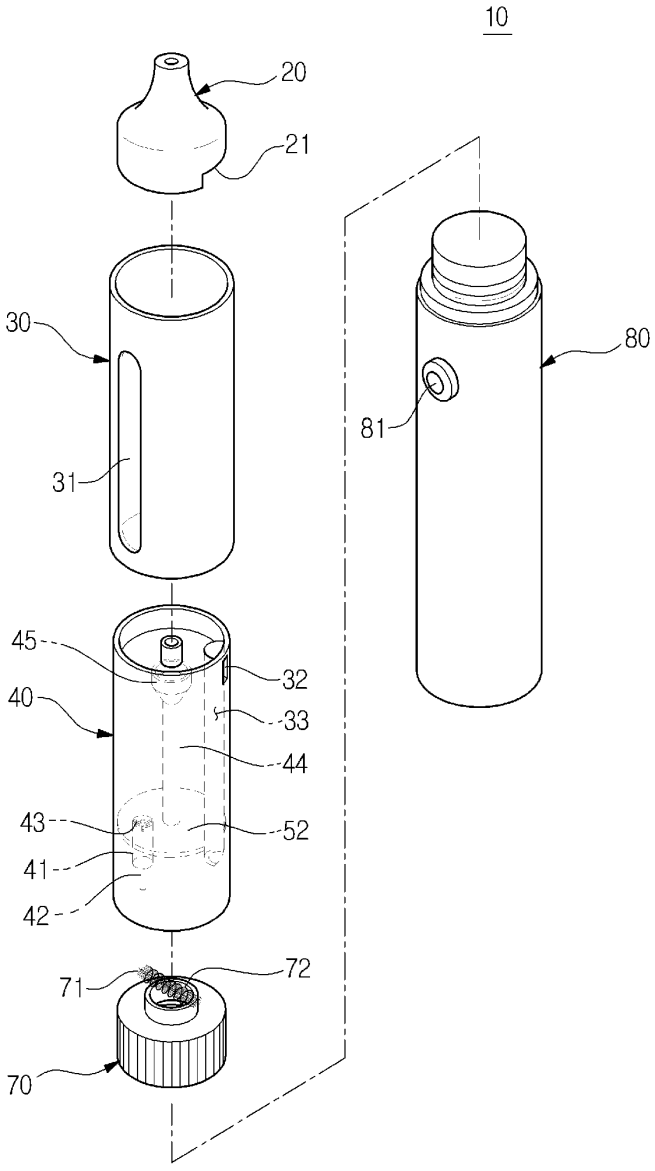
70:무화기

NJOY Exhibit 1002.1794

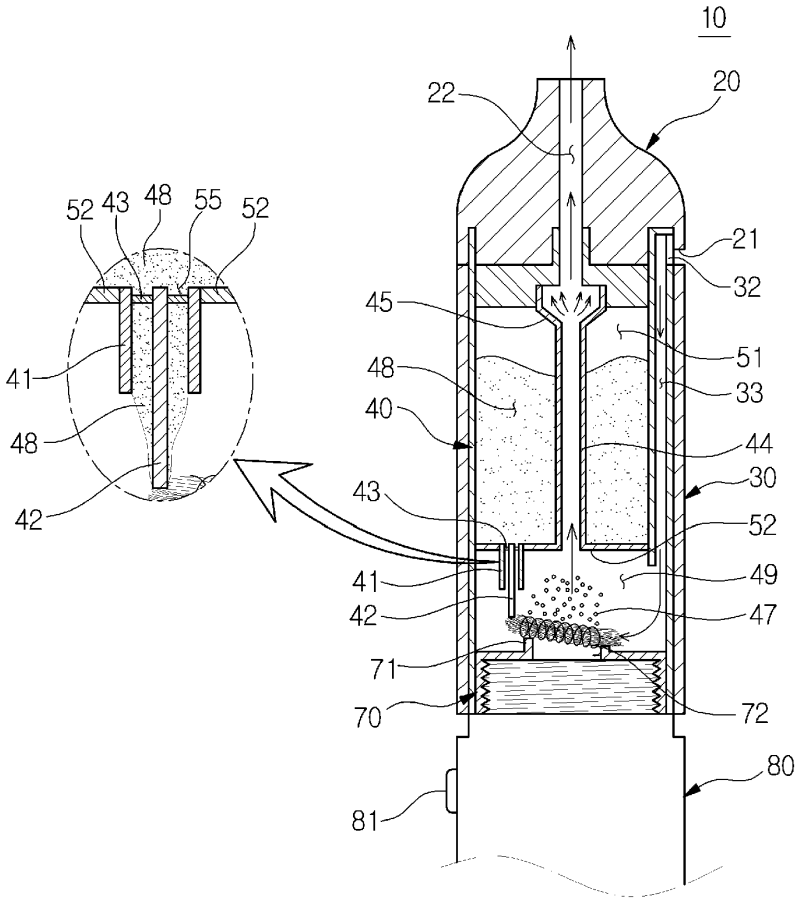
80:배터리유닛

도면

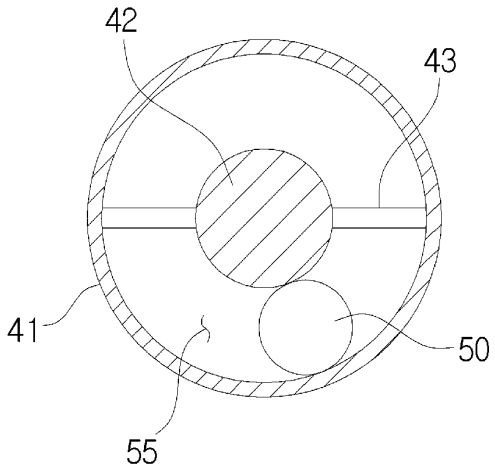
도면1



도면2



도면3



NJOY Exhibit 1002.1796

Espacenet

Bibliographic data: KR20120113519 (A) — 2012-10-15

CONTAINER OF NICOTINE SOLUTION FOR ELECTRIC CIGARETTE AND ELECTRIC CIGARETTE WITH THE SAME

Inventor(s): LEE YONG YIN [KR] ± (LEE, YONG YIN)

Applicant(s): LEE YONG YIN [KR] ± (LEE, YONG YIN)

Classification: **- international:** ***A24F47/00***
- cooperative: **A24B15/167**; **A24F47/008**; **A61M15/06** more

Application number: KR20110031266 20110405 Global Dossier

Priority number(s): KR20110031266 20110405

Also published as: KR101265170 (B1)

Abstract of KR20120113519 (A)

PURPOSE: A nicotine solution container and electric cigarettes with the same are provided to directly supply external air to a receiving container. CONSTITUTION: An electric cigarette comprises a battery assembly(11), a heater assembly(12), a receiving container(13), and a suction assembly(14). The battery assembly comprises a first housing for power supply, a battery, a printed circuit board, a lighting unit, a cover, and a connector. The heater assembly comprises a coupling unit combined with the connector, a separator, and a heater fixing unit. The receiving container comprises an evaporation room, a storage room, and an evaporation induction tube.

NJOY Exhibit 1002.1797

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(11) 공개번호 10-2012-0113519
(43) 공개일자 2012년10월15일

(51) 국제특허분류(Int. Cl.)
A24F 47/00 (2006.01)
(21) 출원번호 10-2011-0031266
(22) 출원일자 2011년04월05일
심사청구일자 2011년04월05일

(71) 출원인
이영인
서울특별시 강동구 고덕로20가길 59 (암사동)
(72) 발명자
이영인
서울특별시 강동구 고덕로20가길 59 (암사동)
(74) 대리인
특허법인 다해

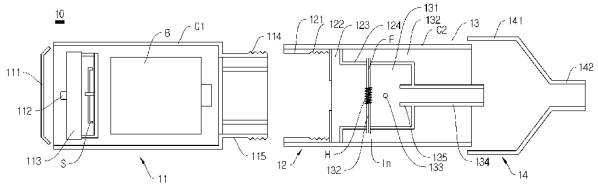
전체 청구항 수 : 총 6 항

(54) 발명의 명칭 **전자담배를 위한 니코틴 용액의 수용 용기 및 이를 가진 전자담배**

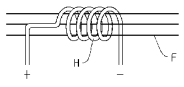
(57) 요 약

본 발명은 전자담배를 위한 니코틴 용액의 수용 용기 및 이와 같은 수용 용기를 가진 전자담배에 관한 것이고, 구체적으로 공기가 수용 용기로 직접 공급이 되면서 이와 동시에 기화 가능한 일정액의 니코틴 용액이 히터로 공급될 수 있도록 하는 전자 담배를 위한 니코틴 용액의 수용 용기 및 이를 가진 전자 담배에 관한 것이다. 한쪽 끝에 히터가 고정될 수 있는 전자담배를 위한 니코틴 용액의 수용 용기는 히터가 수용되는 기화 룸(131); 기화 공간과 분리된 저장 룸(132); 기화 룸으로부터 저장 룸의 외부로 연장된 기화 유도관(134); 저장 룸(132)의 니코틴 용액을 기화 룸(131)으로 공급하기 위한 공급 통로(21); 및 공급 통로(21)와 기화 룸(131)을 소통시키는 유입 홀(In)을 포함하고, 상기 기화 룸(131) 측벽의 적어도 일부는 저장 룸 측벽과 일체가 되고 공급 통로(21)는 일체로 된 부분에 형성된다.

대 표 도 - 도1



(가)



(나)

NJOY Exhibit 1002.1798

특허청구의 범위

청구항 1

한쪽 끝에 히터가 고정될 수 있는 전자담배를 위한 니코틴 용액의 수용 용기에 있어서,

히터가 수용되는 기화 룸(131);

기화 공간과 분리된 저장 룸(132);

기화 룸으로부터 저장 룸의 외부로 연장된 유도 유도관(134);

저장 룸(132)의 니코틴 용액을 기화 룸(131)으로 공급하기 위한 공급 통로(21); 및

공급 통로(21)와 기화 룸(131)을 소통시키는 유입 홀(In)을 포함하고,

상기 기화 룸(131) 측벽의 적어도 일부는 저장 룸 측벽과 일체가 되고 공급 통로(21)는 일체로 된 부분에 형성되는 것을 특징으로 하는 전자담배를 위한 니코틴 용액의 수용 용기.

청구항 2

청구항 1에 있어서, 기화 룸(131)은 외부 공기를 유입시키는 공기 유입 통로를 가지는 것을 특징으로 하는 전자담배를 위한 니코틴 용액의 수용 용기.

청구항 3

청구항 2에 있어서, 공기 유입 통로는 기화 룸(131) 측벽에 대하여 경사진 것을 특징으로 하는 전자담배를 위한 니코틴 용액의 수용 용기

청구항 4

배터리 어셈블리(11);

히터 어셈블리(12);

한쪽 끝에 히터(H)가 결합되고 내부에 저장 룸(131)이 형성된 수용 용기(13);

저장 룸(131)으로부터 수용 용기(13)의 외부로 연장된 기화 유도관(134);

기화 유도관(134)에 연결된 흡입 어셈블리(14); 및

수용 용기(13)로부터 저장 룸(131)으로 니코틴 용액을 공급하기 위한 공급 통로를 포함하고,

상기 공급 통로는 수용 용기(13)와 저장 룸(131)이 형성하는 공통 측벽에 형성되고 공급 통로의 한쪽 끝 부분에 저장 룸(131)으로 연결되는 흡입 홀(In)이 형성된 것을 특징으로 하는 전자담배.

청구항 5

청구항 4에 있어서, 저장 룸(131)에 외부 공기를 내부로 유입하기 위한 공기 유입 통로가 형성된 것을 특징으로 하는 전자담배.

청구항 6

청구항 4에 있어서, 히터 어셈블리(12)에 공기 소통 홀이 형성된 것을 특징으로 하는 전자담배.

명 세 서

기 술 분 야

[0001] 본 발명은 전자담배를 위한 니코틴 용액의 수용 용기 및 이와 같은 수용 용기를 가진 전자담배에 관한 것이고, 구체적으로 공기가 수용 용기로 직접 공급이 되면서 이와 동시에 기화 가능한 일정액의 니코틴 용액이 히터로 공급될 수 있도록 하는 전자 담배를 위한 니코틴 용액의 수용 용기 및 이를 가진 전자 담배에 관한 것이다.

NJOY Exhibit 1002.1799

배경기술

[0002] 전자담배는 이 분야에서 공지되어 있고 도 5에 도시된 것과 유사한 구조를 가진다. 도 5를 참조하면 전자담배(5)는 전력의 공급을 위한 배터리(511)가 수용되는 배터리 어셈블리(51), 하우징(521), 외부로부터 유입된 공기의 유도를 위한 공기 유도로(522), 배터리(511)로부터 공급된 전력에 의하여 가열되는 히터(523), 히터(523)로부터 전달된 열을 이용하여 공급 용기(526)로부터 공급된 니코틴 용액을 기화시키는 기화기(524)와 기화기(524)에서 기화된 니코틴 연기를 유도하는 연기 유도로(525)로 이루어진 기화 어셈블리(52), 스위치와 같은 장치의 작동에 의하여 작동하는 발열체(523) 및 니코틴 연기를 입으로 유도하는 흡입 통로(541) 및 흡입 통로(541)와 연결된 배출구(542)로 이루어진 흡입 어셈블리(54)를 포함한다. 위와 같은 구조를 가진 공지의 전자담배에서 외부의 공기가 화살표 A로 표시된 지점으로 유입되어 기화 어셈블리(52)의 내부로 유입된다. 기화된 공기는 기화기(524)에서 기화된 니코틴 용액과 함께 화살표 B로 표시된 지점을 통하여 연기 유도로(525)로 유도되어 화살표 C로 표시된 흡입 어셈블리(54)로 공급된다. 그리고 니코틴 연기는 흡입 어셈블리(54)를 통하여 입으로 유입될 수 있다. 추가로 공지의 전자담배(5)는 흡연 여부를 표시할 수 있는 발광체(53)를 포함할 수 있다.

[0003] 공지된 전자담배에서 니코틴 용액의 공급을 위한 카트리지 또는 공급 용기(526)에 내장된 섬유집합체로부터 니코틴 용액이 일정하게 기화기(524)로 공급될 수 있도록 하는 한편 기화과정에서 불완전하게 기화된 니코틴 용액이 공급 용기(526)로 다시 흡수될 수 있도록 한다. 그러나 공급 용기(526)의 내부에 니코틴 용액을 함유하는 섬유집합체를 배치하는 것은 공급 용기(526)의 수용 능력을 감소시킨다는 문제점을 가진다. 다른 한편으로 니코틴 용액을 함유하는 섬유집합체가 기화기(524)에 접촉되어 니코틴 용액이 공급되면 흡연이 이루어지지 않는 경우 니코틴 용액이 누설될 수 있다는 문제점을 가진다.

[0004] 본 발명은 공지의 전자담배가 가진 위와 같은 문제점을 해결하기 위한 것으로 아래와 같은 목적을 가진다.

발명의 내용

해결하려는 과제

[0005] 본 발명의 목적은 기화가 발생되는 히터에 대한 외부 공기가 중간 통로를 경유하지 않고 직접 수용 용기로 공급되도록 하는 것에 의하여 구조가 간단한 전자담배를 위한 니코틴 용액의 수용 용기를 제공하는 것이다.

[0006] 본 발명의 다른 목적은 니코틴 용액이 저장되는 저장 용기와 니코틴 용액의 기화가 발생되는 기화 공간이 일체로 형성되고 니코틴 용액은 별도로 형성된 공급 통로를 통하여 공급되는 수용 용기를 가진 전자담배를 제공하는 것이다.

과제의 해결 수단

[0007] 본 발명의 적절한 실시 형태에 따르면, 한쪽 끝에 히터가 고정될 수 있는 전자담배를 위한 니코틴 용액의 수용 용기는 히터가 수용되는 기화 룸; 기화 공간과 분리된 저장 룸; 기화 룸으로부터 저장 룸의 외부로 연장된 기화 유도관; 저장 룸의 니코틴 용액을 기화 룸으로 공급하기 위한 공급 통로; 및 공급 통로와 기화 룸을 소통시키는 유입 홀을 포함하고, 상기 기화 룸 측벽의 적어도 일부는 저장 룸 측벽과 일체가 되고 공급 통로는 일체로 된 부분에 형성된다.

[0008] 본 발명의 다른 적절한 실시 형태에 따르면, 기화 룸은 외부 공기를 유입시키는 공기 유입 통로를 가진다.

[0009] 본 발명의 또 다른 적절한 실시 형태에 따르면, 공기 유입 통로는 기화 룸 측벽에 대하여 경사진다.

[0010] 본 발명의 또 다른 적절한 실시 형태에 따르면, 전자담배는 배터리 어셈블리; 히터 어셈블리; 한쪽 끝에 히터가 결합되고 내부에 저장 룸이 형성된 수용 용기; 저장 룸으로부터 수용 용기의 외부로 연장된 기화 유도관; 기화 유도관에 연결된 흡입 어셈블리; 및 수용 용기로부터 저장 룸으로 니코틴 용액을 공급하기 위한 공급 통로를 포함하고, 상기 공급 통로는 수용 용기와 저장 룸이 형성하는 공통 측벽에 형성되고 공급 통로의 한쪽 끝 부분에 저장 룸으로 연결되는 흡입 홀이 형성된다.

[0011] 본 발명의 또 다른 적절한 실시 형태에 따르면, 히터 어셈블리에 공기 소통 홀이 형성된다.

발명의 효과

[0012] 본 발명에 따른 수용 용기는 전자담배의 구조가 간단해지도록 하면서 니코틴 용액의 누설이 방지될 수 있도록 한다는 이점을 가진다. 또한 본 발명에 따른 수용 용기는 다양한 형태의 전자담배에 적용될 수 있도록 하면서

NJOY Exhibit 1002.1800

수용 용기의 대량 생산이 가능하도록 한다는 장점을 가진다.

도면의 간단한 설명

[0013] 도 1은 본 발명에 따른 수용 용기가 적용된 전자담배의 실시 예를 도시한 것이다.

도 2a는 본 발명에 따른 수용 용기의 실시 예에 대한 단면도를 도시한 것이다.

도 2b는 외부 공기 유입이 조절되는 구조에 대한 실시 예 및 히터에 섬유집합체가 고정되는 실시 예를 도시한 것이다.

도 3은 본 발명에 다른 수용 용기가 적용된 전자담배의 다른 실시 예를 도시한 것이다.

도 4는 본 발명에 따른 수용 용기에 니코틴 용액이 공급되는 구조에 대한 실시 예를 도시한 것이다

도 5는 공지의 전자 담배의 구조를 개략적으로 도시한 것이다.

발명을 실시하기 위한 구체적인 내용

[0014] 아래에서 본 발명은 첨부된 도면에 제시된 실시 예를 참조하여 상세하게 설명이 되지만 실시 예는 본 발명의 명확한 이해를 위한 것으로 본 발명은 이에 제한되지 않는다.

[0015] 도 1은 본 발명에 따른 수용 용기가 적용된 전자담배의 실시 예를 도시한 것이다.

[0016] 본 발명에 따른 전자담배를 위한 니코틴 용액의 수용 용기는 히터가 수용되는 기화 룸(131), 기화 공간과 분리된 저장 룸(132), 기화 룸(132)으로부터 저장 룸(131)의 외부로 연장된 기화 유도관(134), 저장 룸(132)의 니코틴 용액을 기화 룸(131)으로 공급하기 위한 공급 통로(21) 및 공급 통로(21)와 기화 룸(131)을 소통시키는 유입 홀(In)을 포함하고, 상기 기화 룸(131) 측벽의 적어도 일부는 저장 룸(132) 측벽과 일체가 되고 공급 통로(21)는 일체로 된 부분에 형성된다.

[0017] 아래에서 구체적으로 설명한다.

[0018] 도 1을 참조하면, 본 발명에 따른 수용 용기가 적용될 수 있는 전자담배(10)는 전력 공급을 위한 제1 하우징(C1), 배터리(B), 앞쪽에 설치된 전자기판(113), 배터리(B)에 의하여 전력 공급을 받는 발광 수단(112), 커버(111) 및 연결 부분(114)을 가지는 배터리 어셈블리(11); 연결 부분(114)에 결합되는 체결 부분(121), 분리판(123) 및 분리판(123)에 고정되는 히터 고정 수단(124)으로 이루어진 히터 어셈블리(12); 히터 고정 수단(124)에 결합되면서 히터 고정 수단(124)과 함께 섬유 집합체(F)를 고정하는 한편 니코틴 용액을 공급하기 위한 유입 홀(In)을 형성하는 기화 룸(131), 기화 룸(131)이 수용되고 니코틴 용액이 저장되는 저장 룸(132) 및 기화 룸(131)으로부터 저장 룸(132)의 외부로 연장된 기화 유도관(134)으로 이루어진 수용 용기(13); 및 기화 룸(132)의 다른 쪽 끝에 결합되는 체류 공간(141)과 마우스피스(142)로 이루어진 흡입 어셈블리(14)를 포함한다.

[0019] 배터리 어셈블리(11)는 필요에 따라 발광 수단(112)의 발광 여부 또는 히터(H)의 작동을 제어하거나 흡입 회수를 계산하기 위한 전자기판(113)을 포함할 수 있다. 전자담배(10)는 외부에 설치되는 스위치에 의하여 작동되거나 또는 흡입에 의한 공기 유입에 의하여 작동될 수 있다. 공기 유입에 의하여 작동이 되는 경우 필요에 따라 스위치(S)가 설치될 수 있다.

[0020] 배터리 어셈블리(11)와 기화 어셈블리(12)는 다양한 방법으로 결합될 수 있고 예를 들어 도 1에 도시된 것처럼, 연결 부분(114)과 체결 부분(121)에 형성된 나사 부분(115, 122)에 의하여 서로 결합될 수 있지만 이에 제한되지 않는다.

[0021] 히터 어셈블리(12)에 설치된 분리판(123)은 히터 고정 수단(124)을 지지하면서 배터리 어셈블리(11)와 기화 룸(131)을 물리적으로 분리시키는 기능을 가진다. 이와 같은 물리적 분리는 기화된 니코틴 용액이 아래쪽으로 배출되는 것을 방지하고 섬유 집합체(F)에 잔류하는 니코틴 용액의 누설을 방지하고 그리고 배터리 어셈블리(11)의 내부로 유입된 공기가 제어된 형태로 기화 룸(131)으로 유입될 수 있도록 한다. 본 발명에 따르면, 외부 공기는 배터리 어셈블리(11)에 형성된 틈(도시되지 않음)을 통하여 기화 룸(131)으로 유입되거나 또는 공기 유입 통로(133)를 통하여 기화 룸(131)으로 유입될 수 있다.

[0022] 히터 고정 수단(124)은 기화 룸(131)의 내부에 히터(H)를 고정하기 위한 것으로 도 1에 도시되지 않았지만 예를 들어 히터(H)에 전력을 공급하기 위한 전극 연결 단자를 포함할 수 있다. 히터(H)는 니크롬선, 판형 히터 또는 카본 히터와 같이 이 분야에서 공지된 임의의 수단이 될 수 있고 본 발명은 히터(H)의 종류에 의하여 제한되지

NJOY Exhibit 1002.1801

않는다.

[0023] 기화 룸(131)은 히터(H)에 의하여 니코틴 용액이 기화가 되는 공간이 된다. 히터(H)에 대한 니코틴 용액의 공급은 예를 들어 도 1의 (나)에 도시된 것처럼, 섬유 집합체(F)에 의하여 이루어질 수 있다. 섬유 집합체(F)로 전달되는 니코틴 용액은 저장 룸(132)에 저장될 수 있고 아래에서 설명되는 방법으로 히터(H) 또는 섬유 집합체(F)에 전달될 수 있다.

[0024] 기화 룸(131)에서 기화된 니코틴 용액은 기화 유도관(134)을 통하여 흡입 어셈블리(14)로 유도될 수 있다. 기화 유도관(134)은 기화 룸(131)으로부터 저장 룸(134)의 외부로 연장될 수 있다. 기화 유도관(134)의 한쪽 끝은 기화 룸(131)의 내부로 돌출된 돌출 부분(135)을 형성하고 다른 쪽 끝은 저장 룸(132)의 외부로 일정 길이만큼 연장될 수 있다. 돌출 부분(135)은 기화 룸(131)의 내부에 잔류할 수 있는 기화되지 않은 액체 형태의 니코틴 용액이 기화 유도관(134)의 내부로 유입되는 것을 방지한다.

[0025] 히터 어셈블리(12)와 수용 용기(13)는 제2 하우징(C2)의 내부에 수용되고 흡입 어셈블리(14)는 제2 하우징(C2)의 다른 끝 부분에 연결될 수 있다. 구체적으로 제2 하우징(C2)의 한쪽 끝에 배터리 어셈블리(11)가 연결되고 다른 끝 부분에 흡입 어셈블리(14)가 연결될 수 있다. 제2 하우징(C2)의 둘레 벽은 저장 룸(132)의 측벽을 형성하면서 이와 동시에 기화 룸(131)의 측벽을 형성한다. 본 명세서에서 둘레 벽, 측벽 또는 외벽은 일정 공간의 외부를 둘러싸는 면을 지칭하고 동일 또는 유사한 의미로 사용된다. 제2 하우징(C2)의 둘레 벽이 기화 룸(131)과 저장 룸(132)의 측벽을 형성하면서 저장 룸(132)의 측벽의 일부는 기화 룸(131)의 측벽이 된다. 그러므로 기화 룸(131)과 저장 룸(132)의 별도로 분리되어 제조된 이후 결합이 되는 것이 아니라 일체로 형성될 수 있다.

[0026] 기화 룸(131)에 대한 외부 공기의 유입은 분리판(123)의 아래쪽으로부터 이루어지거나 공기 유입 통로(133)를 통하여 이루어질 수 있다. 분리판(123)의 아래쪽으로 공기가 유입되기 위한 구조는 예를 들어 특허공개번호 제2009-0005139호에 개시되어 있다. 본 발명에 따른 기화 룸(131)의 내부에 대한 공기 유입은 위 선행기술에 개시된 방법과 동일 또는 유사한 방법으로 이루어질 수 있다.

[0027] 본 발명에 따르면, 외부 공기는 공기 유입 통로(133)를 통하여 기화 룸(131)의 내부로 유입될 수 있다. 공기 유입 통로(133)는 저장 룸(132)과 일체로 형성된 기화 룸(131)의 외벽을 관통하는 형태로 만들어질 수 있다. 외부 공기는 기화된 니코틴 용액을 기화 유도관(134)으로 유도하기 위한 것이다. 만약 스위치 방식으로 전자담배가 작동이 된다면, 외부 공기는 기화 룸(131)에만 공급될 수 있다. 그러나 스위치가 설치되지 않고 공기 유입에 의하여 작동되는 전자담배의 경우 배터리 어셈블리(11)로부터 기화 룸(131)으로 공기가 유입될 필요가 있다. 그러므로 공기 유입 통로(133) 이외에 별도의 공기 통로가 배터리 어셈블리(11)에 형성될 필요가 있다. 다른 한편으로 배터리 어셈블리(11)로부터 또는 공기 유입 통로(131)를 제외한 다른 경로를 통하여 히터 어셈블리(12)로 공기가 공급이 된다면 공기 유입 통로(131)가 반드시 형성되어야 하는 것은 아니다. 이와 같이 본 발명에 따르면, 공기 유입 통로(134)를 제외한 공기 유입 경로가 형성되거나 또는 공기 유입 통로(134)가 형성되지 않을 수 있다.

[0028] 공기 유입 통로(134)에 대하여 아래에서 다시 설명이 된다.

[0029] 수용 용기(13)는 기화 룸(131)과 저장 룸(132)으로 이루어질 수 있고 기화 룸(131)의 내부에 히터 어셈블리(12)가 수용될 수 있다. 저장 룸(132)에 저장된 니코틴 용액은 기화 룸(131)과 저장 룸(132)의 공통 외벽에 형성된 공급 통로를 통하여 기화 룸(131)의 내부로 공급될 수 있다. 기화 룸(131)의 내부에서 니코틴 용액은 예를 들어 섬유 집합체(F)와 같은 전달 수단을 통하여 히터에 공급될 수 있다.

[0030] 흡입 어셈블리(14)는 체류 공간(141)과 마우스피스(142)로 이루어질 수 있다. 체류 공간(141)에 기화 유도관(134)의 일부가 수용되어 기화된 니코틴 용액이 체류 공간(141)으로 전달될 수 있다. 체류 공간(141)은 수용 용기(13)에 결합될 수 있고 마우스피스(142)는 흡입에 적절한 구조를 가질 수 있다. 흡입 어셈블리(14)는 이 분야에서 공지된 임의의 형태가 될 수 있고 본 발명은 흡입 어셈블리(14)의 구조에 의하여 제한되지 않는다.

[0031] 도 2a는 본 발명에 따른 수용 용기의 실시 예에 대한 단면도를 도시한 것이다.

[0032] 도 2a를 참조하면, 수용 용기의 한쪽 끝에 분리판(123)과 히터 고정 장치(124)로 이루어진 히터 어셈블리가 결합된다. 히터 고정 장치(124)는 분리판(123)에 고정되면서 기화 룸(131)의 내부에 수용될 수 있고 끝 부분에서 히터(도 1 참조)가 설치될 수 있다. 기화 룸(131)은 히터를 수용하면서 저장 룸(132)과 분리된 공간을 형성할 수 있다. 제2 하우징(C2)의 둘레 면 중 기화 룸(131)과 저장 룸(132)이 공통 측벽을 형성하는 부분에 공급 통로(21, 21a)가 형성될 수 있다. 도 2a의 (다)에 도시된 것처럼, 공급 통로(21, 21a)는 공통 측벽에 원형을 단면을 가지는 유로를 형성하는 방법으로 만들어질 수 있다. 구체적으로 도 2a의 (다)를 참조하면, 제2 하우징(C2)의

NJOY Exhibit 1002.1802

벽은 수직 방향으로 서로 다른 두께를 가지도록 만들어질 수 있다. 기화 룸(131)의 윗면(131a) 또는 저장 룸(132)의 바닥면으로부터 아래쪽으로 기화 룸(131)의 측벽을 형성하는 부분은 두꺼운 측벽(22a)으로 될 있고 저장 룸(132)의 측벽은 제2 하우징(C2)의 둘레 면이 될 수 있다. 이와 같은 두꺼운 측벽(22a)은 기화 룸(131)의 측벽 전체로 형성되거나 또는 일부에 형성될 수 있다. 공급 통로(21)는 두꺼운 측벽(22a)을 따라 기화 룸(131)의 측벽에 형성될 수 있다. 대안으로 도 2a의 (다)의 오른쪽 부분에 도시된 것처럼, 기화 룸(131)의 측벽에 기화 룸(131)의 길이 방향으로 연장되는 돌출 연장 부분(22)이 형성될 수 있다. 공급 통로(21a)는 돌출 연장 부분(22)을 따라 형성될 수 있다.

[0033] 공급 통로(21, 21a)는 저장 룸(132)의 니코틴 용액을 기화 룸(131)으로 전달하기 위한 것으로 원형의 단면을 가지거나 또는 다각형의 단면을 가질 수 있다. 공급 통로(21, 21a)를 통하여 전달되는 니코틴 용액은 유입 홀(In)을 통하여 히터(H)에 공급될 수 있다. 유입 홀(In)은 공급 통로(21, 21a)와 기화 룸(131)을 연결하는 관통 홀의 형상이 될 수 있다. 만약 섬유 집합체(F)가 니코틴 용액의 전달 수단이 된다면 섬유 집합체(F)의 양끝은 유입 홀(In)을 통하여 공급 통로(21, 21a)로 연장될 수 있다.

[0034] 기화 룸(131)에 외부 공기를 유입시키기 위한 공기 유입 통로(133)는 기화 룸(131)의 수직 방향에 대하여 유입 홀(In)의 위쪽 부분에 형성될 수 있지만 특별히 제한되지 않는다. 도 2a의 (나)를 참조하면, 전자담배는 배터리 어셈블리(11), 히터 어셈블리(12), 수용 용기(13) 및 흡입 어셈블리(14)로 이루어질 수 있고 히터는 히터 어셈블리(12)와 수용 용기(13)의 경계 부분에 위치하게 되고 공기 유입 통로(133)는 경계 부분으로부터 위쪽 부분(도면에서 아래쪽에 해당)에 위치하게 된다.

[0035] 기화 룸(131)의 내부로 외부 공기를 유입시키는 것은 기화 룸(131)의 내부에서 기화된 니코틴 용액이 외부 공기와 함께 흡입 어셈블리(14)를 경유하여 사람의 입으로 유입될 수 있도록 하기 위한 것이다. 도 2b의 (나)에 도시된 것처럼, 공기 유입 통로(133)는 기화 룸(131)의 측벽(C22, C21)에 대하여 경사된 형태가 될 수 있다. 도 2b의 (나)에 도시된 구조는 기화 룸(131)의 측벽이 저장 룸(132)의 측벽에 비하여 두꺼운 구조에 해당한다. 구체적으로 바깥 측벽(C21)은 제2 하우징(C2)의 둘레면 또는 저장 룸(132)의 측벽에 해당하고 안쪽 측벽(C22)은 기화 룸(131)만의 측벽에 해당한다. 안쪽 측벽은 위에서 설명한 공급 통로(21, 21a)가 형성된 부분에 해당한다. 공기 유입 통로(133)는 2개의 측벽(C21, C22)을 관통하여 기화 룸(131)의 외부와 내부를 연결하는 형태로 만들어질 수 있다. 또는 하나의 측벽(C22)만이 형성된 부분에 공기 유입 통로(133)가 만들어진다면 하나의 측벽(C22)만을 관통하는 형태로 만들어질 수 있다. 필요에 따라 공기 유입 통로(133)에 필터(FT)가 삽입될 수 있다. 필터(FT)는 외부 공기에서 오염물이 유입되는 것을 방지하거나 또는 흡입 과정에서 공기의 유입으로 인하여 소음이 발생하는 것을 방지하기 위하여 설치될 수 있다. 필터(FT)는 교환 가능한 형태로 만들어질 수 있다.

[0036] 도 2a의 (가)에 도시된 것처럼, 흡입 어셈블리(14)는 저장 룸(132)의 한쪽 끝에 끼워질 수 있는 돌출 부분을 가진 외부 케이싱(141a), 기화 유도관(134)의 한쪽 끝 부분이 삽입될 수 있는 삽입 홀(144) 및 기화된 니코틴 용액이 한꺼번에 입으로 흡입되는 것을 방지하도록 하는 여유 공간(145) 및 흡입 출구(142a)를 포함할 수 있다. 만약 전자담배가 저장 룸(132)에 니코틴 용액이 다시 충전될 수 있는 형태라면 흡입 어셈블리(14)는 저장 룸(132)의 충전을 위한 마개 기능을 가질 수 있다.

[0037] 도 2b는 본 발명에 따른 기화 룸에 유입되는 공기의 양을 조절하는 실시 예, 배터리 어셈블리로부터 기화 룸에 공기를 유입시키기 위한 실시 예 및 섬유 집합체(F)가 고정되는 실시 예를 각각 도시한 것이다.

[0038] 도 2b의 (가)를 참조하면, 공기 유입 통로(133a)는 둘레 면을 따라 일정 길이만큼 연장된 형태의 입구를 가질 수 있다. 입구의 크기는 조절 입구(133b)를 가진 조절 수단(24)에 의하여 조절될 수 있다. 조절 수단(24)은 예를 들어 제2 하우징(C2)을 감싸는 형태로 만들어질 수 있고 공기 유입 통로(133a)와 조절 입구(133b)가 일치하는 정도에 따라 공기 유입 통로(133a)에서 공기가 유입되는 폭이 조절될 수 있다.

[0039] 도 2b의 (나)를 참조하면, 분리판(123)에 공기 소통 홀(25)이 형성될 수 있다. 공기 소통 홀(25)은 분리판(123)을 아래쪽에서 위쪽으로 관통하는 형태로 만들어질 수 있고 위쪽 부분은 분리판(123)의 표면으로부터 일정 거리만큼 돌출된 형태가 되도록 만들어질 수 있다. 이와 같은 돌출된 형태는 히터(H)에 위치하는 섬유 집합체(F)에 잔존하는 니코틴 용액이 분리판(123)의 바닥면에 떨어져서 잔존하게 되어 공기 소통 홀(25)을 통하여 누설이 되는 것을 방지하기 위한 것이다. 공기 소통 홀(25)의 직경은 예를 들어 0.1 ㎜ 내지 0.5 ㎜가 될 수 있지만 이에 제한되지 않는다. 공기 소통 홀(25)의 형성 위치 또는 수는 특별히 제한되지 않으며 바람직하게 히터 고정 수단(124)의 벽면으로 일정 거리만큼 이격되어 형성되는 것이 유리하다. 이는 바닥면을 흐를 수 있는 니코틴 용액의 누설을 방지하기 위한 것이다.

[0040] 도 2b의 (나)에 도시된 것처럼, 섬유 집합체(F)는 히터 고정 수단(124)의 윗면에 형성된 수용 홈(26)과 저장 룸(131)의 고정 측벽(131c)에 형성된 고정 홈(26a)에 의하여 고정될 수 있다. 고정 측벽(131c)은 공급 통로(21, 21a)가 형성된 부분의 안쪽 벽이 될 수 있고 수용 홈(26)과 고정 홈(26a)이 서로 맞물리는 것에 의하여 전체적으로 원형을 형성하고 그리고 섬유 집합체(F)의 끝 부분이 원형 부분에 고정될 수 있다.

[0041] 제시된 실시 예는 예시적인 것으로 섬유집합체(F)는 다양한 방법으로 히터(H)에 고정될 수 있다.

[0042] 도 3은 본 발명에 따른 전자담배의 다른 실시 예를 도시한 것이다.

[0043] 도 3을 참조하면, 전자담배는 전체적으로 직사각형의 단면을 가지면서 연장되는 형상을 가질 수 있다. 필요에 따라 일직선 형태가 아니라 중간 부분에서 꺾인 형상을 가질 수 있다. 외부 케이싱(31)은 직사각 기둥 형상이 되고 잔존 니코틴 용액 표시 부분(32), 배터리 사용 표시 부분(35), 전원 연결 부분(36) 및 연결 마우스피스(33)를 가질 수 있다. 잔존 니코틴 용액 표시 부분(32)은 저장 룸의 내부에 잔존하는 니코틴 용액을 육안으로 살펴볼 수 있도록 하기 위한 것이고 배터리 사용 표시 부분(35)은 현재 사용 가능한 배터리의 용량을 확인하기 위한 것이다. 연결 마우스피스(33)는 도 3의 중간 부분에 도시된 것과 같은 연장 마우스피스(37)의 연결을 위한 것이다. 연장 마우스피스(37)는 연결 마우스피스(33)에 삽입될 수 있는 연결 소켓(33a), 연결 소켓(33a)으로부터 일정 길이만큼 연장되는 연장 튜브(371), 연장 튜브(371)의 끝 부분에 형성된 유입 마우스피스(372)로 이루어질 수 있고 필요에 따라 유입 마우스피스(372)의 앞쪽에 입안에서 고정이 될 수 있도록 하는 고정 테두리(373)가 형성될 수 있다. 기화된 니코틴 용액은 연결 마우스피스(33)로 유입되어 연장 튜브(371)를 경유하여 유입 마우스피스(372)로 전달될 수 있다. 연장 마우스피스(37)는 예를 들어 작업을 하면서 흡연을 하기 위한 것으로 평상시 흡연의 경우 연결 마우스피스(33)를 통하여 흡연이 이루어질 수 있다.

[0044] 전자담배의 휴대성을 높이기 위하여 외부 케이싱(31)의 측면에 줄 고리(G)가 부착될 수 있다. 줄 고리(G)에 예를 들어 전자담배를 목에 걸기 위한 목줄(SP)이 연결될 수 있다.

[0045] 도 3의 (가)에 제시된 실시 예는 전자담배의 휴대성 또는 사용 방법을 향상시키기 위한 예시적인 것으로 본 발명은 제시된 방법에 제한되지 않는다.

[0046] 전자담배가 전체적으로 직사각 기둥 형상을 가지면 도 3의 (나)에 도시된 것처럼, 기화 룸(131a)의 측벽(311)에 공급 통로(312)가 형성될 수 있다. 공급 통로(312)는 위에서 이미 설명한 것처럼 두꺼운 측벽을 형성하거나 또는 돌출 연장 부분을 형성하는 방법으로 만들어 질 수 있다. 또한 공기 유입 통로(133a)가 기화 룸(131a)에 형성될 수 있다.

[0047] 위에서 전자담배는 직사각 형상의 단면 또는 원 형상의 단면을 가질 수 있고 공급 통로(21, 21a)를 통하여 기화 룸 내부에 니코틴 용액이 공급될 수 있다. 아래에서 니코틴 용액이 공급 통로(21, 21a)로부터 히터(H)에 공급되는 실시 예에 대하여 설명한다.

[0048] 도 4는 본 발명에 따른 수용 용기에 니코틴 용액이 공급되는 구조에 대한 실시 예를 도시한 것이다.

[0049] 도 4에 제시된 실시 예에서 원형의 단면을 가진 수용 용기에 대하여 설명이 되지만 사각형 또는 제시된 구조는 다른 단면을 가진 수용 용기에 적절한 설계 변형을 통하여 적용될 수 있다.

[0050] 도 4의 (가)를 참조하면, 히터 어셈블리는 2단으로 이루어진 분리판(123) 및 분리판(123)에 연결된 히터 고정 수단(124)로 이루어지고 히터 고정 수단은 일정 두께(t)를 가진 속이 빈 원통 형상이 될 수 있다. 속이 빈 원통 형상의 위쪽에 히터(H)가 고정되고 일정 두께(t)의 위쪽 면에 홈 형상의 유입 홀(In)이 만들어질 수 있다. 유입 홀(H)에 히터(H)의 내부를 관통하여 고정되는 섬유 집합체(F)의 양 끝이 위치할 수 있다.

[0051] 도 4의 (나)를 참조하면, 기화 룸의 측벽(C2)에 형성된 공급 통로(21, 21a)의 끝 부분에 원형 통로(41)가 형성될 수 있고 원형 통로(41)의 아래쪽 부분에 히터 고정 부분(124)과 접하면서 분리판(123)에 걸쳐지는 바닥 부분(42)이 형성될 수 있다. 원형 통로(41)는 천장 부분과 바닥 면을 가지면서 양 측면은 개방된 기화 룸의 내부를 일주하는 튜브 형상이 될 수 있다. 개방된 바깥 쪽 측면의 2개 지점은 각각 공급 통로(21, 21a)와 연결이 되고 개방된 안쪽 측면의 2개 지점은 유입 홀(In)과 연결이 된다. 그리고 개방된 다른 부분은 히터 고정 부분(124)의 바깥쪽 둘레 면과 접촉하여 막히게 된다. 위와 같은 구조에서 공급 통로(21, 21a)를 통하여 유입된 니코틴 용액은 원형 통로(42)에 저장되고 원형 통로(42)는 일정 지점에서 유입 홀(In)과 연결된다. 그리고 원형 통로(42)에 저장된 니코틴 용액은 유입 홀(In)에 위치하는 섬유 집합체(F)를 통하여 히터(H)로 공급될 수 있다.

[0052] 제시된 구조는 기화 룸과 저장 룸을 일체로 형성하면서 별도로 제작된 히터 어셈블리의 조립을 간단하게 할 수 있다는 이점을 가진다. 구체적으로 만약 원형 통로(41)가 형성되어 있지 않다면 공급 통로(21, 21a)와 유입 홀

NJOY Exhibit 1002.1804

(In)이 일치하도록 조립이 되어야 한다. 그러나 도 4에 도시된 것처럼, 원형 통로(41)가 형성되어 있다면 히터 어셈블리는 임의의 위치에서 기화 룸에 조립될 수 있다.

[0053] 제시된 실시 예는 예시적인 것으로 다양한 구조의 원형 통로 또는 다른 형태의 통로가 형성될 수 있고 본 발명은 이와 같은 통로의 형성 방법 또는 형성 여부에 의하여 제한되지 않는다.

[0054] 본 발명에 따른 수용 용기는 전자담배의 구조가 간단해지도록 하면서 니코틴 용액의 누설이 방지될 수 있도록 한다는 이점을 가진다. 또한 본 발명에 따른 수용 용기는 다양한 형태의 전자담배에 적용될 수 있도록 하면서 수용 용기의 대량 생산이 가능하도록 한다는 장점을 가진다.

[0055] 위에서 본 발명의 제시된 실시 예를 참조하여 상세하게 설명이 되었지만 이 분야에서 통상의 지식을 가진 자는 제시된 실시 예를 참조하여 본 발명의 기술적 사상을 벗어나지 않는 범위에서 다양한 변형 및 수정 발명을 만들 수 있을 것이다. 본 발명은 이와 같은 변형 및 수정 발명에 의하여 제한되지 않으며 다만 아래에 첨부된 청구범위에 의하여 제한된다.

부호의 설명

[0056]

10: 전자담배

11: 배터리 어셈블리

112: 발광 수단

111: 커버

113: 전자기판

114: 연결 부분

115: 나사 부분

12: 히터 어셈블리

121: 체결 부분

122: 나사 부분

123: 분리판

124: 히터 고정 수단

13: 수용 용기

131, 131a: 기화 룸

131c: 고정 측벽

132: 저장 룸

133, 133a: 공기 유입 통로

133b: 조절 입구

134: 기화 유도관

135: 돌출 부분

14: 흡입 어셈블리

141: 체류 공간

141a: 외부 케이싱

142: 마우스피스

142a: 흡입 출구

144: 삽입 홀

145: 여유 공간

21, 21a: 공급 통로

22a: 두꺼운 측벽

22: 돌출 연장 부분

24: 조절 수단

25: 공기 소통 홀

26: 수용 홈

26a: 고정 홈

31: 외부 케이싱

311: 측벽

312: 공급 통로

32: 니코틴 용액 표시부분

33: 연결 마우스피스

33a: 연결 소켓

35: 배터리 사용 표시 부분

36: 전원 연결 부분

37: 연장 마우스피스

371: 연장 튜브

372: 유입 마우스피스

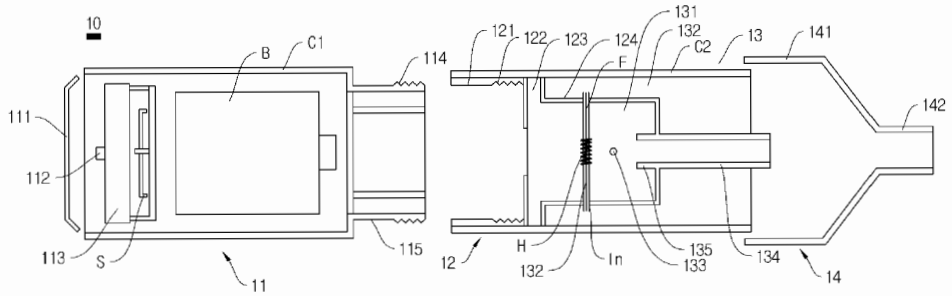
373: 고정 테두리

NJOY Exhibit 1002.1805

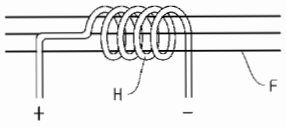
41: 원형 통로
42: 바닥 부분
5: 전자담배
51: 배터리 어셈블리
511: 배터리
52: 기화 어셈블리
521: 하우징
522: 공기 유도로
523: 히터
526: 공급 용기
524: 기화기
525: 연기 유도로
523: 발열체
53:발광체
541: 흡입 통로
542:배출구
54: 흡입 어셈블리
C1: 제1 하우징
C2: 제2 하우징
FT: 필터
B: 배터리
In: 유입 홀
F: 섬유 집합체
H: 히터
C21, C22: 측벽
G: 줄 고리
SP: 목줄

도면

도면1



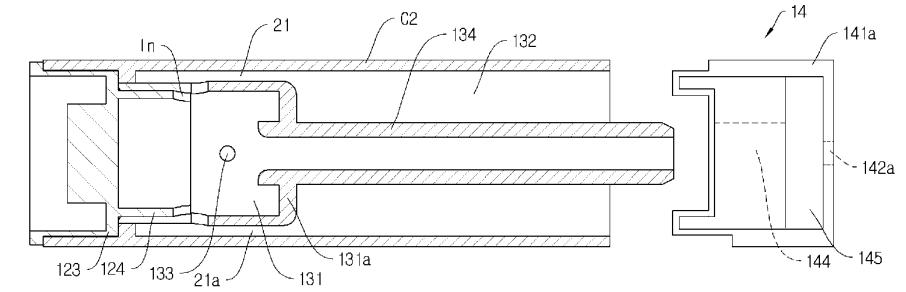
(가)



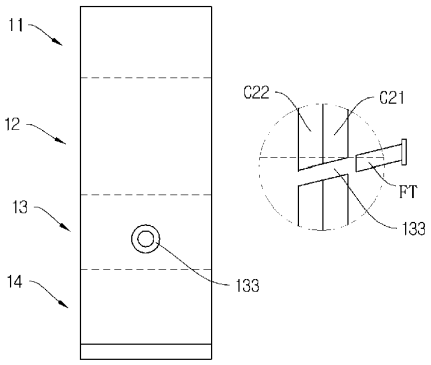
(나)

NJOY Exhibit 1002.1806

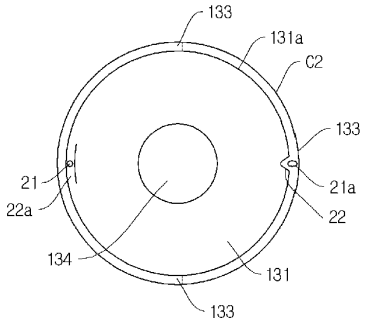
도면2a


21
C2
134
132
14
141a
In
142a
123
124
133
21a
131
131a
144
145

(가)

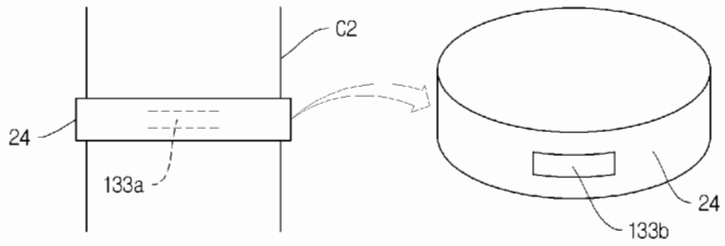

11
12
13
14
133
C22
C21
FT
133

(나)

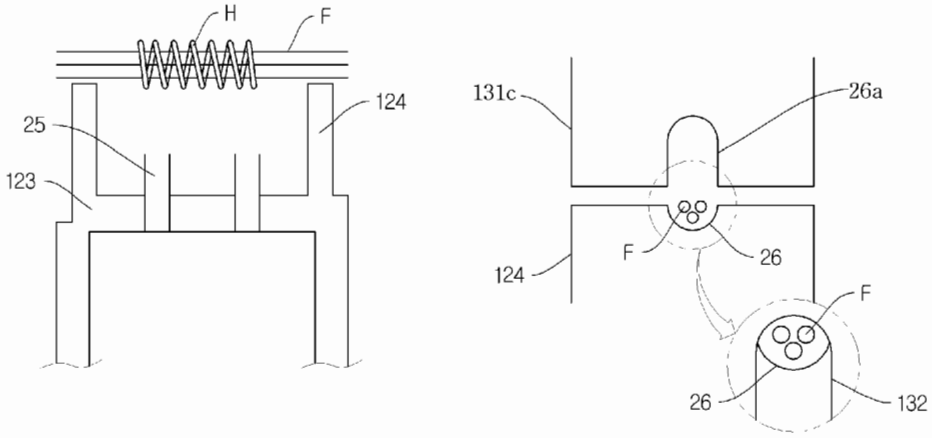

133
131a
C2
133
21
21a
22a
22
134
131
133

(다)

도면2b



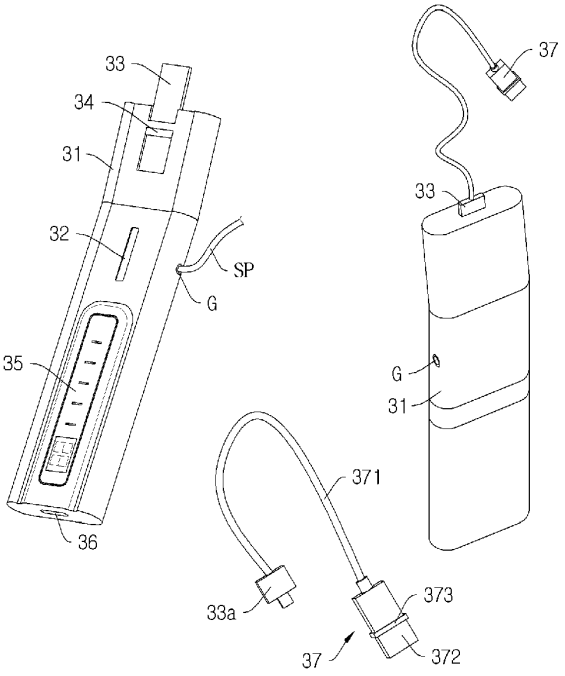
(가)



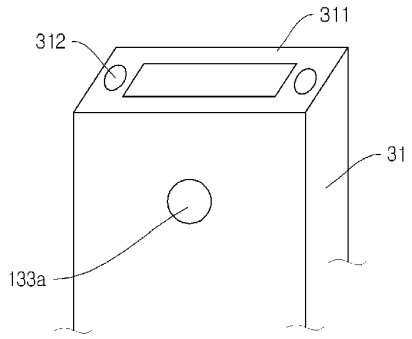
(나)

NJOY Exhibit 1002.1808

도면3

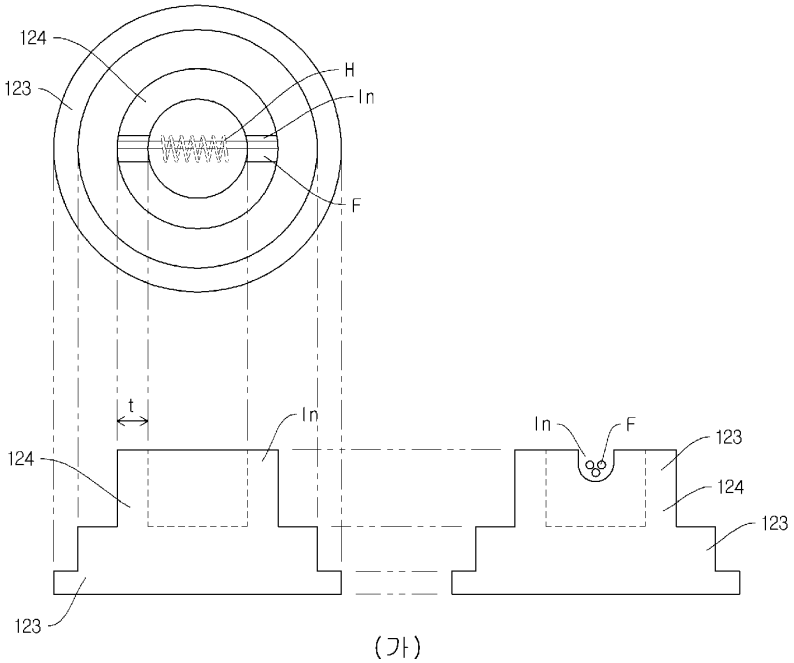


(가)

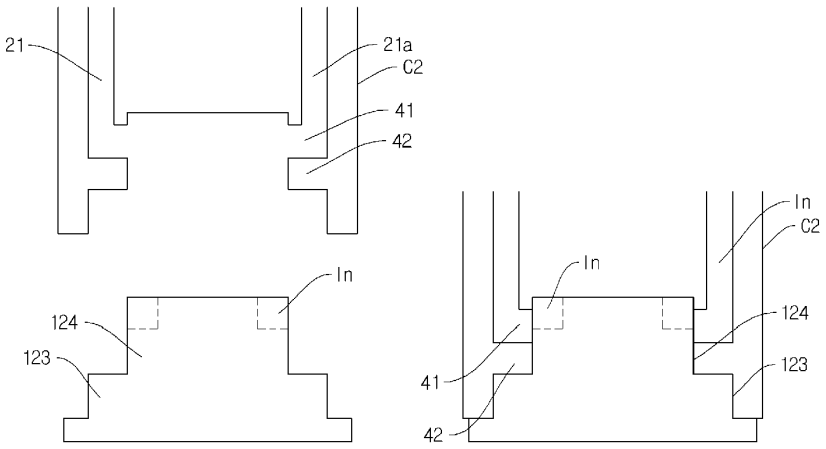


(나)

도면4

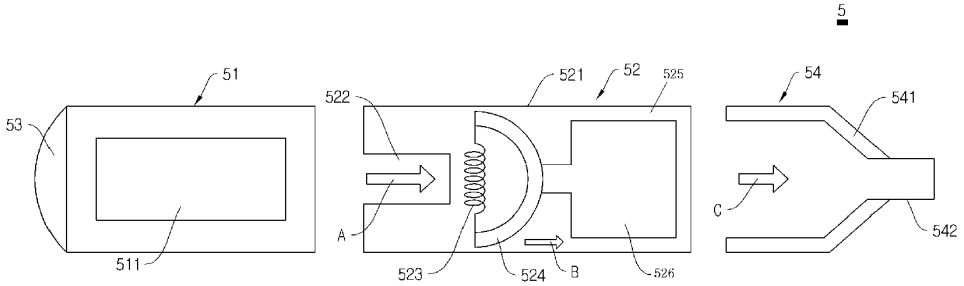

124
123
H
In
F
t
In
In
F
123
124
123
124
123

(가)


21
21a
C2
41
42
In
124
123
In
In
C2
124
123
41
42

(나)

도면5


5
51
53
511
522
521
52
525
A
523
524
B
526
54
541
C
542

Morningside IP The Leader in Global IP Solutions

TRANSLATOR CERTIFICATION

Date: October 31, 2018

To whom it may concern:

I, Sean Lee, a translator fluent in the Korean and English languages, on behalf of Morningside Translations, do solemnly and sincerely declare that the following is, to the best of my knowledge and belief, a true and correct translation of the document(s) listed below in a form that best reflects the intention and meaning of the original text.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

The documents are designated as:

Patent Application Publication 10-2013-0106741

Signature

Sean Lee

Print

NEW YORK
450 Seventh Avenue
10th Floor
New York, NY 10123, USA
P: (212) 643-8800

SAN FRANCISCO
111 Pine Street
Suite 1815
San Francisco, CA 94111, USA
P: (415) 580-6360

KENT
Corn Exchange House
49 The Pantiles
Tunbridge Wells
Kent TN2 5TE, UK
P: +44 (0)1892 549784

HAMBURG
Kurze Mühren 1
2nd Floor
Hamburg, Germany 20095
P: +49 (0) 407 679 6500

JERUSALEM
43 Emek Refaim
Entrance B
Jerusalem 9314104, Israel
P: +972 (02) 563-1728

info@morningsideip.com | www.morningsideIP.com

(19) Korean Intellectual Property Office (KR)
(12) Patent Application Publication (A)

(11) Disclosure number: 10-2013-0106741
(43) Disclosure date: September 30, 2013

(51) International classification code (Int. Cl.)
A24F 47/00 (January, 2006) A24B 15/16 (January, 2006)
(21) Application number 10-2012-0028517
(22) Application date March 20, 2012
Evaluation request date March 20, 2012

(71) Applicant
Young In Lee
59, 20-gagil, Goduk-ro, Gangdong-gu, Seoul
(72) Inventor
Han Ki Kim
708-902, 108 Yatap-ro, Bundang-gu, Seongnam-si, Gyeonggi-do (Tapmaeul, Yatap-dong)
(74) Agent
DAHAI

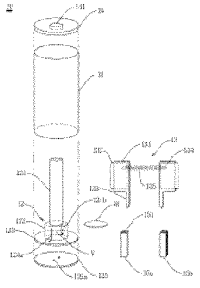
Total number of claims: 6

(54) Name of the invention: A cartridge structure capable of providing consistent amount

(57) Summary

The present invention pertains to a cartridge structure capable of providing consistent quantity. Specifically, the present invention is about a cartridge structure that provides consistent amount of the liquid stored in the supply container to the vaporization chip located inside the supply container through a supply medium at the same time preventing leakages. The cartridge structure (10) for electric cigarettes or smoking cessation aids is composed of a supply container (11) capable of storing liquid inside with storage space (V) formed on one side, liquid storage units (131, 132) fixed to the storage space (V) capable of receiving the liquid stored inside the supply container (11) and capable of maintaining the predetermined amount, and a vaporization chip (13) composed of vaporization units (134, 135) capable of receiving and vaporizing the consistent amount from the liquid storage unit (131).

Representative diagram- Figure 1a



Scope of claims

Claim 1

A cartridge structure (10) for electric cigarettes or smoking cessation aids composed of a supply container (11) capable of storing liquid inside with storage space (V) formed on one side, liquid storage units (131, 132) fixed to the storage space capable of receiving the liquid stored inside the supply container (11) and capable of maintaining the predetermined amount, and a vaporization chip (13) composed of vaporization units (134, 135) capable of receiving and vaporizing the consistent amount from the liquid storage unit (131).

Claim 2

NJOY Exhibit 1002.1812

A cartridge structure of Claim 1, wherein the liquid storage unit is composed of the internal storage unit (132) capable of absorbing liquid from the supply container (11) and an external fixed unit (131) that surrounds the internal storage unit (132) and that prevents the liquid from leaking.

Claim 3

A cartridge structure of Claim 1, wherein at least some part of the liquid storage unit is composed of a conductive material.

Claim 4

A cartridge structure for electric cigarettes or smoking cessation aids composed of a supply container (11) capable of storing liquid inside with storage space (V) formed on one side, liquid storage units (131, 132) fixed to the storage space (V) capable of receiving the liquid stored inside the supply container (11) and capable of maintaining the predetermined amount, and a vaporization chip (13) composed of vaporization units (134, 135) capable of receiving and vaporizing the consistent amount from the liquid storage unit (131).

Claim 5

A cartridge structure of Claim 4, wherein the internal fixed unit (132) is composed of fiber.

Claim 6

A cartridge structure of Claim 4, wherein at least part of the internal storage unit (131) is located inside the supply container (11).

Statement

Technological field

[0001] The present invention pertains to a cartridge structure capable of providing consistent quantity. Specifically, the present invention is about a cartridge structure that provides consistent amount of the liquid stored in the supply container to the vaporization chip located inside the supply container through a supply medium at the same time preventing leakages.

Background technology

[0002] A cartridge containing certain amount of nicotine liquid or smoking cessation medication could be used with an electric cigarette or smoking cessation equipment. Such an electric cigarette or smoking cessation device is publicly known, and Figure 4 illustrates a publicly known electric cigarette.

[0003] According to Figure 4, an electric cigarette is composed of a battery assembly (41) containing a battery (411) to provide power, a housing (421), an air inducing passageway (422) to induce air flown from outside, a heater that is heated by the power supplied from the battery (411), a vaporization assembly (42) composed of the vaporizer (422) that vaporizes the nicotine liquid supplied from the supply container (426) using the heat transmitted from the heater (423) and the smoke inducing passageway (425) that induces nicotine smoke vaporized at the vaporizer (424), an inhaling passageway (441) that induces nicotine smoke to the mouth, and an inhaling assembly (44) composed of the inhaling passageway (441) and the exit (442) connected to the inhaling passageway (441). In the publicly known electric cigarette with the above structure external air flows in to the location market by arrow A to flow into the vaporization assembly (42). The vaporized air flows into the smoke inducing passageway (425) through the location indicated as arrow B with the vaporized nicotine liquid at the vaporizer (424) and is supplied to the inhaling assembly (44) marked as arrow C. Additionally, the publicly known electric cigarette could include a light emitting body (43) capable of displaying smoking.

NJOY Exhibit 1002.1813

[0004] The supply container (426) in the publicly known electric cigarette or smoking cessation supplies nicotine liquid to the vaporizer (424), and the nicotine liquid supplied to the vaporizer (424) by the heat supplied from the heater (423) becomes vaporized and can be emitted to the exit (442) through the inhaling passageway (441). In the event that the liquid is not vaporized, the liquid remains in the heater (423) or vaporizer (424), and as a result the solution is leaked outside. Also, due to the fact that the amount of the liquid remaining in the vaporizer (424) is not consistent, the amount of liquid that is vaporized could differ each time in the vaporization process. Such leakages or inconsistent amount of liquid vapor could be causes of defects in electric cigarettes or smoking cessation devices, and could be factors that deteriorate product quality.

[0005] The present invention was devised in order to resolve such problems of the prior art, and has the following purposes.

Details of the invention

Issues to be resolved

[0006] The purpose of the present invention is to provide a cartridge structure capable of providing consistent quantity as well as preventing leakages.

[0007] The purpose of the present invention is to provide a cartridge structure that can be easily separated from the vaporizer or battery at the same time capable of being combined easily so that replacement is possible.

Methods to resolve the issues

[0008] According to an appropriate embodiment of the present invention, the cartridge structure for electric cigarettes or smoking cessation devices includes a supply container capable of storing liquid inside with storage space formed at one side and a vaporization chip composed of the liquid storage unit that is fixed to the storage space and capable of receiving the liquid stored inside the supply container and maintaining consistent amount and the vaporization unit that receives consistent amount from the liquid storage unit.

[0009] According to another appropriate embodiment of the present invention, the liquid storage unit is composed of the internal storage unit capable of absorbing and maintaining liquid from the supply container and the external fixing unit that surrounds the internal storage unit (132) to prevent liquid from leaking.

[0010] According to another appropriate embodiment of the present invention, at least some part of the liquid storage unit is composed of a conductive material.

[0011] According to another appropriate embodiment of the present invention, the cartridge structure for electric cigarettes or smoking cessation devices includes a supply container capable of storing liquid inside with storage space formed outside, the internal storage unit that is fixed to the storage space to receive and store liquid from the supply container, the external fixed unit (131) that prevents the leaking of the liquid stored in the internal storage unit, and the vaporization unit that receives liquid from the internal storage unit and vaporizes the liquid.

[0012] According to another appropriate embodiment of the present invention, the internal fixed unit is composed of fiber.

[0013] According to another appropriate embodiment of the present invention, at least part of the internal storage unit is located inside the supply container.

Effects of the invention

[0014] The cartridge in accordance with the present invention is applied to electric cigarettes or smoking cessation devices to prevent leakages at the same time providing consistent amount of liquid during the vaporization process. Also, with the cartridge in accordance with the present invention, in the event that liquid is consumed it is possible to replace with a backup cartridge, so that the production cost of electric cigarettes or smoking cessation devices is reduced.

NJOY Exhibit 1002.1814

Brief description of the drawings

[0015] Figure 1a and Figure 1b are rough decomposition drawing and front diagram, respectively, according to an embodiment under the present invention.

Figure 2 illustrates an embodiment of a vaporization chip applied to the cartridge under the present invention.

Figure 3 illustrates an embodiment of the process in which liquid is supplied from the cartridge and vaporization occurs in accordance with the present invention.

Specific details to embody the present invention

[0016] Although the present invention is described in detail below by referring to the embodiment presented in the attached drawings, the purpose of the embodiment is assist with clear understanding of the present invention, and the present invention is not limited to the embodiment.

[0017] According to Figure 1a and Figure 1b, the cartridge structure (10) in accordance with the present invention is composed of a supply container (11) capable of storing liquid inside with storage space (V) formed on one side, liquid storage units (131, 132) fixed to the storage space (V) capable of receiving the liquid stored inside the supply container (11) and capable of maintaining the predetermined amount, and a vaporization chip (13) composed of vaporization units (134, 135) capable of receiving and vaporizing the consistent amount from the liquid storage unit (131).

[0018] Although the supply container (11) could be in the shape of an empty cylinder overall, this is not the only shape. It is possible to contain nicotine liquid, smoking cessation medication or other types of liquid inside the supply container (11), and such material as plastic or stainless metal could be used.

[0019] The supply container (11)'s either side could be open, and each side could be closed by an inhaling cover (14) or vaporization inducing unit (12). The inhaling cover (14) could take any shape known in this field to emit vaporization components outside, and the shape is not limited to the shape presented in the embodiment.

[0020] The vaporization inducing unit (12) could be composed of the vaporization unit (122) that forms the storage space (V), the induction tube (121) to induce the vaporization components generated in the vaporization unit (122) to the outside, and the lower plate (123) that is formed at the bottom of the vaporization unit (122) to close the other side of the supply container (11) at the same time combining the vaporization induction unit (12) with the supply container (11). The vaporization unit (122) and the lower plate (123) could be formed in a single body, and the induction tube (121) could be extended from one end of the vaporization unit (122) and connected to the emission passageway (141) formed on the induction cover (14).

[0021] Connection units (124a, 124b) to fix the vaporization chip (13) to the vaporization unit (122) and to connect the vaporization chip (13) to the supply container (11) could be formed. The vaporization chip (13) will be described again below.

[0022] An optional penetration plate (H) could be formed on the top side of the vaporization unit (122). Although the optional penetration plate (H) could be made with a material that penetrates air but does not penetrate liquids such as a hydrophobic material, and could be formed with such materials as zeolite. Although it is possible for the vaporization component to be emitted outside through the induction tube (121), the liquid components that could be included in the vaporization components could adhere to the optional penetration plate (H). As a result, liquids in the shape of small bubbles are not formed in the vaporization components, so that the quality of the vaporization components could improve. However, it is not mandatory for the optional penetration plate (H) to be installed.

[0023] A closed plate (125) could be formed at the bottom of the lower plate (123). The closed plate (125) could fix the vaporization chip (13) at the same time additionally closing the storage space (V) from the outside.

NJOY Exhibit 1002.1815

The closed plate (125) could be formed with the same or similar material as the optional penetration plate (H), and could include a fixed hole (125a) to induce part of the vaporization chip (13) equipped with electrode functions to the outside. The fixed hole (125a) could have the functions of an external air induction hole as needed.

[0024] A vaporization chip (13) could be installed in the storage space (V). As illustrated in Figure 1a and Figure 1b, the vaporization chip (13) could have functions to receive power from such power sources as a battery (not illustrated) and vaporization liquid. The vaporization chip (13) has the function to store certain amount of liquid on its own and additionally can be supplied with liquid from the liquid container (11). Specifically, the vaporization chip (13) could be composed of the liquid storage unit (131, 132) capable of receiving the liquid stored inside the supply container (11) and maintaining the liquid in the predetermined amount and the vaporization unit (134, 135) receives certain amount of liquid from the liquid storage unit (131, 132). Also, the liquid storage unit could be composed of the internal storage unit (132) capable of absorbing liquid from the supply container (11) and maintaining the liquid and the external fixed unit (131) that surrounds the internal storage unit (132) to prevent liquid from leaking.

[0025] The external fixed unit (131) could be composed of such conductive materials as metals or aluminum, and could be formed with two plates overlapping. Part of the internal storage unit (132) could be inserted between the external fixed unit (131) that is partially overlapped and the remaining part could be exposed on the outside of the external fixed unit (131). The internal storage unit (131) could be composed of a material capable of absorbing and storing liquid such as cotton, fiber, non-woven fabric, paper, or porous materials.

[0026] The liquid storage unit (131, 132) could be composed of a pair, and could fix both ends of the vaporization unit (134, 135). Specifically, the vaporization unit (134, 135) could be composed of a transmission medium (134) to transmit liquid from the internal storage unit (132) and a vaporization unit (135) that vaporizes solution contained in the transmission medium (134). The transmission medium (134) could be composed of a collection of fibers, but also could be composed of any material or structure capable of transmitting solution from the internal storage unit (132) based on a liquid transmission method such as the capillary tube phenomenon. Also, the vaporization unit (135) could be composed of any material or structure capable of generating heat by being supplied with power from nichrome lines to vaporize liquid. In the presented embodiment, the vaporization unit (135) is coil-shaped, the transmission medium (134) penetrates the vaporization unit, and both ends of the transmission medium 134) are fixed to the solution storage unit (131, 132) along with both ends of the vaporization unit (135).

[0027] An electrode lead (133) could be formed at the bottom of the liquid storage unit (131, 132). The purpose of the electrode lead (133) is to electrically connect the vaporization unit (135) to the power source such as a battery, and could have various forms, and is not limited to the forms in the embodiment presented. The electrode lead (133) could be exposed outside through the fixed hole (125a).

[0028] As illustrated in Figure 1a and Figure 1b, the vaporization chip (13) could be fixed to the connection unit (124a, 124b). In the event that the external fixed unit (131) is in the shape of two overlapped plates, the connection unit (124a, 124b) could become a chasm formed on the vaporization unit (122)'s wall or on part of the lower plate (123) that extends lengthwise. When the external fixed part (131) is fixed by being inserted to the connection unit (124a, 124b), part of the vaporization chip (13) is located inside the supply container (11), and the remaining part of the vaporization chip (13) could be located in the storage space (V). The exposed part of the internal storage unit (132) is located inside the supply container (11), and as a result it is possible for the supply container (11)'s liquid to be continuously supplied to the internal storage unit (132).

[0029] On the other hand, liquid could be leaked through one corner of the vaporization chip (13) that is located in the storage space (V). In order to prevent this, a closing material (15a, 15b) that closes one corner of the vaporization chip (13) could be installed. The closing unit (15a, 15b) could have an insertion groove (151) into which the external fixed part (131) of the overlapped plate could be inserted. The closing unit (15a, 15b) could have functions to prevent the leaking of the vaporization chip (13)'s liquid at the same time fixing the vaporization chip (13) inside the storage space (V). It is not necessary for the closing unit (15a,

NJOY Exhibit 1002.1816

15b) to be formed, and it is possible for the closing unit (15a, 15b) not to be formed depending on the structure of the vaporization chip (13).

[0030] The vaporization chip (13) could be formed in various structures, could be fixed to the storage space (V) in various methods to transmit and store the liquid inside the supply container (11). The embodiment presented was for illustrative purposes, and the present invention is not limited to this.

[0031] The vaporization chip (13) will be described specifically below.

[0032] Figure 2 illustrates an embodiment of the vaporization chip applied to the cartridge under the present invention.

[0033] Figure 2 (A) illustrates a vaporization chip (23) with two overlapping plates, Figure 2 (B) is a cross-sectional diagram along line A-A, and Figure 2 (C) is a cross-sectional diagram along line B-B.

[0034] According to Figure 2 (A), the external fixed unit (231) could have a rectangular plate structure, and could be a pair. At the bottom of the external fixed part (231), the electrode lead (233) described above could be formed. The external fixed unit (231) could be composed of a conductive material such as a metal, and as a result the vaporization unit (235) and a power source could be electrically connected.

[0035] The internal storage unit (232) could be in the shape of a rectangle, and could be formed thinly with fiber or non-woven fabric. It is possible to use any material capable of absorbing and maintaining liquid for the internal storage unit (232), and as illustrated in Figure 2 (B), it could be posited so that part of the internal storage unit could be exposed outside the external fixed unit (231). In the embodiment presented in figure 2 (B), one corner of the external fixed part (231) could be closed with an appropriate method. For example, a pair of the external fixed part (231) could be closed by applying strong pressure.

[0036] The transmission medium (234) that forms the vaporization unit (234, 235) and both ends of the vaporization unit (235) come into contact with the internal fixed unit (232), and the vaporization unit (235) especially comes into contact with the external fixed unit (232) that is conducive. As a result, the power source could be connected to the vaporization unit (235) via the external fixed unit (231) from the electrode lead (233).

[0037] As illustrated in Figure 2 (c), the internal storage unit (23) could be composed of two layers, and both ends of the vaporization unit (232) could be inserted into the internal storage unit (232). Even in this case, the vaporization unit (232) must be positioned so that the vaporization unit (235) comes into contact with the external fixed unit.

[0038] The embodiment of the vaporization chip (23) presented in Figure 2 is for illustrative purposes, and it is possible for the vaporization chip (23) to be formed using various materials or various structures, and the present invention is not limited to the embodiment presented.

[0039] An embodiment in which vaporization occurs in a cartridge in accordance with the present invention will be described below.

[0040] According to Figure 3 (A) and Figure 3 (B), the solution (S) filled in the supply container (11) could flow into the vaporization chip through the route indicated as F1. In the vaporization chip, part of the internal storage unit (232) is exposed to the inside of the supply container (11), and as a result the liquid can flow into the vaporization chip. Part of the liquid in the vaporization chip can be supplied to the vaporization unit (235) using the transmission medium (234) to the route indicated as F2 again. The movement of liquid could take place through the capillary tube phenomenon, for example. When power is supplied through the electrode lead (233), heat is generated in the vaporization unit (235) and the liquid is vaporized, and is emitted through the route marked as G. When the liquid existing in the vaporization unit (235) is vaporized, the liquid can be supplied to the vaporization unit (235) through the route marked as F3 (substantially identical toF2) again. Then, the components that are vaporized from the vaporization unit (235) are emitted through the route marked as G. On the other hand, when the liquid inside the vaporization chip is reduced,

NJOY Exhibit 1002.1817

the liquid could be supplied to the vaporization chip from the supply container (11). The liquid in the supply container (11) is stored in the vaporization chip in the above method, and is supplied to the vaporization unit so that the liquid in the supply container (11) can be vaporized.

[0041] The embodiment presented in Figure 3 is for illustrative purposes, and the present invention is not limited to the embodiments presented.

[0042] The cartridge in accordance with the present invention is applied to electric cigarettes or smoking cessation devices to prevent leakages and the same time providing consistent amount of liquid in the vaporization process. Also, with the cartridge in accordance with the present invention, in the event that the liquid is consumed it is possible to replace with a backup cartridge, so the production cost of electric cigarettes or smoking cessation devices is reduced.

[0043] Although the present invention was described in detail with references to the embodiments of the present invention presented here, any person with ordinary level of knowledge in this field will be able to make various changes and modifications without deviating from the technological ideas of the present invention by referring to the embodiments presented here. The present invention is not limited by such changes or modifications, but is limited by the scope of claims attached below.

Description of the parts

[0044]

10: Cartridge structure	11: Supply container
12: vaporization induction unit	13: vaporization chip
14: Inhalation cap	15a, 15b: Closing unit
23: vaporization chip	
121: Induction tube	122: vaporization unit
123: Lower plate	124a, 124b: Connection unit
125: Closing plate	125a: Fixed hole
131: External fixed part	132: Internal storage unit
133: Electrode lead	134: Transmission medium
135: Vaporization unit	141: Emission passageway
151: Insertion groove	
231: External fixed unit	232: Internal storage unit
233: Electrode lead	234: Transmission medium
235: vaporization unit	
41: Battery assembly	42: Vaporization assembly
43: Light emitting body	44: Inhalation assembly
411: Battery	421: Housing
422: Air induction route	423: Heater

NJOY Exhibit 1002.1818

424: Vaporizer 425: Air induction route

426: Supply container 441: Inhalation passageway

442: Exit

V: Storage space H: Optional penetration plate S: Liquid

Drawings

Figure 1a

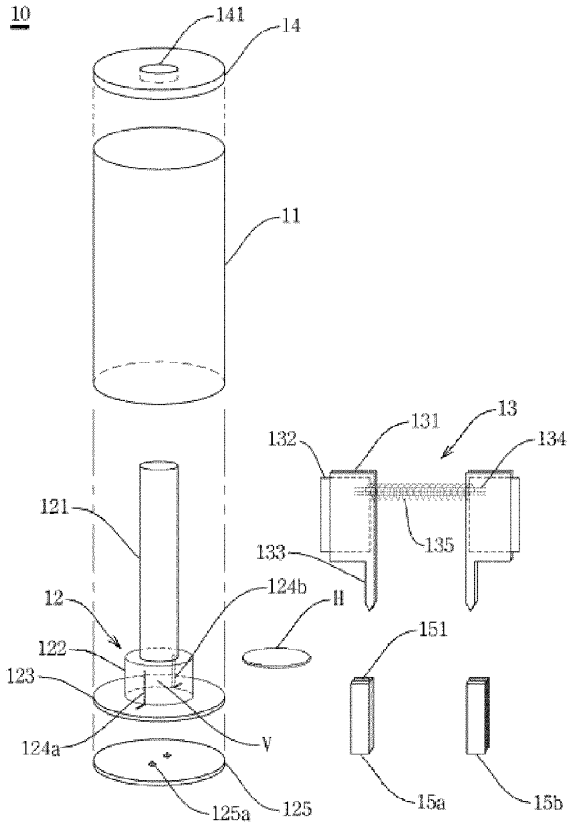


Figure 1b

NJOY Exhibit 1002.1819

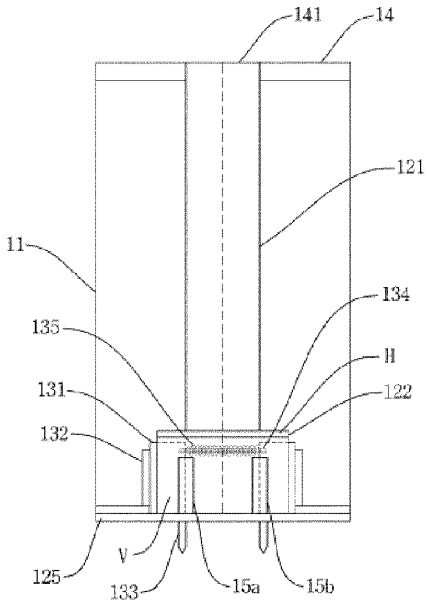
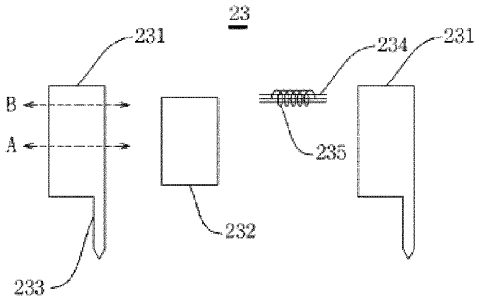
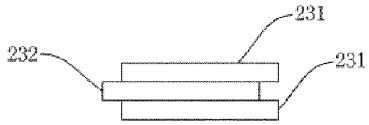


Figure 2

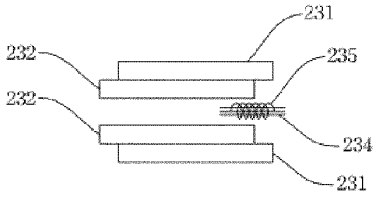


(A)



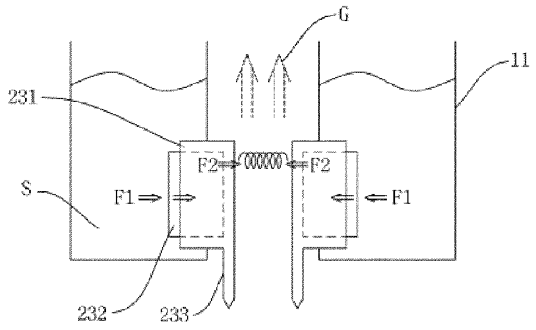
(B)

NJOY Exhibit 1002.1820

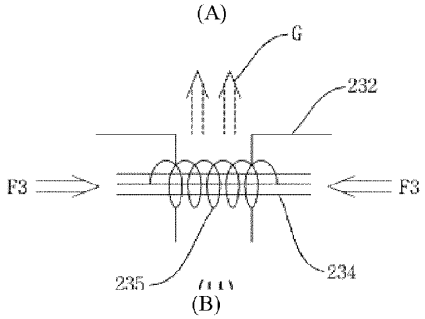


(C)

Figure 3

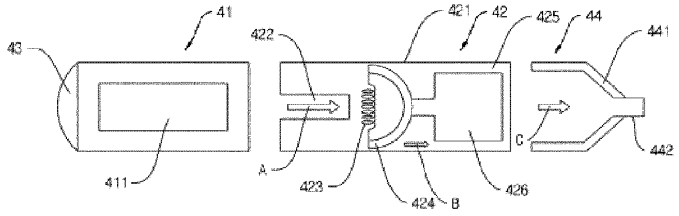


(A)



(B)

Figure 4



NJOY Exhibit 1002.1821

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(11) 공개번호 10-2013-0106741
(43) 공개일자 2013년09월30일

(51) 국제특허분류(Int. Cl.)
A24F 47/00 (2006.01) *A24B 15/16* (2006.01)
(21) 출원번호 10-2012-0028517
(22) 출원일자 2012년03월20일
심사청구일자 2012년03월20일

(71) 출원인
이영인
서울특별시 강동구 고덕로20가길 59 (암사동)
(72) 발명자
김한기
경기도 성남시 분당구 야탑로 108 ,708-902(야탑동,탑마을)
(74) 대리인
특허법인 다해

전체 청구항 수 : 총 6 항

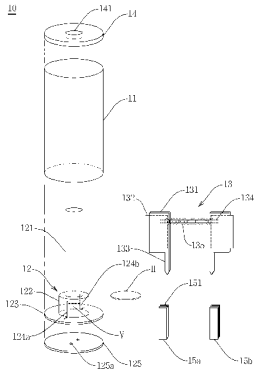
(54) 발명의 명칭 **정량 공급이 가능한 카트리지 구조**

(57) 요 약

본 발명은 정량 공급이 가능한 카트리지 구조에 관한 것이고, 구체적으로 본 발명은 공급 매개체를 통하여 공급 용기에 저장된 용액을 공급 용기의 내부에 위치하는 기화 칩에 공급하는 것에 의하여 정량 공급이 가능하면서 누설이 방지될 수 있도록 하는 정량 공급이 가능한 카트리지 구조에 관한 것이다. 전자담배 또는 금연 보조기기를 위한 카트리지 구조(10)는 내부에 용액의 저장이 가능하고 한쪽 부분에 수용 공간(V)이 형성된 공급 용기(11); 및

수용 공간에 고정되고 공급 용기(11)의 내부에 저장된 용액을 공급받아 정해진 양으로 유지할 수 있는 용액 저장 부분(131, 132)과 용액 저장 부분(131)으로부터 일정 양을 공급받아 기화를 시킬 수 있는 기화 부분(134, 135)으로 이루어진 기화 칩(13)을 포함한다.

대 표 도 - 도1a



NJOY Exhibit 1002.1822

특허청구의 범위

청구항 1

전자담배 또는 금연 보조기기를 위한 카트리지 구조(10)에 있어서,

내부에 용액의 저장이 가능하고 한쪽 부분에 수용 공간(V)이 형성된 공급 용기(11); 및

수용 공간에 고정되고 공급 용기(11)의 내부에 저장된 용액을 공급받아 정해진 양으로 유지할 수 있는 용액 저장 부분(131, 132)과 용액 저장 부분(131)으로 일정 양을 공급받아 기화를 시킬 수 있는 기화 부분(134, 135)으로 이루어진 기화 칩(13)을 포함하는 카트리지 구조.

청구항 2

청구항 1에 있어서, 용액 저장 부분은 공급 용기(11)로부터 용액을 흡수하여 유지할 수 있는 내부 저장 부분(132) 및 내부 저장 부분(132)을 둘러싸고 용액의 누설을 방지하기 위한 외부 고정 부분(131)으로 이루어진 것을 특징으로 하는 카트리지 구조.

청구항 3

청구항 1에 있어서, 용액 저장 부분의 적어도 일부는 전도성 소재로 이루어진 것을 특징으로 하는 카트리지 구조.

청구항 4

전자담배 또는 금연 보조기기를 위한 카트리지 구조에 있어서,

내부에 용액의 저장이 가능하고 외부에 수용 공간(V)이 형성된 공급 용기(11);

수용 공간(V)에 고정되어 공급 용기(11)로부터 용액을 공급받아 저장하는 내부 저장 부분(132) 및 내부 저장 부분(132)에 저장된 용액의 누설을 방지하는 외부 고정 부분(131); 및

내부 저장 부분(132)으로부터 용액을 공급받아 용액을 기화시키는 기화 부분(134, 135)을 포함하는 카트리지 구조.

청구항 5

청구항 4에 있어서, 내부 고정 부분(132)은 섬유 소재가 되는 것을 특징으로 하는 카트리지 구조.

청구항 6

청구항 4에 있어서, 내부 저장 부분(131)의 적어도 일부는 공급 용기(11)의 내부에 위치하는 것을 특징으로 하는 카트리지 구조.

명 세 서

기 술 분 야

[0001] 본 발명은 정량 공급이 가능한 카트리지 구조에 관한 것이고, 구체적으로 본 발명은 공급 매개체를 통하여 공급 용기에 저장된 용액을 공급 용기의 내부에 위치하는 기화 칩에 공급하는 것에 의하여 정량 공급이 가능하면서 누설이 방지될 수 있도록 하는 정량 공급이 가능한 카트리지 구조에 관한 것이다.

배 경 기 술

[0002] 일정량의 니코틴 용액 또는 금연 보조제가 수용된 카트리지는 전자담배 또는 금연보조 기기에 사용될 수 있다. 이와 같은 전자담배 또는 금연보조 기기는 공지되어 있고 도 4는 공지된 전자담배를 도시한 것이다.

[0003] 도 4를 참조하면 전자담배는 전력의 공급을 위한 배터리(411)가 수용되는 배터리 어셈블리(41), 하우징(421),

외부로부터 유입된 공기의 유도를 위한 공기 유도로(422), 배터리(411)로부터 공급된 전력에 의하여 가열되는 히터(423), 히터(423)로부터 전달된 열을 이용하여 공급 용기(426)로부터 공급된 니코틴 용액을 기화시키는 기화기(424)와 기화기(424)에서 기화된 니코틴 연기를 유도하는 연기 유도로(425)로 이루어진 기화 어셈블리(42), 니코틴 연기를 입으로 유도하는 흡입 통로(441) 및 흡입 통로(441)와 연결된 배출구(442)로 이루어진 흡입 어셈블리(44)를 포함한다. 위와 같은 구조를 가진 공지의 전자담배에서 외부의 공기가 화살표 A로 표시된 지점으로 유입되어 기화 어셈블리(42)의 내부로 유입된다. 기화된 공기는 기화기(424)에서 기화된 니코틴 용액과 함께 화살표 B로 표시된 지점을 통하여 연기 유도로(425)로 유도되어 화살표 C로 표시된 흡입 어셈블리(44)로 공급된다. 그리고 니코틴 연기는 흡입 어셈블리(44)를 통하여 입으로 유입될 수 있다. 추가로 공지의 전자담배는 흡연 여부를 표시할 수 있는 발광체(43)를 포함할 수 있다.

[0004] 공지된 전자담배 또는 금연보조 기기에서 공급 용기(426)는 기화기(424)로 니코틴 용액을 공급하게 되고 그리고 히터(423)로부터 공급되는 열에 의하여 기화기(424)에 공급된 니코틴 용액은 기화가 되어 흡입 통로(441)를 통하여 배출구(442)로 배출될 수 있다. 기화가 되지 않는 경우 용액은 히터(423) 또는 기화기(424)에 잔존하게 되고 이로 인하여 용액이 외부로 누설될 수 있다. 또한 기화기(424)에 잔존하는 용액의 양이 일정하지 않으므로 기화가 되는 양이 매 기화 과정에서 서로 다를 수 있다. 이와 같은 누설 또는 불균일한 기화 양은 전자담배 또는 금연보조 기기에서 발생하는 불량의 원인이 될 수 있으면서 제품의 질을 저하시키는 요인이 된다.

[0005] 본 발명은 선행기술이 가진 이와 같은 문제점을 해결하기 위한 것으로 아래와 같은 목적을 가진다.

발명의 내용

해결하려는 과제

[0006] 본 발명의 목적은 정량 공급이 가능하면서 누설이 방지될 수 있는 정량 공급이 가능한 카트리지 구조를 제공하는 것이다.

[0007] 본 발명은 기화기 또는 배터리로부터 쉽게 분리될 수 있으면서 이와 동시에 결합이 용이하여 교환이 가능한 카트리지 구조를 제공하는 것이다.

과제의 해결 수단

[0008] 본 발명의 적절한 실시 형태에 따르면, 전자담배 또는 금연 보조기기를 위한 카트리지 구조는 내부에 용액의 저장이 가능하고 한쪽 부분에 수용 공간이 형성된 공급 용기 및 수용 공간에 고정되고 공급 용기의 내부에 저장된 용액을 공급받아 정해진 양으로 유지할 수 있는 용액 저장 부분과 용액 저장 부분으로부터 일정 양을 공급받아 기화를 시킬 수 있는 기화 부분으로 이루어진 기화 칩을 포함한다.

[0009] 본 발명의 다른 적절한 실시 형태에 따르면, 용액 저장 부분은 공급 용기로부터 용액을 흡수하여 유지할 수 있는 내부 저장 부분 및 내부 저장 부분(132)을 둘러싸고 용액의 누설을 방지하기 위한 외부 고정 부분으로 이루어진다.

[0010] 본 발명의 또 다른 적절한 실시 형태에 따르면, 용액 저장 부분의 적어도 일부는 전도성 소재로 이루어진다.

[0011] 본 발명의 또 다른 적절한 실시 형태에 따르면, 전자담배 또는 금연 보조기기를 위한 카트리지 구조는 내부에 용액의 저장이 가능하고 외부에 수용 공간이 형성된 공급 용기; 수용 공간에 고정되어 공급 용기로부터 용액을 공급받아 저장하는 내부 저장 부분 및 내부 저장 부분에 저장된 용액의 누설을 방지하는 외부 고정 부분(131) 및 내부 저장 부분으로부터 용액을 공급받아 용액을 기화시키는 기화 부분을 포함한다.

[0012] 본 발명의 또 다른 적절한 실시 형태에 따르면, 내부 고정 부분은 섬유 소재가 된다.

[0013] 본 발명의 또 다른 적절한 실시 형태에 따르면, 내부 저장 부분의 적어도 일부는 공급 용기의 내부에 위치한다.

발명의 효과

[0014] 본 발명에 따른 카트리지는 전자담배 또는 금연 보조 기기에 적용이 되어 누설이 방지되도록 하면서 기화 과정에서 용액이 정량으로 공급될 수 있도록 한다는 이점을 가진다. 또한 본 발명에 따른 카트리지는 용액이 소모되는 경우 예비 카트리지의 교환이 가능하여 전자담배 또는 금연 보조기기의 제조비용이 감소되도록 한다는 이점을 가진다.

NJOY Exhibit 1002.1824

도면의 간단한 설명

[0015] 도 1a 및 도 1b는 본 발명에 따른 카트리지의 실시 예에 대한 분해도 및 정면도를 개략적으로 도시한 것이다.

도 2는 본 발명에 따른 카트리지에 적용되는 기화 칩의 실시 예를 도시한 것이다.

도 3은 본 발명에 따른 카트리지에서 용액의 공급 및 기화가 발생되는 과정에 대한 실시 예를 도시한 것이다.

발명을 실시하기 위한 구체적인 내용

[0016] 아래에서 본 발명은 첨부된 도면에 제시된 실시 예를 참조하여 상세하게 설명이 되지만 실시 예는 본 발명의 명확한 이해를 위한 것으로 본 발명은 이에 제한되지 않는다.

[0017] 도 1a 및 도 1b를 참조하면, 본 발명에 따른 카트리지 구조(10)는 내부에 용액의 저장이 가능하고 한쪽 부분에 수용 공간(V)이 형성된 공급 용기(11) 및 수용 공간에 고정되고 공급 용기(11)의 내부에 저장된 용액을 공급받아 정해진 양으로 유지할 수 있는 용액 저장 부분(131, 132)과 용액 저장 부분(131, 132)으로부터 일정 양을 공급받아 기화를 시킬 수 있는 기화 부분(134, 135)으로 이루어진 기화 칩(13)을 포함한다.

[0018] 공급 용기(11)는 전체적으로 속이 빈 원통 형상을 가질 수 있지만 이에 제한되지 않는다. 공급 용기(11)의 내부에 니코틴 용액, 금연 보조제 또는 다른 용액이 수용될 수 있고 예를 들어 플라스틱 또는 스테인리스 금속과 같은 소재로 만들어질 수 있다.

[0019] 공급 용기(11)는 한쪽 및 다른 쪽이 개방된 형상을 가질 수 있고 각각 흡입 마개(14) 및 기화 유도 유닛(12)에 의하여 밀폐될 수 있다. 흡입 마개(14)는 개폐가 가능하면서 기화 성분을 외부로 배출시킬 수 있는 이 분야에서 공지된 임의의 형상을 가질 수 있고 제시된 실시 예에 제한되지 않는다.

[0020] 기화 유도 유닛(12)은 수용 공간(V)을 형성하는 기화 부분(122), 기화 부분(122)에서 발생된 기화 성분을 외부로 유도하기 위한 유도 튜브(121), 기화 부분(122)의 아래쪽에 형성되어 공급 용기(11)의 다른 쪽 부분을 밀폐시키면서 기화 유도 유닛(12)을 공급 용기(11)에 결합 및 고정시키는 하부 플레이트(123)로 이루어질 수 있다. 기화 부분(122)과 하부 플레이트(123)는 일체로 형성될 수 있고 유도 튜브(121)는 기화 부분(122)의 한 쪽 끝으로부터 연장되어 흡입 마개(14)에 형성된 배출 통로(141)와 연결될 수 있다.

[0021] 기화 부분(122)에 기화 칩(13)을 고정하면서 기화 칩(13)을 공급 용기(11)와 연결하기 위한 연결 부분(124a, 124b)이 형성될 수 있다. 기화 칩(13)에 대하여 아래에서 다시 설명이 된다.

[0022] 기화 부분(122)의 위쪽 면에 선택 투과 판(H)이 형성될 수 있다. 선택 투과 판(H)은 기체에 대하여 투과성을 가지지만 액체에 대하여 투과성을 가지지 않는 예를 들어 소수성 소재로 만들어질 수 있고 제올라이트와 같은 소재로 형성될 수 있다. 선택 투과 판(H)에 의하여 기화 성분은 유도 튜브(121)를 통하여 외부로 배출이 될 수 있지만 기화 성분에 포함될 수 있는 액체 성분은 선택 투과 판(H)에 흡착이 될 수 있다. 이로 인하여 기화 성분에 작은 물방울 형태의 액체가 포함되지 않아 기화 성분의 질이 향상될 수 있도록 한다. 다만 선택 투과 판(H)이 반드시 설치되어야 하는 것은 아니다.

[0023] 하부 플레이트(123)의 아래쪽에 밀폐 플레이트(125)가 형성될 수 있다. 밀폐 플레이트(125)는 기화 칩(13)을 고정하면서 추가적으로 수용 공간(V)을 외부에 대하여 밀폐시키는 기능을 가질 수 있다. 밀폐 플레이트(125)는 선택 투과 판(H)과 동일 또는 유사한 소재로 형성될 수 있고 전극 기능을 가지는 기화 칩(13)의 일부를 외부로 유도하기 위한 고정 홀(125a)을 포함할 수 있다. 고정 홀(125a)은 필요에 따라 외부 공기 유입 홀의 기능을 가질 수 있다.

[0024] 수용 공간(V)에 기화 칩(13)이 설치될 수 있다. 도 1a 및 도 1b에 도시된 것처럼, 기화 칩(13)은 예를 들어 배터리(도시되지 않음)와 같은 전원으로부터 전력을 공급받아 용액을 기화시키는 기능을 가질 수 있다. 기화 칩(13)은 자체적으로 일정량의 용액을 저장할 수 있는 기능을 가지면서 추가로 공급 용기로(11)로부터 용액을 공급받을 수 있다. 구체적으로 기화 칩(13)은 공급 용기(11)의 내부에 저장된 용액을 공급받아 정해진 양으로 유지할 수 있는 용액 저장 부분(131, 132)과 용액 저장 부분(131, 132)으로 일정 양을 공급받아 기화를 시킬 수 있는 기화 부분(134, 135)으로 이루어질 수 있다. 그리고 용액 저장 부분은 공급 용기(11)로부터 용액을 흡수하여 유지할 수 있는 내부 저장 부분(132) 및 내부 저장 부분(132)을 둘러싸고 용액의 누설을 방지하기 위한 외부 고정 부분(131)으로 이루어질 수 있다.

[0025] 외부 고정 부분(131)은 예를 들어 금속 또는 알루미늄과 같은 전도성 소재로 이루어질 수 있고 2개의 판이 겹쳐

NJOY Exhibit 1002.1825

진 형상이 될 수 있다. 내부 저장 부분(132)은 일부가 겹쳐진 외부 고정 부분(131)의 사이에 삽입되고 나머지 일부는 외부 고정 부분(131)의 외부로 노출될 수 있다. 내부 저장 부분(131)은 액체를 흡수하여 저장할 수 있는 예를 들어 솜, 섬유, 부직포, 종이 또는 다공성 소재가 될 수 있다.

[0026] 용액 저장 부분(131, 132)은 한 쌍으로 이루어질 수 있고 기화 부분(134, 135)의 양 끝을 고정시킬 수 있다. 구체적으로 기화 부분(134, 135)은 내부 저장 부분(132)으로부터 용액을 전달하기 위한 전달 매개체(134) 및 전달 매개체(134)에 포함된 용액을 기화시키는 기화체(135)로 이루어질 수 있다. 전달 매개체(134)는 예를 들어 다수개의 섬유가 꼬인 섬유 집합체가 될 수 있지만 이에 제한되지 않고 예를 들어 모세관 현상과 같은 액체 전달 방법에 의하여 내부 저장 부분(132)으로부터 용액을 기화체(135)로 전달할 수 있는 임의의 소재 또는 구조를 가질 수 있다. 그리고 기화체(135)는 예를 들어 니크롬 선과 같이 전력 공급에 의하여 열을 발생시켜 용액을 기화시킬 수 있는 임의의 소재 또는 구조를 가질 수 있다. 제시된 실시 예에서 기화체(135)는 코일 형상이 되고 내부로 전달 매개체(134)가 관통하고 그리고 전달 매개체(134)의 양쪽 끝은 기화체(135)의 양쪽 끝과 함께 용액 저장 부분(131, 132)에 고정된다.

[0027] 용액 저장 부분(131,132)의 아래쪽에 전극 리드(133)가 형성될 수 있다. 전극 리드(133)는 예를 들어 배터리와 같은 전원에 기화체(135)를 전기적으로 연결시키기 위한 것으로 다양한 형상을 가질 수 있고 제시된 실시 예에 제한되지 않는다. 전극 리드(133)는 고정 홀(125a)을 통하여 외부로 노출될 수 있다.

[0028] 도 1a 및 도 1b에 도시된 것처럼, 기화 칩(13)은 연결 부분(124a, 124b)에 고정될 수 있다. 외부 고정 부분(131)이 겹치진 2개의 판 형상이 되는 경우 연결 부분(124a, 124b)은 기화 부분(122)의 벽 및 하부 플레이트(123)의 일부에 형성된 길이 방향으로 연장되는 틈이 될 수 있다. 외부 고정 부분(131)이 연결 부분(124a, 124b)에 삽입되는 형태로 고정되면 기화 칩(13)의 일부는 공급 용기(11)의 내부에 위치하고 그리고 기화 칩(13)의 나머지 일부는 수용 공간(V)에 위치할 수 있다. 내부 저장 부분(132)의 노출된 부분은 공급 용기(11)의 내부에 위치하게 되고 이로 인하여 내부 저장 부분(132)에 공급 용기(11)의 용액이 지속적으로 공급되어 저장될 수 있다.

[0029] 다른 한편으로 수용 공간(V)에 위치하는 기화 칩(13)의 한쪽 가장자리를 통하여 용액이 누설될 수 있다. 이를 방지하기 위하여 기화 칩(13)의 한쪽 가장자리를 밀폐시키기 위한 밀폐 부재(15a, 15b)가 설치될 수 있다. 밀폐 부재(15a, 15b)는 겹쳐진 판 형상의 외부 고정 부분(131)이 삽입될 수 있는 삽입 홈(151)을 가질 수 있다. 밀폐 부재(15a, 15b)는 기화 칩(13)의 용액 누설을 방지하면서 이와 동시에 기화 칩(13)을 수용 공간(V) 내부에 고정시키는 기능을 가질 수 있다. 밀폐 부재(15a, 15b)가 반드시 형성되어야 하는 것은 아니며 기화 칩(13)의 구조에 따라 밀폐 부재(15a, 15b)가 형성되지 않을 수 있다.

[0030] 기화 칩(13)은 다양한 구조로 형성될 수 있고 다양한 방법으로 수용 공간(V)에 고정되어 공급 용기(11) 내부의 용액이 전달되어 저장되도록 할 수 있다. 제시된 실시 예는 예시적인 것으로 본 발명은 이에 제한되지 않는다.

[0031] 아래에서 기화 칩(13)에 대하여 구체적으로 설명한다.

[0032] 도 2는 본 발명에 따른 카트리지에 적용되는 기화 칩의 실시 예를 도시한 것이다.

[0033] 도 2의 (가)는 2개의 겹쳐진 판구조를 가지는 기화 칩(23), (나)는 A-A선을 따른 단면도 그리고 (다)는 B-B선을 따른 단면도를 각각 도시한 것이다.

[0034] 도 2의 (가)를 참조하면, 외부 고정 부분(231)은 사각 형상의 판구조를 가질 수 있고 한 쌍이 될 수 있다. 외부 고정 부분((231)의 아래쪽에 위에서 설명이 된 전극 리드(233)가 형성될 수 있다. 외부 고정 부분(231)은 금속과 같은 전도성 소재로 이루어질 수 있고 이로 인하여 기화체(235)와 전원이 전기적으로 연결될 수 있다.

[0035] 내부 저장 부분(232)은 사각 형상이 될 수 있고 예를 들어 섬유 또는 부직포와 같이 얇은 두께로 형성될 수 있다. 내부 저장 부분(232)은 용액을 흡수하여 유지할 수 있는 임의의 소재로 만들어질 수 있고 도 2의 (나)에 도시된 것처럼, 일부가 외부 고정 부분(231)의 바깥 으로 노출이 되도록 배치될 수 있다. 도 2의 (나)에 제시된 실시 예에서 외부 고정 부분(231)의 한 쪽 가장자리는 적절한 방법으로 밀폐가 될 수 있고 예를 들어 강한 압력을 주어 한 쌍의 외부 고정 부분(231)이 밀착되도록 할 수 있다.

[0036] 기화 부분(234, 235)을 형성하는 전달 매개체(234) 및 기화체(235)의 양쪽 끝 부분은 내부고정 부분(232)과 접하게 되고 그리고 기화체(235)는 특히 도체에 해당하는 외부 고정 부분(232)에 접하게 된다. 이로 인하여 전원이 전극 리드(233)로부터 외부 고정 부분(231)을 경유하여 기화체(235)에 연결될 수 있다.

[0037] 도 2의 (다)에 도시된 것처럼, 내부 저장 부분(232)이 2겹으로 이루어질 수 있고 기화 부분(232)의 양쪽 끝은

내부 저장 부분(232)의 내부에 삽입되는 구조가 될 수 있다. 이와 같은 경우에도 기화체(235)는 외부 고정 부분(231)에 접하도록 기화 부분(232)이 배치되어야 한다.

[0038] 도 2에 제시된 기화 칩(23)의 실시 예는 예시적인 것으로 다양한 소재 또는 다양한 구조로 기화 칩(23)이 형성될 수 있고 본 발명은 제시된 실시 예에 제한되지 않는다.

[0039] 아래에서 본 발명에 다른 카트리지에서 기화가 발생되는 실시 예에 대하여 설명한다.

[0040] 도 3의 (가) 및 (나)를 참조하면, 공급 용기(11)에 채워진 용액(S)은 F1으로 표시된 경로를 통하여 기화 칩으로 유입될 수 있다. 기화 칩에서 내부 저장 부분(232)의 일부는 공급 용기(11)의 내부에 노출되어 있고 이로 인하여 용액은 기화 칩의 내부로 유입될 수 있다. 기화 칩 내부의 일부 용액은 다시 F2로 표시된 경로로 전달 매개체(234)를 이용하여 기화체(235)로 공급될 수 있다. 이와 같은 용액의 이동은 예를 들어 모세관 현상을 통하여 이루어질 수 있다. 전극 리드(233)를 통하여 전원이 공급되면 기화체(235)에서 열이 발생하게 되고 용액이 기화되어 G로 표시된 경로를 통하여 배출될 수 있다. 기화로 인하여 기화체(235)에 존재하는 용액이 기화되면 다시 F3으로 표시된 경로(실질적으로 F2와 동일)를 통하여 용액이 기화체(235)로 공급될 수 있다. 그리고 기화체(235)로부터 기화된 성분을 G로 표시된 경로를 통하여 배출된다. 다른 한편으로 기화 칩 내부의 용액이 감소되면 다시 공급 용기(11)로부터 용액이 기화칩으로 공급될 수 있다. 이와 같은 방법으로 공급 용기(11)의 용액은 기화칩에 저장되고 그리고 기화와 함께 기화체로 공급되어 공급 용기(11)의 용액이 기화가 될 수 있다.

[0041] 도 3에 제시된 실시 예는 예시적인 것으로 본 발명은 제시된 실시 예에 제한되지 않는다.

[0042] 본 발명에 따른 카트리지는 전자담배 또는 금연 보조 기기에 적용이 되어 누설이 방지되도록 하면서 기화 과정에서 용액이 정량으로 공급될 수 있도록 한다는 이점을 가진다. 또한 본 발명에 따른 카트리지는 용액이 소모되는 경우 예비 카트리지의 교환이 가능하여 전자담배 또는 금연 보조기기의 제조비용이 감소되도록 한다는 이점을 가진다.

[0043] 위에서 본 발명의 제시된 실시 예를 참조하여 상세하게 설명이 되었지만 이 분야에서 통상의 지식을 가진 자는 제시된 실시 예를 참조하여 본 발명의 기술적 사상을 벗어나지 않는 범위에서 다양한 변형 및 수정 발명을 만들 수 있을 것이다. 본 발명은 이와 같은 변형 및 수정 발명에 의하여 제한되지 않으며 다만 아래에 첨부된 청구범위에 의하여 제한된다.

부호의 설명

[0044]

10: 카트리지 구조	11: 공급 용기
12: 기화 유도 유닛	13: 기화 칩
14: 흡입 마개	15a, 15b: 밀폐 부재
23: 기화 칩	
121: 유도 튜브	122: 기화 부분
123: 하부 플레이트	124a, 124b: 연결 부분
125: 밀폐 플레이트	125a: 고정 홀
131: 외부 고정 부분	132: 내부 저장 부분
133: 전극 리드	134: 전달 매개체
135: 기화체	141: 배출 통로
151: 삽입 홈	
231: 외부 고정 부분	232: 내부 저장 부분
233: 전극 리드	234: 전달 매개체
235: 기화체	
41: 배터리 어셈블리	42: 기화 어셈블리

NJOY Exhibit 1002.1827

43: 발광체 44: 흡입 어셈블리

411: 배터리 421: 하우징

422: 공기 유도로 423: 히터

424: 기화기 425: 공기 유도로

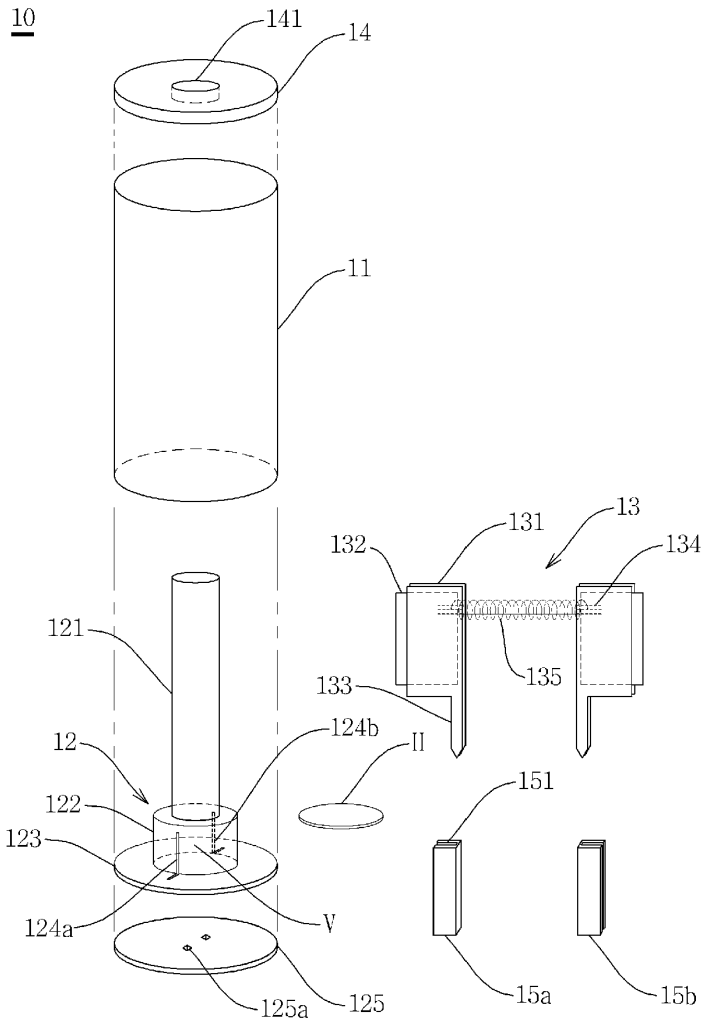
426: 공급 용기 441: 흡입 통로

442: 배출구

V: 수용 공간 H: 선택 투과 판 S: 용액

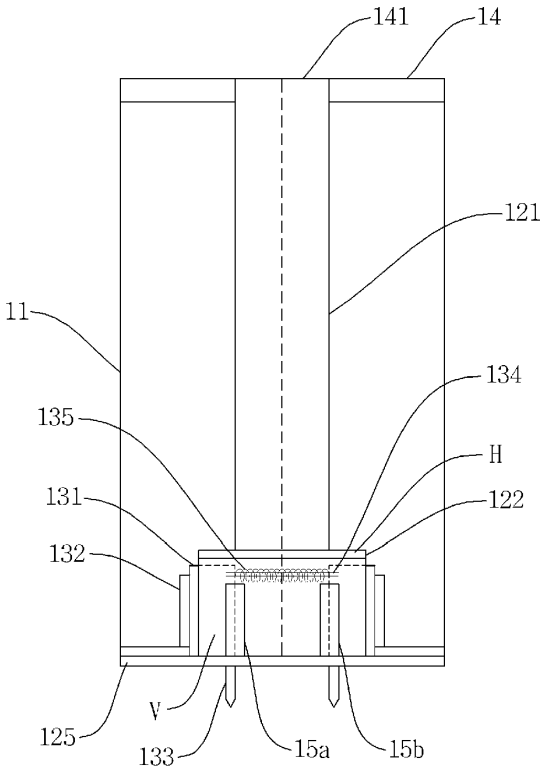
도면

도면1a



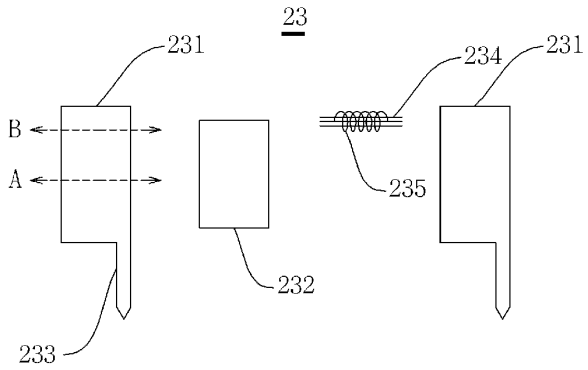
NJOY Exhibit 1002.1828

도면1b



NJOY Exhibit 1002.1829

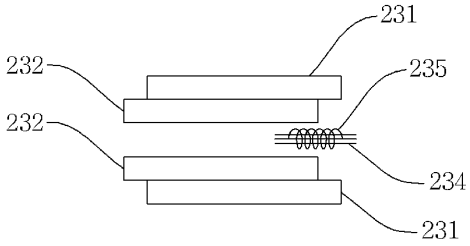
도면2



(가)

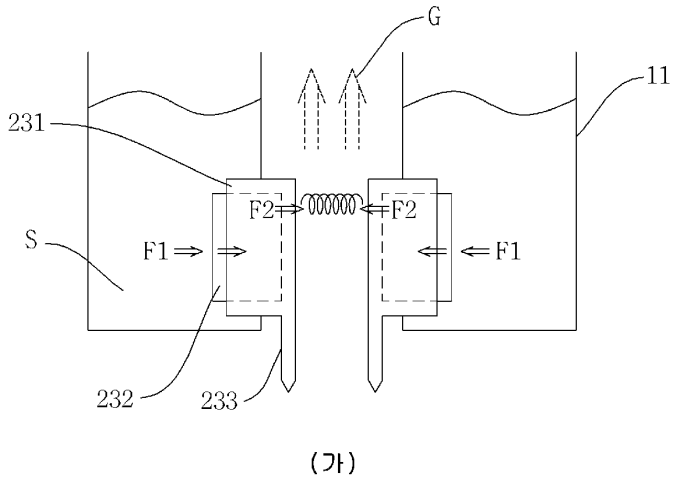


(나)

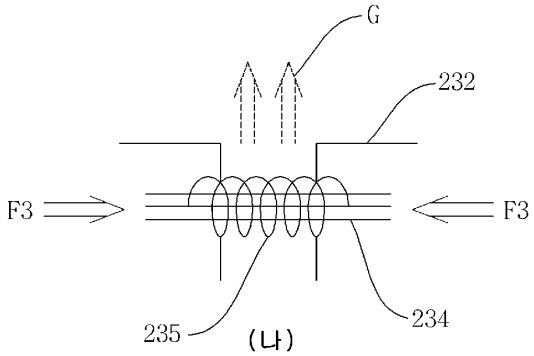


(다)

도면3

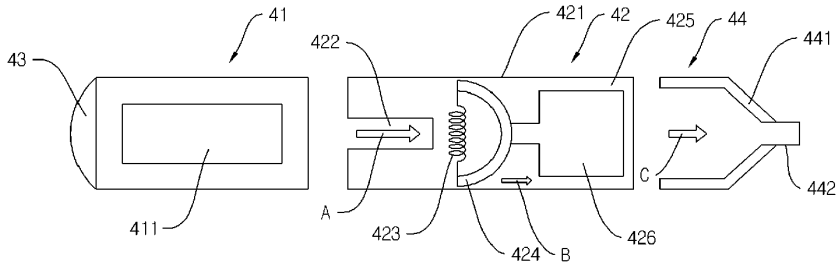

G
11
231
F2
F2
S
F1
F1
232
233

(가)


G
232
F3
F3
235
234

(나)

도면4


41
421
42
425
44
441
43
422
411
A
423
424
B
426
C
442

Espacenet

Bibliographic data: KR20130107658 (A) — 2013-10-02

CARTRIDGE FOR SUPPLYING VAPORIZATION SOLUTION

Inventor(s): KIM HAN KI [KR] ± (KIM, HAN KI)

Applicant(s): LEE YONG YIN [KR] ± (LEE, YONG YIN)

Classification: - international: *A24B15/16; A24F47/00*
- cooperative: A24B15/167; A24D1/14; A24F47/008; A61M15/06 more

Application number: KR20120029602 20120322 Global Dossier

Priority number(s): KR20120029602 20120322

Abstract of KR20130107658 (A)

PURPOSE: A cartridge for supplying a vaporizing solution is provided to improve the quality of a product by separating a supply container from a heater and constantly supplying a solution to a vaporizing unit with a medium unit for supplying a solution. CONSTITUTION: A cartridge for supplying a vaporizing solution (10) comprises a supply container (11) with a space formed inside to contain a vaporizing solution; a unit for inducing vaporization (12) which has a storing space (V) formed and is connected to the end of the supply container; a storing medium unit (131) for storing a solution transferred from the supply container; and vaporizing chips (13) composed of vaporizing units for vaporizing the solution transferred from the storing medium unit. The whole or part of vaporizing chips detachably attached to the unit for inducing vaporization can provide electric power to the vaporizing units owing to the conductive materials of the vaporizing chips.

NJOY Exhibit 1002.1832

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(11) 공개번호 10-2013-0107658
(43) 공개일자 2013년10월02일

(51) 국제특허분류(Int. Cl.)
A24F 47/00 (2006.01) *A24B 15/16* (2006.01)
(21) 출원번호 10-2012-0029602
(22) 출원일자 2012년03월22일
심사청구일자 2012년03월22일

(71) 출원인
이영인
서울특별시 강동구 고덕로20가길 59 (암사동)
(72) 발명자
김한기
경기도 성남시 분당구 야탑로 108 ,708-902(야탑동,탑마을)
(74) 대리인
특허법인 다해

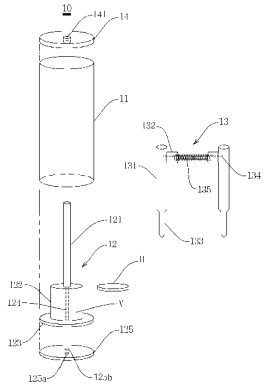
전체 청구항 수 : 총 6 항

(54) 발명의 명칭 **기화 용액의 공급을 위한 카트리지**

(57) 요 약

본 발명은 기화 용액의 공급을 위한 카트리지에 관한 것이고, 구체적으로 본 발명은 공급 매개체를 통하여 공급 용기에 저장된 용액을 공급 용기의 내부에 위치하는 기화 칩에 공급하는 것에 의하여 정량 공급이 가능하면서 필요에 따라 공급 용기의 교환 또는 충전이 가능한 기화 용액의 공급을 위한 카트리지 구조에 관한 것이다. 기화 용액의 공급을 위한 카트리지는 내부에 기화 용액이 수용될 수 있는 공간이 형성된 공급 용기(11); 수용 공간(V)이 형성되고 공급 용기(11)의 한쪽 끝에 결합되는 기화 유도 유닛(12); 및 공급 용기(11)로부터 용액이 전달되어 저장될 수 있는 저장 매개 장치(131) 및 저장 매개 장치(131)로부터 용액을 전달받아 기화를 시키는 기화 장치로 이루어진 기화 칩(13)을 포함하고, 상기 기화 칩(13)의 적어도 일부는 전도성 소재가 되어 기화 장치에 전력을 공급할 수 있고 기화 칩(13)은 기하 유닛(12)에 분리 가능하도록 결합이 된다.

대 표 도 - 도1a



NJOY Exhibit 1002.1833

특허청구의 범위

청구항 1

기화 용액의 공급을 위한 카트리지에 있어서,

내부에 기화 용액이 수용될 수 있는 공간이 형성된 공급 용기(11);

수용 공간(V)이 형성되고 공급 용기(11)의 한쪽 끝에 결합되는 기화 유도 유닛(12); 및

공급 용기(11)로부터 용액이 전달되어 저장될 수 있는 저장 매개 장치(131) 및 저장 매개 장치(131)로부터 용액을 전달받아 기화를 시키는 기화 장치로 이루어진 기화 칩(13)을 포함하고,

상기 기화 칩(13)의 적어도 일부는 전도성 소재가 되어 기화 장치에 전력을 공급할 수 있고 기화 칩(13)은 기하 유닛(12)에 분리 가능하도록 결합이 되는 것을 특징으로 하는 카트리지.

청구항 2

청구항 1에 있어서, 저장 매개 장치(131)는 튜브 형상이 되어 기화 유도 유닛(12)에 형성된 결합 홈(124)에 결합이 되는 것을 특징으로 하는 카트리지.

청구항 3

청구항 2에 있어서, 저장 매개 장치(131) 및 결합 홈(124)에 각각 공급 틈이 형성된 것을 특징으로 하는 카트리지.

청구항 4

청구항 1에 있어서, 저장 매개 장치(131)와 기화 장치를 연결하는 전도성 소재의 공급 커넥터(132)를 더 포함하는 카트리지.

청구항 5

청구항 1에 있어서, 기화 장치는 저장 매개 장치(131)로부터 용액을 전달하는 용액 전달 수단(134) 및 용액 전달 수단(134)으로부터 전달된 용액을 기화시키는 열 발생 수단(135)으로 이루어진 것을 특징으로 하는 카트리지.

청구항 6

기화 용액의 공급을 위한 카트리지에 있어서,

내부에 용액이 수용될 수 있는 공간이 형성된 공급 용기(11);

공급 용기(11)의 한쪽에 결합되고 공급 용기(11)의 내부에 형성된 수용 공간(V) 및 수용 공간(V)으로부터 연장되는 유도 튜브(122)를 포함하고 그리고 수용 공간(V)을 이루는 벽면에 공급 틈을 가진 결합 홈(124)이 형성된 기화 유도 유닛(12); 및

결합 홈(124)에 결합될 수 있고 공급 틈으로부터 전달되는 용액이 저장될 수 있는 저장 매개 장치(131), 용액을 기화시키기 위한 열 발생 수단(135)을 가지는 기화 장치 및 저장 매개 장치(131)와 기하 장치를 연결하는 공급 커넥터(132)를 포함하는 기화 칩(13)을 포함하고,

상기 공급 용기(11)로부터 저장 매개 장치(131)로 전달된 용액은 모세관 현상을 통하여 기화 장치로 전달되고 그리고 공급 용기(11)와 기화 유도 유닛(12)은 기화 칩(13)으로부터 분리 가능한 것을 특징으로 하는 카트리지.

명 세 서

NJOY Exhibit 1002.1834

기 술 분 야

[0001] 본 발명은 기화 용액의 공급을 위한 카트리지에 관한 것이고, 구체적으로 본 발명은 공급 매개체를 통하여 공급 용기에 저장된 용액을 공급 용기의 내부에 위치하는 기화 칩에 공급하는 것에 의하여 정량 공급이 가능하면서 필요에 따라 공급 용기의 교환 또는 충전이 가능한 기화 용액의 공급을 위한 카트리지 구조에 관한 것이다.

배 경 기 술

[0002] 일정량의 니코틴 용액 또는 금연 보조제가 수용된 카트리지는 전자담배 또는 금연보조 기기에 사용될 수 있다. 이와 같은 전자담배 또는 금연보조 기기는 공지되어 있고 도 4는 공지된 전자담배를 도시한 것이다.

[0003] 도 4를 참조하면 전자담배는 전력의 공급을 위한 배터리(411)가 수용되는 배터리 어셈블리(41), 하우징(421), 외부로부터 유입된 공기의 유도를 위한 공기 유도로(422), 배터리(411)로부터 공급된 전력에 의하여 가열되는 히터(423), 히터(423)로부터 전달된 열을 이용하여 공급 용기(426)로부터 공급된 니코틴 용액을 기화시키는 기화기(424)와 기화기(424)에서 기화된 니코틴 연기를 유도하는 연기 유도로(425)로 이루어진 기화 어셈블리(42), 니코틴 연기를 입으로 유도하는 흡입 통로(441) 및 흡입 통로(441)와 연결된 배출구(442)로 이루어진 흡입 어셈블리(44)를 포함한다. 위와 같은 구조를 가진 공지의 전자담배에서 외부의 공기가 화살표 A로 표시된 지점으로 유입되어 기화 어셈블리(42)의 내부로 유입된다. 기화된 공기는 기화기(424)에서 기화된 니코틴 용액과 함께 화살표 B로 표시된 지점을 통하여 연기 유도로(425)로 유도되어 화살표 C로 표시된 흡입 어셈블리(44)로 공급된다. 그리고 니코틴 연기는 흡입 어셈블리(44)를 통하여 입으로 유입될 수 있다. 추가로 공지의 전자담배는 흡연 여부를 표시할 수 있는 발광체(43)를 포함할 수 있다.

[0004] 공지된 전자담배 또는 금연보조 기기에서 공급 용기(426)는 기화기(424)로 니코틴 용액을 공급하게 되고 그리고 히터(423)로부터 공급되는 열에 의하여 기화기(424)에 공급된 니코틴 용액은 기화가 되어 흡입 통로(441)를 통하여 배출구(442)로 배출될 수 있다. 기화가 되지 않는 경우 용액은 히터(423) 또는 기화기(424)에 잔존하게 되고 이로 인하여 용액이 외부로 누설될 수 있다. 또한 기화기(424)에 잔존하는 용액의 양이 일정하지 않으므로 기화가 되는 양이 매 기화 과정에서 서로 다를 수 있다. 다른 한편으로 니코틴 용액이 저장된 공급용기는 전자담배 또는 금연보조기기가 일체형으로 제조되는 경우 모두 소진되면 배터리와 함께 폐기된다. 대안으로 공급 용기를 다시 충전시키는 방법이 개발되었지만 충전 과정이 복잡하고 누설이 발생한다는 문제점을 가진다.

[0005] 본 발명은 선행기술이 가진 이와 같은 문제점을 해결하기 위한 것으로 아래와 같은 목적을 가진다.

발명의 내용

해결하려는 과제

[0006] 본 발명의 목적은 정량 공급이 가능하면서 필요에 따라 공급 용기의 충전 또는 교환이 가능한 기화 용액의 공급을 위한 카트리지를 제공하는 것이다.

과제의 해결 수단

[0007] 본 발명의 적절한 실시 형태에 따르면, 기화 용액의 공급을 위한 카트리지는 내부에 기화 용액이 수용될 수 있는 공간이 형성된 공급 용기; 수용 공간이 형성되고 공급 용기의 한쪽 끝에 결합되는 기화 유도 유닛; 및 공급 용기로부터 용액이 전달되어 저장될 수 있는 저장 매개 장치 및 저장 매개 장치로부터 용액을 전달받아 기화를 시키는 기화 장치로 이루어진 기화 칩을 포함하고, 상기 기화 칩의 적어도 일부는 전도성 소재가 되어 기화 장치에 전력을 공급할 수 있고 기화 칩은 기하 유닛에 분리 가능하도록 결합이 된다.

[0008] 본 발명의 다른 적절한 실시 형태에 따르면, 저장 매개 장치는 튜브 형상이 되어 기화 유도 유닛(12)에 형성된 결합 홈에 결합이 된다.

[0009] 본 발명의 또 다른 적절한 실시 형태에 따르면, 저장 매개 장치 및 결합 홈에 각각 공급 틈이 형성된다.

[0010] 본 발명의 또 다른 적절한 실시 형태에 따르면, 저장 매개 장치와 기화 장치를 연결하는 전도성 소재의 공급 커넥터를 더 포함한다.

[0011] 본 발명의 또 다른 적절한 실시 형태에 따르면, 기화 장치는 저장 매개 장치로부터 용액을 전달하는 용액 전달

NJOY Exhibit 1002.1835

수단 및 용액 전달 수단으로부터 전달된 용액을 기화시키는 열 발생 수단으로 이루어진다.

[0012] 본 발명의 또 다른 적절한 실시 형태에 따르면, 기화 용액의 공급을 위한 카트리지는 내부에 용액이 수용될 수 있는 공간이 형성된 공급 용기; 공급 용기의 한쪽에 결합되고 공급 용기의 내부에 형성된 수용 공간 및 수용 공간으로부터 연장되는 유도 튜브를 포함하고 그리고 수용 공간을 이루는 벽면에 공급 틈을 가진 결합 홈이 형성된 기화 유도 유닛; 및 결합 홈에 결합될 수 있고 공급 틈으로부터 전달되는 용액이 저장될 수 있는 저장 매개 장치, 용액을 기화시키기 위한 열 발생 수단(135)을 가지는 기화 장치 및 저장 매개 장치와 기하 장치를 연결하는 공급 커넥터를 포함하는 기화 칩을 포함하고, 상기 공급 용기로부터 저장 매개 장치로 전달된 용액은 모세관 현상을 통하여 기화 장치로 전달되고 그리고 공급 용기와 기화 유도 유닛은 기화 칩으로부터 분리 가능하다.

발명의 효과

[0013] 본 발명에 따른 카트리지는 전자담배 또는 금연 보조 기기에 적용이 되어 공급 용액이 모두 소진된 경우 공급 용기의 충전 또는 교환이 가능하도록 하는 것에 의하여 전자담배의 사용 편리성이 향상되도록 하면서 사용에 따른 비용이 감소되도록 한다는 이점을 가진다. 또한 본 발명에 따른 카트리지는 공급 용기 및 허터가 분리 가능하도록 하면서 용액 전달 매개 수단에 의하여 기화 수단에 용액이 일정량으로 공급이 될 수 있도록 하는 것에 의하여 제품의 품질이 향상될 수 있도록 한다는 장점을 가진다. 추가로 본 발명에 따른 카트리지는 기화 수단의 노출에 따라 발생할 수 있는 누설이 방지될 수 있도록 하는 것에 의하여 전자담배의 청결 및 작동 오류가 방지될 수 있도록 한다는 장점을 가진다.

도면의 간단한 설명

[0014] 도 1a 및 도 1b는 본 발명에 따른 카트리지의 실시 예에 대한 분해도 및 정면도를 개략적으로 도시한 것이다.

도 2는 본 발명에 따른 카트리지에 적용되는 기화 칩의 실시 예를 도시한 것이다.

도 3은 본 발명에 따른 카트리지에서 용액의 공급 및 기화가 발생되는 과정에 대한 실시 예를 도시한 것이다.

발명을 실시하기 위한 구체적인 내용

[0015] 아래에서 본 발명은 첨부된 도면에 제시된 실시 예를 참조하여 상세하게 설명이 되지만 실시 예는 본 발명의 명확한 이해를 위한 것으로 본 발명은 이에 제한되지 않는다.

[0016] 도 1a 및 도 1b는 본 발명에 따른 카트리지의 실시 예에 대한 분해도 및 정면도를 개략적으로 도시한 것이다.

[0017] 도 1a 및 도 1b를 참조하면, 기화 용액의 공급을 위한 카트리지(10)는 내부에 기화 용액이 수용될 수 있는 공간이 형성된 공급 용기(11); 수용 공간(V)이 형성되고 공급 용기(11)의 한쪽 끝에 결합되는 기화 유도 유닛(12); 및 공급 용기(11)로부터 용액이 전달되어 저장될 수 있는 저장 매개 장치(131) 및 저장 매개 장치(131)로부터 용액을 전달받아 기화를 시키는 기화 장치로 이루어진 기화 칩(13)을 포함하고, 상기 기화 칩(13)의 적어도 일부는 전도성 소재가 되어 기화 장치에 전력을 공급할 수 있고 기화 칩(13)은 기하 유닛(12)에 분리 가능하도록 결합이 된다.

[0018] 공급 용기(11)는 전체적으로 속이 빈 원통 형상을 가질 수 있지만 이에 제한되지 않는다. 공급 용기(11)의 내부에 니코틴 용액, 금연 보조제 또는 다른 용액이 수용될 수 있고 예를 들어 플라스틱 또는 스테인리스 금속과 같은 소재로 만들어질 수 있다.

[0019] 공급 용기(11)는 한쪽 및 다른 쪽이 개방된 형상을 가질 수 있고 각각 흡입 마개(14) 및 기화 유도 유닛(12)에 의하여 밀폐될 수 있다. 흡입 마개(14)는 개폐가 가능하면서 기화 성분을 외부로 배출시킬 수 있는 이 분야에서 공지된 임의의 형상을 가질 수 있고 제시된 실시 예에 제한되지 않는다.

[0020] 기화 유도 유닛(12)은 수용 공간(V)을 형성하는 기화 부분(122), 기화 부분(122)에서 발생된 기화 성분을 외부로 유도하기 위한 유도 튜브(121), 기화 부분(122)의 아래쪽에 형성되어 공급 용기(11)의 다른 쪽 부분을 밀폐시키면서 기화 유도 유닛(12)을 공급 용기(11)에 결합 및 고정시키는 하부 플레이트(123)로 이루어질 수 있다. 기화 부분(122)과 하부 플레이트(123)는 일체로 형성될 수 있고 유도 튜브(121)는 기화 부분(122)의 한 쪽 끝으로부터 연장되어 흡입 마개(14)에 형성된 배출 통로(141)와 연결될 수 있다.

[0021] 수용 공간(V)을 이루는 벽면에 기화 칩(13)을 고정하기 위한 결합 홈(124)이 형성될 수 있다. 수용 공간(V)은

예를 들어 원통 형상이 될 수 있고 결합 홈(124)은 원통 형상의 실린더의 길이 방향을 따라 단면이 반구형이 되도록 형성될 수 있다. 다만 결합 홈(124)의 형상은 저장 매개 장치(131)의 형상에 따라 결정될 수 있다. 구체적으로 저장 매개 장치(131)의 일부가 결합 홈(124)에 결합되면서 기화 칩(13)이 기화 유도 유닛(12)에 고정되고 이와 동시에 공급 용기(11)로부터 용액이 저장 매개 장치(131)로 공급될 수 있다. 저장 매개 장치(131)는 다양한 형상으로 만들어질 수 있고 결합 홈(124)은 저장 매개 장치(131)를 고정시킬 수 있는 적절한 형상을 가질 수 있다.

[0022] 기화 부분(122)의 위쪽 면에 선택 투과 판(H)이 형성될 수 있다. 선택 투과 판(H)은 기체에 대하여 투과성을 가지지만 액체에 대하여 투과성을 가지지 않는 예를 들어 소수성 소재로 만들어질 수 있고 제올라이트와 같은 소재로 형성될 수 있다. 선택 투과 판(H)에 의하여 기화 성분은 유도 튜브(121)를 통하여 외부로 배출이 될 수 있지만 기화 성분에 포함될 수 있는 액체 성분은 선택 투과 판(H)에 흡착이 될 수 있다. 이로 인하여 기화 성분에 작은 물방울 형태의 액체가 포함되지 않아 기화 성분의 질이 향상될 수 있도록 한다. 다만 선택 투과 판(H)이 반드시 설치되어야 하는 것은 아니며 선택 투과 판(H)의 설치 여부는 선택적이다.

[0023] 하부 플레이트(123)의 아래쪽에 밀폐 플레이트(125)가 형성될 수 있다. 밀폐 플레이트(125)는 기화 칩(13)을 고정하면서 추가적으로 수용 공간(V)을 외부에 대하여 밀폐시키는 기능을 가질 수 있다. 밀폐 플레이트(125)는 선택 투과 판(H)과 동일 또는 유사한 소재로 형성될 수 있고 전극 기능을 가지는 기화 칩(13)의 일부를 외부로 유도하기 위한 고정 홀(125a)을 포함할 수 있다. 고정 홀(125a)은 필요에 따라 외부 공기 유입 홀의 기능을 가질 수 있다.

[0024] 수용 공간(V)에 기화 칩(13)이 설치될 수 있다. 도 1a 및 도 1b에 도시된 것처럼, 기화 칩(13)은 예를 들어 배터리(도시되지 않음)와 같은 전원으로부터 전력을 공급받아 용액을 기화시키는 기능을 가질 수 있다. 기화 칩(13)은 자체적으로 일정량의 용액을 저장할 수 있는 기능을 가지면서 추가로 공급 용기(11)로부터 용액을 공급받을 수 있다. 구체적으로 기화 칩(13)은 공급 용기(11)의 내부에 저장된 용액을 공급받아 정해진 양으로 유지할 수 있는 저장 매체 장치(131), 저장 매체 장치(131)로부터 전달된 용액을 기화시키는 기화 장치 및 저장 매체 장치(131)와 기화 장치를 연결시키는 공급 커넥터(132)로 이루어질 수 있다. 추가로 기화 칩(13)은 저장 매체 장치(131)의 아래쪽에 형성되어 배터리와 같은 전원에 연결되는 전극 리드(133)를 포함할 수 있다. 그리고 기화 장치는 저장 매체 장치(131)로부터 일정량의 용액을 전달하는 용액 전달 수단(134) 및 용액 전달 수단(134)으로부터 전달된 용액을 기화시키는 열 발생 수단(135)으로 이루어질 수 있다.

[0025] 저장 매체 장치(131)는 예를 들어 속이 빈 튜브 형상을 가질 수 있고 내부에 용액이 수용될 수 있다. 필요에 따라 저장 매체 장치(131)의 내부가 예를 들어 섬유, 흡습성 분말 또는 솜과 같은 소재로 채워질 수 있다. 저장 매체 장치(131)는 공급 용기(11)로부터 용액을 공급받아 기화장치에서 기화가 발생되지 않는 경우 용액을 저장하는 기능을 가진다. 그리고 기화가 발생되는 경우 저장된 용액은 용액 전달 수단(134)을 통하여 열 발생 수단(135)으로 전달될 수 있다. 저장 매체 장치(131)는 이와 같이 일시적으로 용액을 저장하여 기화가 발생되는 경우 용액을 기화 장치로 전달하는 기능을 가지고 이에 적합한 구조로 만들어질 수 있다. 구체적으로 저장 매체 장치(131)의 내부는 부직포, 섬유 또는 솜과 같은 소재로 채워지거나 또는 용액을 흡수하여 유지할 수 있는 분말 형태의 소재로 채워질 수 있다. 저장 매체 장치(131)의 다른 기능을 열 발생 수단(135)을 전극 리드(133)와 전기적으로 연결하는 것이다. 이를 위하여 저장 매체 장치(131)는 전도성 소재로 전도성 소재로 만들어질 수 있다. 저장 매체 장치(131)의 또 다른 기능은 기화 칩(13)을 기화 유도 유닛(12)에 고정하는 것이다. 이와 같은 기능을 고려하여 저장 매체 장치(131)는 다양한 구조로 만들어질 수 있고 제시된 실시 예에 제한되지 않는다.

[0026] 용액 전달 수단(134)은 예를 들어 다수 개의 섬유 가닥 또는 섬유 집합체와 같은 것이 될 수 있고 열 발생 수단(135)은 니크롬선과 같은 것이 될 수 있다. 이와 같은 경우 용액 전달 수단(134)인 섬유 집합체는 열 발생 수단(135)에 해당하는 니크롬선의 내부를 관통하는 구조를 가질 수 있다.

[0027] 공급 커넥터(132)는 기화 장치의 양 끝을 고정하면서 이와 동시에 저장 매체 장치(131)로부터 기화 장치로 용액이 공급되도록 하는 통로 기능을 가질 수 있다. 구체적으로 용액 전달 수단(134)의 끝 부분과 열 발생 수단(135)의 끝 부분은 함께 공급 커넥터((132)의 한쪽 끝에 고정될 수 있다. 예를 들어 공급 커넥터(132)는 겹쳐진 판 형상이 될 수 있고 용액 전달 수단(134)과 열 발생 수단(135)의 끝 부분은 겹쳐진 판 사이에 삽입되어 고정될 수 있다. 그리고 공급 커넥터(132)의 다른 한쪽 끝은 저장 매체 장치(131)에 연결될 수 있다. 필요에 따라 공급 커넥터(132)의 내부는 예를 들어 부직포 또는 솜과 같은 소재로 채워질 수 있다. 배터리의 전원은 전극 리드(133)로부터 저장 매체 장치(131)를 통하여 공급 커넥터(132)를 경유하여 열 발생 수단(135)으로 전달될 수 있다. 그러므로 공급 커넥터(132)는 전도성 소재로 만들어질 수 있다.

NJOY Exhibit 1002.1837

[0028] 도 1a 또는 도 1b에 제시된 기화 칩(13)은 다양한 구조로 형성될 수 있고 다양한 방법으로 수용 공간(V)에 고정되어 공급 용기(11) 내부의 용액이 전달되어 저장되도록 할 수 있다. 제시된 실시 예는 예시적인 것으로 본 발명은 이에 제한되지 않는다.

[0029] 아래에서 기화 칩(13)에 대하여 구체적으로 설명한다.

[0030] 도 2는 본 발명에 따른 카트리지에 적용되는 기화 칩(13)의 실시 예를 도시한 것이다.

[0031] 도 2의 (가)는 기화 칩(13)이 고정되는 공급 용기 및 기화 유도 유닛의 실시 예를 도시한 것이고 도 2의 (나)는 기화 유도 유닛에 고정되는 기화 칩(13)의 실시 예를 도시한 것이다.

[0032] 도 2에서 도 1a 또는 도 1b와 동일한 도면 부호를 가지는 구성 요소는 동일 또는 유사한 기능을 가지므로 반복하여 설명하지 않는다.

[0033] 도 2의 (가)를 참조하면, 수용 공간((V)을 형성하는 기화 부분(122)의 길이 방향의 벽면을 따라 반원형의 단면을 가지는 한 쌍의 결합 홈(21a, 21b)이 형성될 수 있다. 그리고 결합 홈(21a, 21b)을 따라 다수 개의 공급 틈(211)이 배치될 수 있다. 공급 용기에 저장된 용액은 공급 틈(211)을 따라 저장 매체 장치(131)로 전달될 수 있다.

[0034] 도 2의 (나)를 참조하면 저장 매체 장치(131)는 일부가 결합 홈(21a, 21b)에 결합될 수 있는 형상을 가질 수 있다. 구체적으로 저장 매체 장치(131)는 단면이 원형인 튜브 형상이 될 수 있고 일부가 결합 홈(21a, 21b)에 고정될 수 있다. 다른 한편으로 저장 매체 장치(131)에 공급 틈(221)이 형성될 수 있다. 공급 틈(221)은 결합 홈(21a, 21b)에 형성된 공급 틈(211)을 통하여 공급된 용액을 저장 매체 장치(131)로 전달하는 기능을 가진다. 그러므로 공급 틈(221)은 저장 매체 장치(131)가 결합 홈(21a, 21b)에 접촉하는 표면에 형성될 수 있다.

[0035] 공급 틈(211, 221)을 통하여 저장 매체 장치(131)의 내부로 전달된 용액은 공급 커넥터(132)를 통하여 기화 장치로 전달될 수 있다. 도 2의 (나)에 도시된 것처럼, 공급 커넥터(132)는 2개의 판이 겹쳐지고 내부에 용액 공급 수단(134)이 삽입된 구조를 가질 수 있다.

[0036] 도 2에 제시된 기화 칩(13)의 고정 구조는 예시적인 것으로 본 발명은 제시된 실시 예에 제한되지 않는다. 용액은 공급 용기로부터 공급 틈(211, 221)을 통하여 저장 매체 장치(131)로 전달될 수 있고 다시 공급 커넥터(132)를 통하여 기화 장치로 전달될 수 있다. 공급 틈(211, 221)은 다양한 형상이 될 수 있고 저장 매체 장치(131)도 마찬가지로 다양한 형상을 가질 수 있다. 그리고 결합 홈(21a, 21b)은 저장 매체 장치(131)의 일부를 수용하여 고정할 수 있는 적절한 구조를 가질 수 있다.

[0037] 아래에서 본 발명에 다른 카트리지에서 기화가 발생되는 실시 예에 대하여 설명한다.

[0038] 도 3의 (가) 및 (나)를 참조하면, 공급 용기(11)에 채워진 용액(S)은 F1로 표시된 경로로 공급 틈(221)을 통하여 기화 칩의 저장 매체 장치(131)로 유입될 수 있다. 저장 매체 장치(131)에 유입된 용액은 공급 커넥터(132)를 통하여 다시 공급 전달 수단(134)을 채우게 된다. 구체적으로 모세관 현상을 통하여 공급 용기(11)로부터 공급 전달 수단(134)으로 용액이 전달될 수 있다.

[0039] 열 발생 수단(135)에서 용액의 기화가 발생하지 않는 경우 충분한 양의 용액이 용액 공급 수단(134)으로 전달되면 더 이상의 용액이 전달되지 않는다. 이후 기화가 발생하면 기화 성분은 G로 표시된 것처럼 유도 튜브(121)를 통하여 배출되고 용액 전달 수단(134)에 존재하는 용액이 감소함에 따라 저장 매체 장치(131)에 저장된 용액이 다시 용액 전달 수단(134)으로 공급된다. 그리고 저장 매체 장치(131)의 용액 감소는 공급 틈(221)을 통한 용액의 유입에 의하여 보충될 수 있다. 이와 같은 과정을 통하여 공급 용기(11)의 용액의 완전히 소진되면 공급 용기(11) 및 기화 유도 유닛은 기화 칩으로부터 분리되고 새로운 공급 용기(11) 및 기화 유도 유닛이 기화 칩에 결합될 수 있다. 또는 공급 용기(11)에 용액을 충전시킬 수 있다. 이와 같이 본 발명에 따르면 일정량의 용액만 용액 전달 수단(134)으로 공급되고 기화에 의하여 용액이 완전히 소진이 되면 공급 용기가 교체되거나 또는 용액이 공급 용기에 보충될 수 있다. 그러므로 본 발명에 따라 용액의 누설이 방지되면서 이와 동시에 기기의 사용에 따른 비용이 감소될 수 있다.

[0040] 본 발명에 따른 카트리지는 전자담배 또는 금연 보조 기기에 적용이 되어 공급 용액이 모두 소진된 경우 공급 용기의 충전 또는 교환이 가능하도록 하는 것에 의하여 전자담배의 사용 편리성이 향상되도록 하면서 사용에 따른 비용이 감소되도록 한다는 이점을 가진다. 또한 본 발명에 따른 카트리지는 공급 용기 및 히터가 분리 가능하도록 하면서 용액 전달 매개 수단에 의하여 기화 수단에 용액이 일정량으로 공급이 될 수 있도록 하는 것에 의하여 제품의 품질이 향상될 수 있도록 한다는 장점을 가진다. 추가로 본 발명에 따른 카트리지는 기화 수단의

NJOY Exhibit 1002.1838

노출에 따라 발생할 수 있는 누설이 방지될 수 있도록 하는 것에 의하여 전자담배의 청결 및 작동 오류가 방지될 수 있도록 한다는 장점을 가진다.

[0041] 위에서 본 발명의 제시된 실시 예를 참조하여 상세하게 설명이 되었지만 이 분야에서 통상의 지식을 가진 자는 제시된 실시 예를 참조하여 본 발명의 기술적 사상을 벗어나지 않는 범위에서 다양한 변형 및 수정 발명을 만들 수 있을 것이다. 본 발명은 이와 같은 변형 및 수정 발명에 의하여 제한되지 않으며 다만 아래에 첨부된 청구범위에 의하여 제한된다.

부호의 설명

[0042] 10: 카트리지 11: 공급 용기

12: 기화 유도 유닛 13: 기화 칩

14: 흡입 마개

121: 유도 튜브 122: 기화 부분

123: 하부 플레이트 124: 결합 홈

125: 밀폐 플레이트 125a: 고정 홀

131: 저장 매체 장치 132: 공급 커넥터

133: 전극 리드 134: 용액 전달 수단

135: 열 발생 수단 141: 배출 통로

151: 삽입 홈

211, 221: 공급 틈

41: 배터리 어셈블리 42: 기화 어셈블리

43: 발광체 44: 흡입 어셈블리

411: 배터리 421: 하우징

422: 공기 유도로 423: 히터

424: 기화기 425: 공기 유도로

426: 공급 용기 441: 흡입 통로

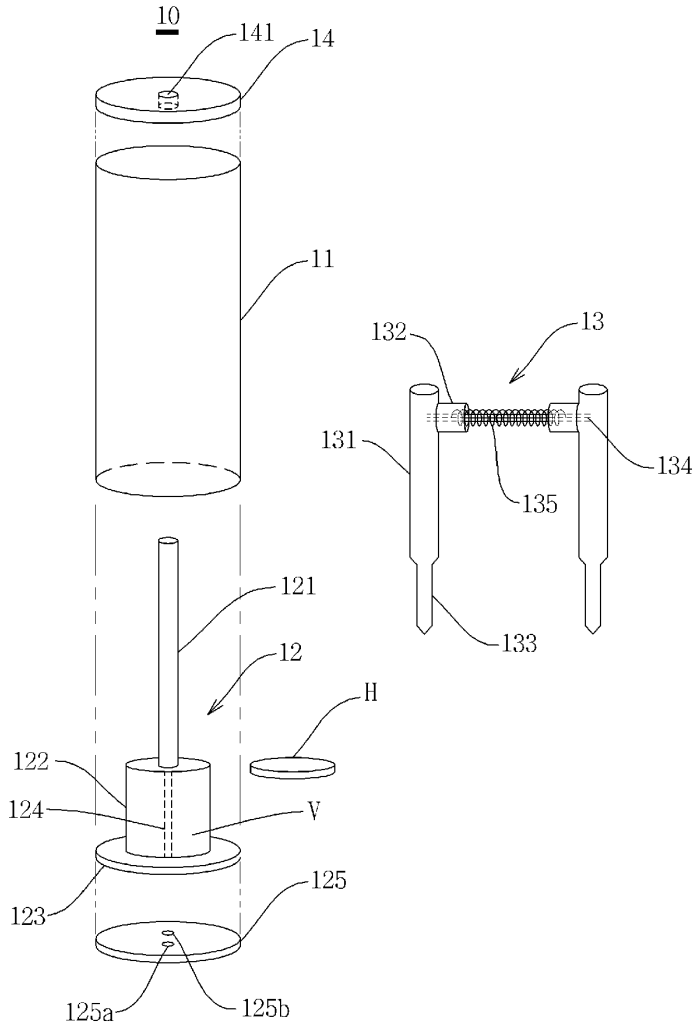
442: 배출구

V: 수용 공간 H: 선택 투과 판 S: 용액

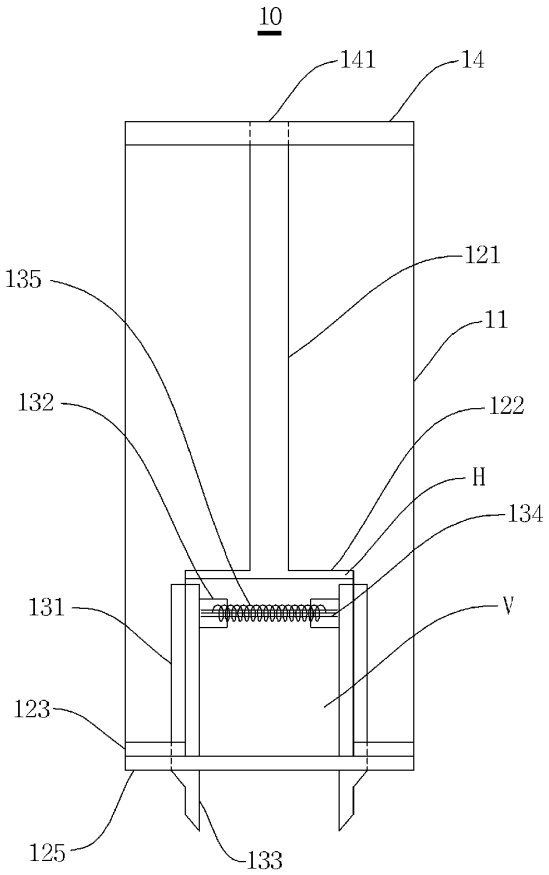
NJOY Exhibit 1002.1839

도면

도면1a

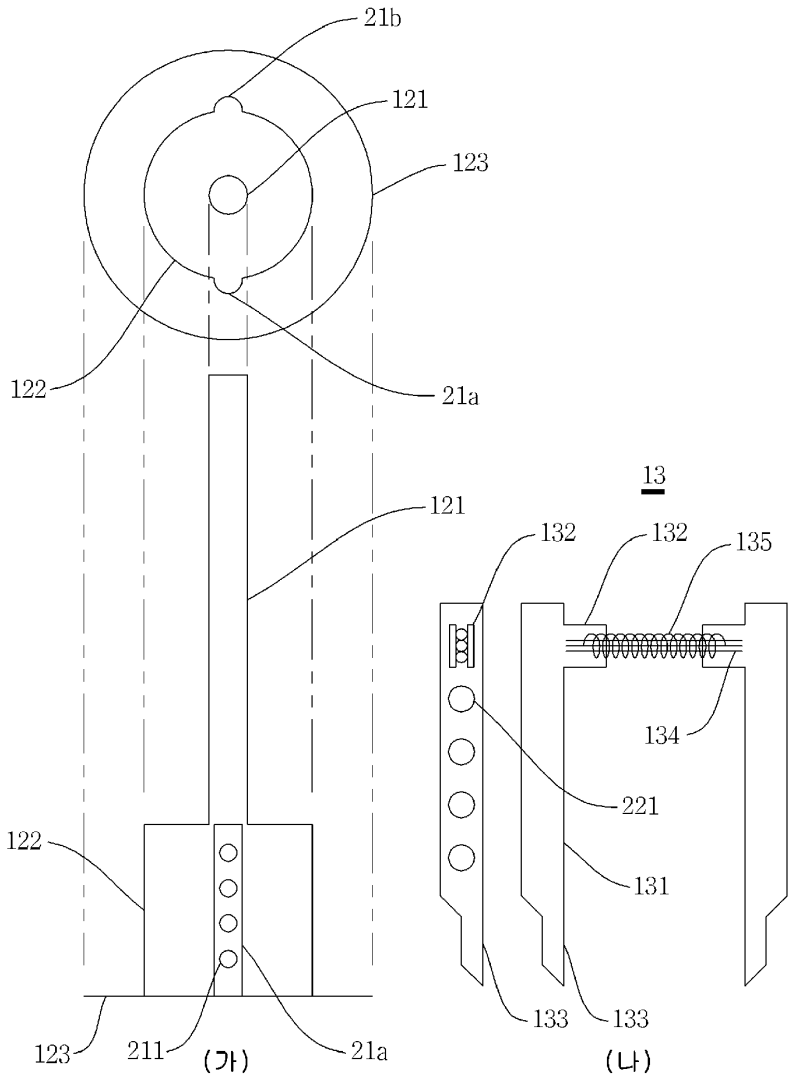

10
141
14
11
132
13
131
134
135
121
133
12
H
122
124
V
123
125
125a
125b

도면1b



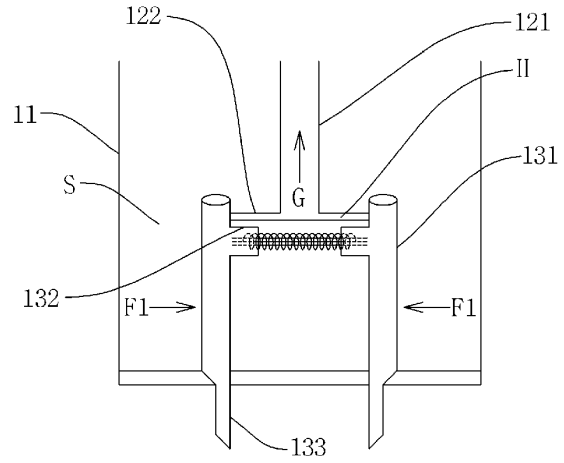
NJOY Exhibit 1002.1841

도면2

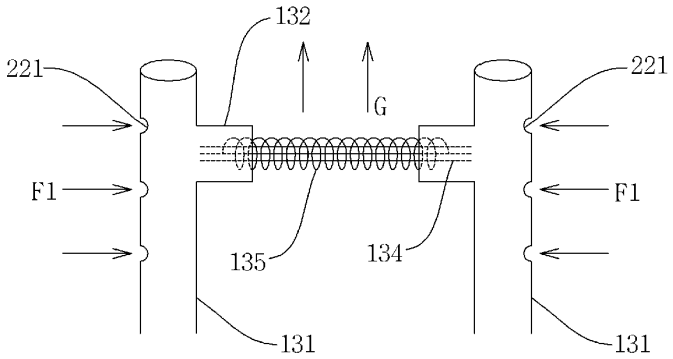


NJOY Exhibit 1002.1842

도면3



(가)



(나)

NJOY Exhibit 1002.1843

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 July 2003 (31.07.2003)

PCT

(10) International Publication Number
WO 03/061716 A1

(51) International Patent Classification[7]: A61L 9/03, 9/02, A01M 1/20

(21) International Application Number: PCT/US03/02158

(22) International Filing Date: 23 January 2003 (23.01.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/351,388 24 January 2002 (24.01.2002) US

(71) Applicant *(for all designated States except US)*: **THE DIAL CORPORATION** [US/US]; 15501 North Dial Boulevard, Scottsdale, AZ 85260 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **TRIPLETT, Carl** [US/US]; 9202 East Pershing Avenue, Scottsdale, AZ 85260 (US). **HE, Mengtao, Pete** [US/US]; 10814 East Palm Ridge Drive, Scottsdale, AZ 85259 (US). **WOLPERT, Christopher, J.** [US/US]; 6411 East Jean Drive, Scottsdale, AZ 85254 (US). **STATHAKIS, Kristopher, J.** [US/US]; 11642 North 91st Way, Scottsdale, AZ 85260 (US). **PARK, Debra** [US/US]; 2916 East Lockwood Street, Mesa, AZ 85213 (US).

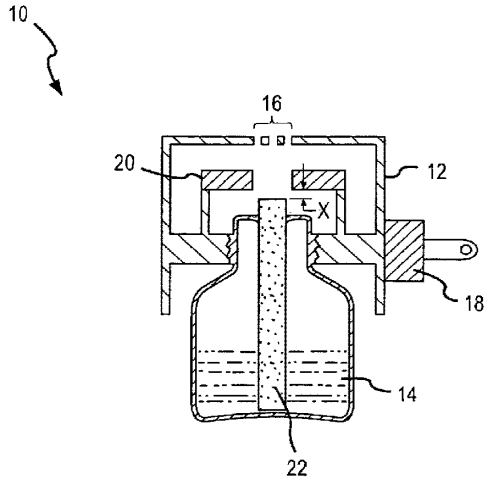
(74) Agent: **BOYD, Damon, L.**; Snell & Wilmer L.L.P., One Arizona Center, 400 East Van Buren, Phoenix, AZ 85004 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR POSITIONING A WICK MATERIAL IN A VAPOR-DISPENSING DEVICE



(57) Abstract: In accordance with one embodiment of the present invention, through effective alignment and positioning of a wick relative to a heating element in a vapor-dispensing device, effective vaporization of the vaporizable liquid can be obtained without subjecting the wick material to possible damage due to contact with the heating unit of the vaporizer during insertion, removal and/or use. For example, the wick is suitably selected and positioned such that sufficient surface area of the wick material is suitably exposed to the heating unit to enable effective evaporation of a vaporizable liquid, but the wick height relative to the heating element prevents contact between the heating element and the wick.

WO 03/061716 A1

NJOY Exhibit 1002.1844

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

NJOY Exhibit 1002.1845

METHOD AND APPARATUS FOR POSITIONING A WICK MATERIAL IN A VAPOR-DISPENSING DEVICE

FIELD OF THE INVENTION

This invention generally relates to vapor-dispensing devices, and more particularly, to a method and apparatus for positioning a wick material in a vapor-dispensing device.

BACKGROUND OF THE INVENTION

There have been various methods devised to attempt to regulate the diffusion of volatile materials especially with regard to the vapor delivery of fragrances and/or deodorizers. Exemplary prior art devices which relate to this are U.S. Patent Nos.: 525,646; 1,123,036; 1,129,897; 1,323,659; 1,377,909; 2,383,960; 2,507,889; 2,616,759; 2,657,090; 2,787,496; 2,797,844; 2,878,060; 2,961,167; 2,975,464; 3,104,816; 3,239,145; 3,550,853; 3,633,881; 3,679,133; 3,804,331; 4,014,501; 4,094,639; 4,413,779; 4,663,315; 4,739,928; 5,038,394; 5,647,053; 5,903,710; 5,945,094; 5,976,503; and 6,104,867. The primary function of these types of devices has generally been the counteracting of malodors through the delivery of aesthetically pleasing fragrance vapors, or facilitating the delivery of other vapors, such as insecticides or other compositions.

In general, vapor-dispensing products typically include a fragrance-reservoir and a transport system from which fragrance is evaporated into the surrounding air. For example, in such systems the liquid to be evaporated is transported from a reservoir via a wick material partially immersed in the liquid. In such a system, in general, the liquid is transported through the wick by capillary action. Many of these systems, such as the system described in U.S. Patent No. 6,104,867 ("the '867 patent"), include a housing unit into which the liquid reservoir is placed. The housing of such devices advantageously includes a heating unit.

In such devices, the heating element delivers kinetic energy to molecules of the liquid as contained in the wick, thereby increasing the rate of evaporation to obtain higher fragrance intensity and uniform delivery density over time. Typically, in such

NJOY Exhibit 1002.1846

units, a plug unit is plugged onto a conventional electrical outlet, thereby causing the heating unit to heat the liquid and vaporized liquid that have been drawn up into the wick. The wick and/or bottle unit containing the wick are suitably configured to such that the wick material is placed, when completely assembled, in proximity to the heating element. For example preferably, in most such devices, care is taken to ensure that the wick material, and particularly the uppermost portion thereof extends at least into, or more preferably into and through the typically circumferentially arranged heating unit.

While devices so configured typically ensure effective vaporization of the liquid to be dispensed, various difficulties can be encountered through use of the devices. For example, as explained in some detail in the '867 patent, one of these difficulties (addressed by the guidance and/or stabilization systems described in the '867 patent) is that the wick may become damaged either during insertion, use and/or removal of the wick containing reservoir (e.g., bottle). For example, during insertion and/or removal of the reservoir (e.g., bottle) the wick may be caused to contact the heating element. Furthermore, movement of the reservoir (e.g., bottle) relative to the housing during use or otherwise may give rise to deleterious or disadvantageous interactions between the wick and, for example, the hearing unit.

Products currently on the market have utilized wicks constructed of compressed graphite, porous ceramic, or fibrous bundles. See, for example, U.S. Patent No. 4,663,315 issued May 5, 1987 to Hasegawa et al, and U.S. Patent No. 5,647,053 issued July 8, 1997 to Shroeder et al. In these cases, the transport mechanism is capillary action of liquid passing through the structure of a wick, which in use, is contained within the heating element. Notably, and as discussed in more detail below, with momentary reference to Figures 1A and 1B and 2A and 2B, each of these exemplary prior art devices clearly require the wick material to be placed, when in use, within the heating element. (Figures 1A and 1B are Figures from the '315 Hasegawa et al patent, while Figures 2A and 2B are Figures from the '053 Schroeder et al. patent).

Various methods for connecting the fragrance liquid reservoir to a housing unit of a vapor-dispensing device have been developed and are known. Typically, such methods comprise simple snap-type mechanisms, as shown in the aforementioned '867 patent, or screw-thread designs, such as are shown on the '315 patent to

NJOY Exhibit 1002.1847

Hasegawa. With such systems, particularly when used in a wick containing vaporizer, the wick may be damaged by being crushed or bent by careless interconnection, or be overheated by contact with the heating element during operation, due to instability and improper positioning of the wick material relative to the heating element. This same instability and improper positioning may cause uneven heating of the wick, result in diminished evaporative performance, and consumer frustration.

Thus, there exists a need for a method for positioning a wick material in a vapor-dispensing device that addresses the disadvantages of the prior art.

SUMMARY OF THE INVENTION

While the way in which the present invention addresses the disadvantages of the prior art will be discussed in greater detail below, in general, the present invention achieves and advancement in the art by providing a method and apparatus for selective positioning of a wick material in a vapor-dispensing device that facilitates effective fragrance vapor delivery while offering significant advantages in manufacture, assembly, product performance, and product safety.

For example, in accordance with one embodiment of the present invention through effective alignment and positioning of the wick relative to a heating element in a vapor-dispensing device, effective vaporization of the vaporizable liquid can be obtained without subjecting the wick material to possible damage due to contact with the heating unit of the vaporizer during insertion, removal and/or use. In accordance with one aspect of this embodiment, the wick is suitably selected and positioned such that sufficient surface area of the wick material is suitably exposed to the heating unit to enable effective evaporation of a vaporizable liquid, but the wick height relative to the heating element prevents contact between the heating element and the wick.

Further benefits and advantages of the various aspects and embodiments of the present invention are described in detail hereinbelow.

BRIEF DESCRIPTION OF THE DRAWINGS

The subject matter of the present invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. A more complete understanding of the present invention, however, may best be obtained by referring to the detailed description and claims in connection with the drawing figures, wherein:

NJOY Exhibit 1002.1848

Figures 1A and 1B are cross-sectional views of the thermal vaporizer disclosed in U.S. Patent No. 5,038,394 issued August 6, 1991 to Hasegawa et al. wherein Figure 1A corresponds to Figure 5 of the '394 Patent and Figure 1B corresponds to Figure 10 of the '394 Patent;

Figures 2A and 2B illustrate the vapor dispensing device described in U.S. Patent No. 5,647,053 issued July 8, 1997 to Schroeder et al., wherein Figure 2A corresponds to Figure 1 of the '053 Patent and Figure 2B corresponds to Figure 4 of the '053 Patent;

and Figure 3 is a cross-sectional view of an exemplary liquid vaporizer system in accordance with various aspects of the present invention.

DETAILED DESCRIPTION OF AN EXEMPLARY EMBODIMENT

The following description is of exemplary embodiment of the invention only, and is not intended to limit the scope, applicability or configuration of the invention in any way. Rather, the following description is intended to provide a convenient illustration for implementing various embodiments of the invention. As will become apparent, various changes may be made in the function and arrangement of the elements described in these embodiments without departing from the scope of the invention as set forth in the appended claims.

In the context of the present invention the method and apparatus hereof find particular use in connection with liquid vaporizer systems. With reference to Figure 3, an exemplary liquid vaporizer system 10 in accordance with various aspects of one embodiment of the present invention suitably comprises a housing unit 12 and a reservoir (e.g., bottle) unit 14. Reservoir unit 14 is suitably configured for disposition in conjunction with housing 12 and for retention therewithin.

Various methods for connecting the liquid reservoir 14 to a housing unit 12 of a vapor-dispensing system 10 have been developed and are known. Typically, such methods comprise simple snap-type mechanisms or screw-thread designs. Momentarily, generally speaking, various liquid vaporizers are known and any number of such dispensers are suitable for use in accordance with the present invention. That is, any liquid dispensing device which facilitates the transfer of a liquid through a fluid transfer mechanism (e.g., a wick) which is configured to be heated through use of a heating unit can feasibly incorporate various aspects of the present invention.

NJOY Exhibit 1002.1849

For example, a typical non-limiting example used herein is an electric liquid vaporizer comprising a housing unit configured to receive a liquid container or bottle portion. In such systems, typically the bottle portion includes some type of a wick or wick system which permits the liquid, which is ultimately to be vaporized, to be absorbed therein through capillary action. The housing unit of such a system generally contains a heating mechanism, typically electrically activated. The bottle portion which generally contains the liquid for vaporization, is usually configured for attachment to the housing such that the wick is suitably positioned proximate the heating mechanism so that the liquid will be vaporized. In general, however, it should be appreciated that any liquid vaporizer system may be utilized in connection with and benefit from the various aspects of the present invention. The exemplary description provided herein is not intended to be limiting in any way, but rather is provided simply to illustrate various aspects of one embodiment of the present invention.

With continued reference to Figure 3, exemplary devices suitable for incorporating the present invention include vaporizing devices such as liquid electric air fresheners like those described in U.S. Patent No. 6,104,867 issued August 15, 2000 to Stathakis et al; U.S. Patent No. 5,647,053 issued July 8, 1997 to Schroeder et al; and U.S. Patent No. 5,038,394 issued August 6, 1991 to Hasegawa et al. although, generally speaking, various aspects of the present invention can be incorporated in any number of devices, now known or as yet unknown in the art, designed for transporting fluid through a wick or other similar mechanism, and air freshening devices are merely non-limiting examples.

Housing unit 12 generally includes some type of a vent system 16 and an electrical plug unit 18. Housing unit 12 also suitably includes a heating element 20. Typically, such heating units comprise a heating element which can be readily and reliably charged through use in a conventional outlet. In this manner, heating element 20 is electrically connected to plug unit 18 (not shown).

Liquid reservoir 14 suitably comprises some form of a bottle or other liquid containment material. Reservoir 14 is suitably configured for receipt of a vaporizable liquid device. Such liquid material is suitably presented for vaporization through a wick 22. In accordance with various aspects of the present invention, the vaporizable material can be any number of conventional materials dispensed from vapor dispensers including fragrances, disinfectants, sanitizing agents, insect repellents,

NJOY Exhibit 1002.1850

insecticides and the like. Preferably, in accordance with a preferred aspect of the present invention, the material to be volatized comprises a fragrance material and system 10 is suitably configured for use as an air-freshening device. In this manner, reservoir 14 is suitably filled with a fragrance containing material inserted into housing unit 12 such that the fragrance material can be vaporized through operation of heater unit 20.

Inasmuch as the operation of liquid vaporizers of this type is generally known to those of skill in the art, the operation will not be described in detail herein. Suffice it to say, however, that in accordance with various aspects of a preferred embodiment of the present invention, the vapor dispensing system 10 suitably includes some form of housing 12, reservoir 14, and heating element 20 such that when electrical plug unit 18 is plugged into a conventional electrical outlet heater unit is activated.

As discussed in greater detail hereinabove, prior art systems require that the wick pass through a wick opening formed in the heating element itself. For example, as described in U.S. Patent No. 5,038,394, issued August 6, 1991, to Hasegawa, et al., the wick material of the refill bottle is inserted into the ring heater concentrically therewith. As described in the Hasegawa '394 patent, in such a state, the heater is energized and the upper portion of the wick is heated to thereby cause vaporization of the liquid material to be vaporized. See, for example, Figures 1A and 1B.

Similarly, as described in U.S. Patent No. 5,647,053, issued July 8, 1997 to Schroeder, et al., typically the top of the wick will extend into and to about the top of the heating unit so as to enable the heat generated by the heating element to be near the top of the wick. See, for example, Figures 2A and 2B.

In contradistinction to the arrangements shown in the prior art, the present inventors have found that effective fluid delivery can be obtained while avoiding the disadvantages of the prior art by suitably selecting appropriate wick materials and locating the wick structure, for example wick 22, within an effective heating zone, which zone, while proximate the heating element, for example heating unit 20, does not require wick 22 to pass into or through heating unit 20.

In accordance with various aspects of the present invention, the wick material is suitably selected to serve as an effective fluid transport mechanism. Exemplary wick materials include any material which may be suitably configured to exhibit acceptable porosity, and thus, acceptable transport kinetics. Stated another way, in accordance

NJOY Exhibit 1002.1851

with various aspects of the present invention, suitable wick materials include those with effective wicking properties.

For example, the porous wicks described and set forth in Applicants' International Application entitled "Porous Wick for Liquid Vaporizers, "PCT/US01/31462 filed October 9, 2001 and published April 18, 2002, describes various wick constructions having improved vapor dispensing capabilities. The subject matter of that application is hereby incorporated herein by reference. Moreover, other wick materials which permit relatively rapid transport kinetics also may suitably be utilized. For example, various graphite, ceramic, polymeric, or fibrous wicks may be utilized.

Nonetheless, notwithstanding this preference, in each case, it is desirable that the wick material effectively transport the liquid to be vaporized in a substantially uniform manner. It is also preferable that the wick materials be used in an unsheathed fashion. However, in certain applications sheaths may be used; for example, in cases where effective delivery of the volatile material to be vaporized is transported by the wick material to the uppermost portion of the wick. For example, in certain instances where wicks of significant diameters are used, sufficient liquid to be vaporized (e.g., fragrance) may be delivered to the uppermost portion of the wick and in such case sheaths may be adequately employed.

Surprisingly, the present inventors have found that contrary to the teachings of the prior art, there is an effective range within which the wick may be placed and effective vaporization occurs. In this regard, "vaporization," as used herein is used not only in a conventional sense, but also to include the formation of small aerosol-sized particles. That is, vaporization refers not only to the actual vapors but also to these small particles which can remain suspended for extended periods of time. Such vapors are generally caused to be evacuated from the device, such as through vent 16.

In accordance with various aspects of the present invention, suitable wick materials are selected and placed within an effective region (heating zone) surrounding heating element, such as heating element 20. This effective region may be defined in many ways and in part depends upon the particular temperature of the heating element. While certain limitations on the temperatures exist, particularly for air freshening devices, in general, those devices which operate at higher temperatures

NJOY Exhibit 1002.1852

include larger regions within which vaporization continues to be effective. In accordance with various aspects of the present invention, the effective region refers to that varying region which, in part, is temperature dependent.

However, in accordance with various other aspects of the present invention, preferably a suitably selected wick material is placed such that the uppermost portion thereof is located at an effective distance X, as shown in Figure 3, from the lowermost portion of the heating element, for example, heating element 20. In accordance with various aspects of the present invention, the effective distance X preferably is on the order of one centimeter or less, more preferably on the order of less than 0.75 centimeters and optimally in the range of about 0.5 centimeters. In each instance, the height of wick 22 is suitably selected such that when used in connection with housing 12, the uppermost portion of wick 22 is placed in close proximity but not within heating element 20. As such, the effective distance X may approach zero, however, in such instances care should be taken such that the configuration and dimensions of wick ensure that contact with heating element 20 during use are minimized.

The following Example illustrates the utility of the present invention in maintaining a minimal wick height above the wick fitment while enhancing fragrance liquid evaporation through the wick material from a fragrance liquid reservoir.

EXAMPLE

Electric liquid vaporizers having conventional heating elements were obtained. In each instance, the effective distance between the exposed wick and the lowermost portion of the heating element was on the order of 2.7 centimeters. As such, the heights were varied from on the order of about one centimeter away to within the heating element. Specifically, the wick heights were varied from 1.9 cm to 2.9 cm. The vapor-dispensing units were operated for 8 hours per day for 19 days, for a total of 152 hours.

As shown below in Table 1, while the evaporation of fragrance materials from the product increased as the exposed wick surface area was increased, effective evaporation rates are obtained even at that furthest location.

NJOY Exhibit 1002.1853

TABLE 1

Exposed Wick Height	Evaporation	% Relative to D-31
1.9 cm	6.44 g	61%
2.2 cm	7.79 g	74%
2.6 cm	9.70 g	92%
2.9 cm	9.56 g	91%
2.7 cm	10.51 g	100%

In accordance with a further embodiment of the present invention, the wick materials selected may be suitably configured to enhance exposed wick surface area thereby tending to enhance evaporation and, accordingly, vaporization while maintaining minimal wick height. For example, the wick may exhibit any number of sizes, dimensions, and/or combinations thereof which enhance exposed surface area. For example, conically-shaped wicks may be utilized, in addition, suitable wick fitment devices may be selected so as to further enhance exposed wick surface area.

Various principles of the invention have been described in illustrative embodiments. However, many combinations and modifications of the above-described structures, arrangements, proportions, elements, materials and components, used in the practice of the invention, in addition to those not specifically described, may be varied and particularly adapted to specific environments and operating requirements without departing from those principles.

NJOY Exhibit 1002.1854

CLAIMS

We claim:

1. A liquid vaporizer comprising:

a fluid reservoir containing a liquid to be vaporized;

a heating element; and

a wick material wherein the said wick is selectively positioned in an effective operation zone proximate to, but not within the heating element.

2. The vaporizer of claim 1, wherein said effective operation zone is determined by a distance between a lower most portion of the heating element and an uppermost portion of said wick, and wherein said distance is greater than about 0.0 cm.

3. The vaporizer of claim 2, wherein said distance is greater than about 0.25 cm.

4. The vaporizer of claim 3, wherein said distance is greater than about 0.5 cm.

5. The vaporizer of claim 4, wherein said distance is greater than about 1.0 cm.

6. The vaporizer of claim 2, wherein the temperature in said effective operation zone is higher than the temperature outside of said effective operation zone.

7. The improved vaporizer of claim 1, wherein the wick material does not have a sheath.

8. The improved vaporizer of claim 1, wherein the wick material is a porous plastic material.

9. The improved vaporizer of claim 1, wherein the wick material is a graphite material.

NJOY Exhibit 1002.1855

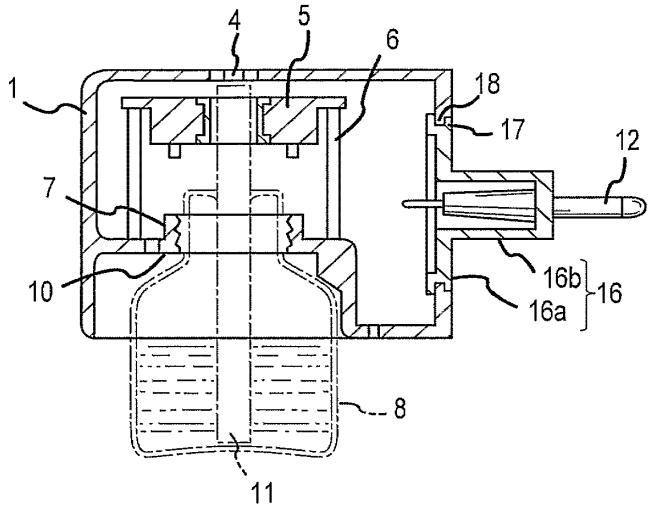


FIG.1A
PRIOR ART

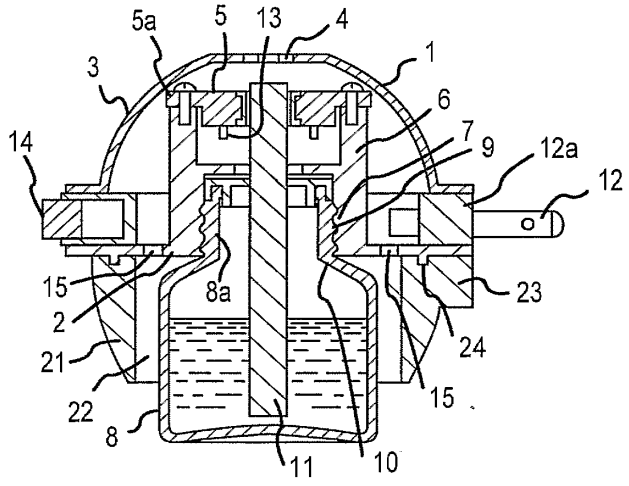


FIG.1B
PRIOR ART

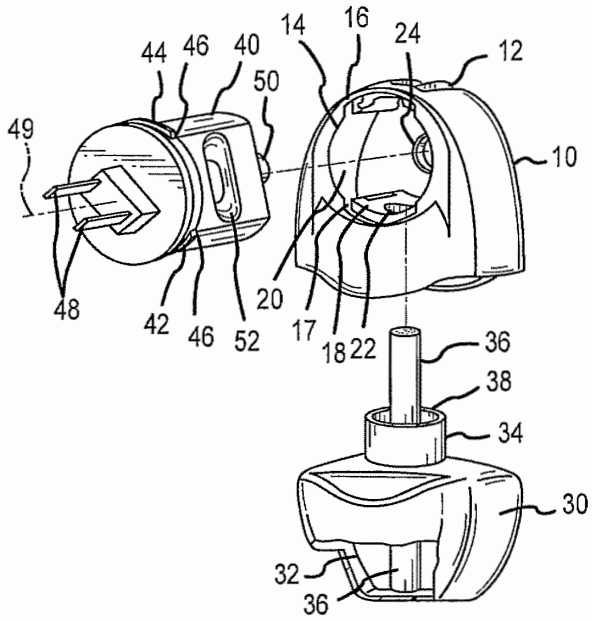


FIG.2A
PRIOR ART

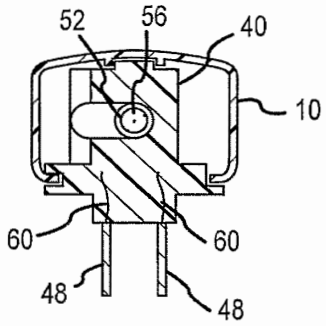


FIG.2B
PRIOR ART

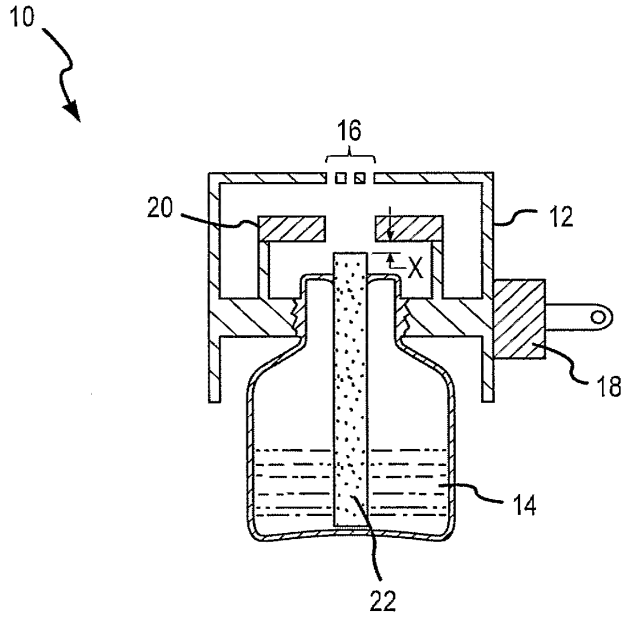


FIG.3

NJOY Exhibit 1002.1858

INTERNATIONAL SEARCH REPORT

Inte ›nal Application No
PCT/US 03/02158

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61L9/03 A61L9/02 A01M1/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61L A01M F24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/020450 A1 (VIEIRA PEDRO QUEIROZ) 13 September 2001 (2001-09-13)	1,2,6,7
Y	paragraph '0037! - paragraph '0038!; claim 9; figures 6,8	3,4,8,9
X	US 5 094 025 A (DANIELS JERRY C) 10 March 1992 (1992-03-10)	1,2,6,7
Y	column 2, line 43 - line 51	3,4,8,9
X	EP 0 914 768 A (OKUNO YOSHITOSHI) 12 May 1999 (1999-05-12)	1,6,7
Y	paragraph '0015! - paragraph '0016!; figures 1,5	8,9
X	US 5 945 094 A (MARTIN JOHN ET AL) 31 August 1999 (1999-08-31)	1,6,7
Y	column 3, line 30 - line 61 column 5, line 4 - line 15	8,9

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 May 2003	20/05/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Katsoulas, K

1

Form PCT/ISA/210 (second sheet) (July 1992)

NJOY Exhibit 1002.1859

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int nal Application No
PCT/US 03/02158

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2001020450 A1	13-09-2001	EP 1108358 A1	20-06-2001
		CZ 20004322 A3	15-08-2001
		JP 2001231425 A	28-08-2001
US 5094025 A	10-03-1992	NONE	
EP 0914768 A	12-05-1999	JP 11137151 A	25-05-1999
		BR 9804759 A	16-11-1999
		CN 1217141 A	26-05-1999
		EG 21139 A	29-11-2000
		EP 0914768 A1	12-05-1999
		TR 9802245 A2	21-10-1999
		US 6145241 A	14-11-2000
		ZA 9809625 A	26-04-1999
US 5945094 A	31-08-1999	AU 7137698 A	11-11-1998
		WO 9846285 A1	22-10-1998

NJOY Exhibit 1002.1860

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 December 2003 (18.12.2003)

PCT

(10) International Publication Number
WO 03/103387 A2

(51) International Patent Classification[7]: A01M 1/20, A61L 9/03

(21) International Application Number: PCT/US03/17767

(22) International Filing Date: 5 June 2003 (05.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/386,998 6 June 2002 (06.06.2002) US

(71) Applicant *(for all designated States except US)*: **S.C. JOHNSON & SON, INC.** [US/US]; 1525 Howe Street, Racine, WI 53403 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **HARWIG, Jeffrey, L.** [US/US]; 3260 S. 146th Street, New Berlin, WI 53151 (US). **HEALY, Brian, E.** [US/US]; W28783 Huntington Street, Hartland, WI 53029 (US). **KIMBALL, James, F.** [US/US]; 5267 S. Meadowlark Lane, Hales Corners, WI 53130 (US). **LEONARD, Stephen, B.** [US/US]; 8629 Talamasca Drive, Franksville, WI 53126 (US). **MEIER, Maude, C.** [US/US]; 5650 Northway Drive, Racine, Wi 53402 (US). **OAKESON, Ralph, W.** [US/US]; 349 Powerville Road, Boonton, NJ 07005 (US).

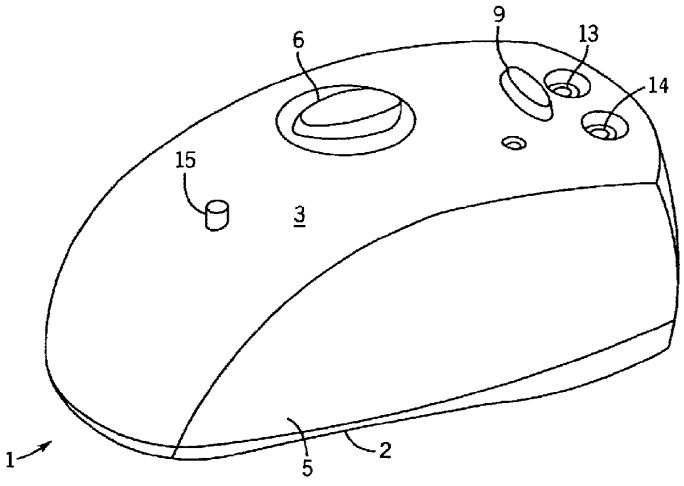
(74) Agents: **WOZNY, Thomas, M.** et al.; Andrus, Sceales, Starke & Sawall, LLP, 100 East Wisconsin Avenue, Suite 1100, Milwaukee, WI 53202 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: LOCALIZED SURFACE VOLATILIZATION



(57) Abstract: The present invention relates to an apparatus and method for rapid flash-like volatilization of high and low vapor pressure components from liquid or solid emanators which is in contact with a point or localized heat source. Vaporization is promoted by a geometrically small electrically resistive heating element with variable activation for pulsed or cyclic heating of an emanating surface containing the volatile components. The apparatus is primarily directed towards the treatment of residential air for fragrancing, odor elimination, treatment of insects or pests, air sanitization, air and surface antibacterial or antimicrobial treatment, or other ambient air or surface modification by way of gas or vapor distribution.

WO 03/103387 A2

NJOY Exhibit 1002.1861

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

NJOY Exhibit 1002.1862

LOCALIZED SURFACE VOLATILIZATION

CROSS-REFERENCE TO RELATED APPLICATION

This application is based on and claims priority from provisional patent Application Number 60/386,998 filed on June 6, 2002.

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus and method for rapid flash-like volatilization of high and low vapor pressure components from liquid or solid emanators which is in contact with a point or localized heat source. Vaporization is promoted by a geometrically small electrically resistive heater material with variable activation for pulsed or cyclic heating of the emanating surface containing the volatile components.

The field of the invention is primarily directed towards the treatment of residential air for fragrancing, odor elimination, treatment for insects or pests, air sanitization, air and surface antibacterial or antimicrobial treatment, or other ambient air or surface modification by way of gas or vapor distribution. Applications include portable, e.g. wearable or carried on an individual's belt, fixed for localized treatment, e.g. covering a relatively small area, or fixed for space treatment, e.g. covering an entire room of a house or building. Other fields of use could include commercial and other public environments requiring air or surface modification by gaseous treatment.

Air modification and treatment has been a part of dwelling, recreational, work, and other indoor and localized outdoor environment aesthetics and functionality throughout history. An inherent problem has been that aesthetic or functional volatiles with sufficiently high vapor pressure to adequately treat the environment by unaided means are limited in number and their treatment benefit. As a result there has been a long history of the use of heat to assist in the vaporization of higher molecular weight and lower vapor pressure compounds.

The use of heat increased the range of aesthetic and functional compounds that can be used for air quality management. Some of the first would have used flame (candle systems, stovetops, etc.). Although effective, and continues to be used today, heat from a flame can be difficult to use because the magnitude of heat

NJOY Exhibit 1002.1863

is difficult to regulate, and a flame typically has wide fluctuations of temperature ranges. Other problems include the affect on larger surfaces, i.e. unintended areas may be raised in temperature, the soot from a flame can blacken components, a flame can give off an unpleasant odor, the solution to be volatized can be rapidly degraded, and there is little adjustment. As a result, many materials are eliminated for use with flame systems.

In addition to flame based systems, there have emerged chemical heat emanation enhancers. Many well-known and simple chemistries are available as described in U.S. Patents 6,248,257 and 6,289,889, and include calcium oxides, aluminum copper sulfate, potassium chlorate, calcium sulfate, iron oxide, acids and bases, and others. Chemical heat sources suffer from inadequate means to closely control temperature, ability to stop the reaction, and many have pre- or post-reaction aggressive components.

Another generation of delivery methods includes devices such as compressed gases or aerosols, which propel minute droplets creating great aggregate surface area for volatilization of a liquid composition into the air. These systems work well for instant and situational applications, but have yet to be as viable for continuous air treatment. A simple set of technologies to address this interest area have been dispensing devices with open or semi-closed supported gelatinous, fibrous, or other material of absorbed or adsorbed actives and enhancers that promotes passive emanation by increased surface area. The needed large surfaces cause these products to be large, heavy, and have unsightly use features as the gels shrink, structures are exposed, surfaces soil, etc.

Other passive metering systems that have emerged and have been used include semipermeable membranes, wicks, capillaries, porous materials or other fluidic transport and emanating surfaces. Other products such as deodorant and sublimation blocks are also used for dispensing air-treating vapors into the atmosphere by evaporation. The performance of these systems vary widely, and although there are hybrid systems of new materials and designs that promote

NJOY Exhibit 1002.1864

vaporization by passive methods, they can suffer from the same drawbacks listed with gel and fibrous systems, and they generally lack optimal performance attributes.

There has been increasing use of electrified systems to promote enhanced volatilization, through the use of heat, air movement, electromechanical aerosolizers, or other methods or combinations. Heat and/or airflow have been combined with many of the passive air modification methods mentioned above. Airflow systems are marginally better than passive systems and continue to require somewhat larger emanating surfaces to achieve enhancement. The added system energy has provided for actives with better effectiveness, and depending upon the complexity of these devices, more optimal delivery performance. Although these systems are generally successful they leave important performance characteristics unaddressed.

SUMMARY OF THE INVENTION

The present invention provides an apparatus and a heating method using a localized heater with pulsed activation that can be incorporated for use in domestic or commercial, indoor or outdoor, fixed or portable applications. The apparatus includes an electro-resistive heating element such as a wire, thin film, or thick film resistive heater touching or affixed to an emanating surface from which a volatile compound can be vaporized by heat generated from pulsed electrical input. Preferably, the heater includes a Nicrome wire that contacts a wick which is heated to vaporize an active on the surface of the wick into the surrounding air. Heating is preferably accomplished using alkaline or rechargeable batteries, and tabletop as well as portable, wearable devices are contemplated. The localized heater and pulsed cycling work jointly to create rapid heating and cooling, limited thermal conductivity away from the local heat zone, meter effluent release by the magnitude, duration, and frequency of electrical cycles, and impart less thermal damage to the effluent. The heater is a component of technology that can be

NJOY Exhibit 1002.1865

integrated with other methods of emanation enhancement, such as moving air, as well as visual or audible stimulus.

The present invention addresses many of the unmet performance attributes of prior devices. One such is the need for portability. Passive devices are portable, but generally ineffective. Powered devices are more effective but restricted to being relatively close to electrical power outlets, and battery powered devices are limited to the use of less energy consuming emanation enhancement technologies such as fans, as resistive heaters rapidly consumes available battery energy. The inability to use heat, again substantially limits the actives that can be effectively used with the unit. All current devices also remain relatively unresponsive to the functional or aesthetic demands and preferences for which the product is intended, such as full space treatment, variable treatment strength, alteration of systems to different chemistries, etc. The present invention overcomes these issues by addressing the important performance issue of using an efficient resistive heater and minimizing the size of the heater to only the very small area needed to achieve desired emanation.

It is a further advantage of this invention to provide volatilization enhancement that improves air treatment performance. Specifically, this involves the use of pulsed heating of a thin film low thermal mass heater that rapidly heats and cools. This permits the heater to be used for metering the amount of active emanated by the magnitude, duration, and frequency of heating. Varying these parameters allows for adjustability to treat environments that change in size, air treatment need, personal preference, and characteristics of different actives and solutions. Such features have not been available with constant heat systems whether the source is a flame, electrical resistive heat, chemical reaction, etc. Air movement systems are also usually fixed in their airflow, and even with those that do modulate, the use of airflow can be limiting for lower vapor pressure component usage.

NJOY Exhibit 1002.1866

This invention also provides the advantage of using localized and pulsed heating to reduce changes in emanation effluent composition. Typical use of heat for emanation enhancement has placed the solution at constant and elevated temperature. The result is that not only is the relatively large heater and immediate area of the emanating surface brought to elevated temperature, but quickly the device, the matrix or container and its contents are also elevated in temperature. This results in not only increased general emanation, but the constant application of heat accelerates concentration change as the high vapor pressure constituents will emanate more rapidly than the lower vapor pressure constituents. This will cause a continuous change in the solution concentration and create a change in the desired composition of the effluent.

The constant application of heat also places constituents at higher temperature and molecular energy that accelerates the kinetics toward molecular degradation. Using carbon based compounds as an example, with the most common and weaker of them being C-C, C-H, C-N, and C-O, all having less than 100 kcal/mole bond strength. With an average bond strength being about 80 kcal/mole, these bonds would be supplied with sufficient energy for degradation at high constant temperatures. Considering Joule's Law a relevant value of the amount of heat produced by a conductor from the flow of current can be obtained. That is, $H=KI^2Rt = KtP$, where: H = heat (cal), K = constant of proportionality and is valued at 0.2390 (cal/j), I = current (A), R = resistance of the conductor (Ω), and t = time (s), and P = power (watt = j/s). Typical values for the localized and pulsed resistive heater can range from 0.25 – 3 seconds pulsed on-time, 0.2 – 25 ohms, and 0.2 – 1 amperes per cycle. At the extremes this represents a heat value $H << 80$ kcal/mole for the short pulse cycles. However, by constant heating it is just a few hours before energies have been input into the system equivalent to those needed for degradation of chemical bonds. This energy is dissipated throughout the solution, its container, the wick, and other structural components. The constant application of heat significantly contributes to accelerating degradation kinetics.

NJOY Exhibit 1002.1867

These undesirable results can be substantially minimized or eliminated by the combined effect of both cyclic and localized heating.

Localized heating implies the use of reduced emanation surfaces. This is possible because the pulsed heating can vary in magnitude, duration, and frequency to get equivalent emanation amounts needed from a smaller area. The benefit of a smaller area is less surface for low temperature release of the higher vapor pressure components of a product, resulting in more uniform product over time. Also because of the nature of pulsed heating, the emanator and effluent in the vicinity of the heater is usually not in a thermal environment and the effluent is not subjected to long and continuous higher energy environments. Also, because of the discontinuous application of heat there is limited heat transfer at proximal or further distances from the heater. These conditions reduce possible effluent degradation and increase effluent stability over time.

When heat is applied with a localized cyclic heater, it can be controlled and directed for optimal vaporization. Vapor pressure of a liquid occurs because at any temperature there is a distribution of kinetic energy held by the molecules in solution. Those with higher energies sufficient to escape the surface of the liquid are vaporized and an equilibrium of vaporization with condensation is reached at the given conditions. By adding heat into the liquid the distribution of molecules with sufficient escape energy increases, rising the rate of vaporization and vapor pressure. By recognizing that vaporization is a surface event, and it is singly the process of vaporizing of the liquid that is desired, then surface heating provides the most efficient method to transfer heat to surface molecules and minimizing the transfer of heat to bulk liquid and degradation processes. Such a mechanism of vaporization can increase energy efficiency of the system. Submerging a heater results in equivalent energy transfer, but the energy within the liquid is subsequently dissipated. At the liquid interface, high energy molecules are allowed to escape or diffuse short distances to the surface and then escape as a vapor. Within the liquid high energy molecules transfer their energy by collision to other

NJOY Exhibit 1002.1868

molecules before escaping, resulting in bulk liquid heating. At temperatures below boiling where vapors do not accumulate into bubbles that can protect the vapor and rise quickly to the surface, many high energy molecules do not reach the surface to escape, thus lowering the efficiency of vaporization for small energy inputs. Consequently, the depth of the surface can extend beyond the distance of a few molecules that are needed for molecular properties at the liquid interface to transition to molecular bulk liquid properties. The nature of the viscosity, intermolecular interaction, and other characteristics of the solution, its various constituents, and their specific ability to reach the surface because of their molecular size, functionality, structure, degree of intermolecular interaction, and other considerations will determine the effective surface thickness that will allow for the rapid vaporization of such constituents without significant loss to bulk heating. A practical consideration for efficiency is that the majority of vaporized molecules escape the surface to include those vaporizing under the heater or opposite the surface, if such condition exists, and which would create longer pathways for escape. A practical definition of this surface thickness is considered 300 μm and more preferably 100 μm with an understanding that thermal lines from a heater are often confined to one diameter or thickness away from the heater and this represents the zone of heating by minimal conductive processes. Surface heating in central to the design of a portable, low energy heat source. Cyclic heating allows for the use of broad temperature ranges with minimal effluent concentration and molecular changes.

Localized and cyclic heating that can vary in its magnitude, duration, and frequency parallels the proportional relationship of increased temperature with increased vaporization. As a result, optimal evaporation can occur regardless of the chemical and physical characteristics of the substance being evaporated. This relationship follows the condensed phase-vapor equilibrium of $\log P = -\Delta H/RT + C$, where P = pressure, ΔH = system interaction enthalpy, R = gas constant, T = temperature (K), and C = constant. A log P is plotted against 1/T and shows

NJOY Exhibit 1002.1869

increasing vapor pressure with increasing temperature between a condensed phase and a vapor phase. The input of low heat for longer cyclic duration or the input of high heat for short duration and frequency of these cycles each achieve similar amounts of vaporized liquid. Localized low mass heaters allow for rapid heating to temperatures, preferably near, but below boiling points. This is not a necessity as multicomponent mixtures for many solutions and even complex mixtures for fragrance solutions will have wide ranges in boiling points of the constituents. It is more important that a rapid heating and then cooling cycle occur that promotes uniform evaporation of all components through a rapid or flash-like vaporization. This mechanism provides for rapid treatment of a space while preserving the concentration and molecular stability of the solution. Lower temperatures and longer on-time cycles can be used to achieve initial treatment or maintenance of the vapor in the space, but then the application becomes more reminiscent of current systems that suffer from extended heating. It is preferred that maintenance be achieved by rapid heating and then cooling, but with less frequency. Thus continuing to preserve solution concentration and molecular stability. As a result, the magnitude and duration of the heating cycle can meter the rate over time, or quantity per cycle vaporized using localized cyclic heating.

Typically, the addition of heat in the localized cyclic heater preferentially creates rapid heat for flash-like evaporation. Doing so limits the flow or flux of heat distantly from the heat source, as governed by Fourier's Law, $q = -kA(MT/Mx)$, where q = heat transfer, k = thermal conductivity of the material, A = unit area of transfer, (MT/Mx) = the temperature gradient. Thermal conductivities of 3.3×10^{-4} cal/(sec)(cm^2)(°C/cm) for light hydrocarbon oils representative of organic liquids, aqueous solutions of 4.3×10^{-5} cal (gm)/(sec)(cm^2)(°C), and 60.3×10^{-6} cal/(sec)(cm^2)(°C/cm) for air. These values indicate that the thermal conductivity for air creates an insulative barrier that does not permit effective thermal transfer from noncontact heat sources which are common in many applications. This invention takes advantage of reduced heat transfer by rapid

NJOY Exhibit 1002.1870

contact heating, limited cyclic timing, and use of inherent low thermal conductivity of common light hydrocarbon or aqueous solutions of $10^{-4} - 10^{-5}$ thermal conductivity to provide an optimal volitalizer of effluents for air modification with limited energy use and improved product stability.

In addition, localized and pulsed heating creates the opportunity for greater portability of a product employing these technologies. Localized heating implies that heat is confined to a specific area. This can be accomplished by limiting the magnitude, duration, and frequency of heating and taking advantage of material properties for limiting undesired thermal transfer. It also suggests that the geometric size and shape of the heater locally confines the influence of heat. Another less obvious aspect of localized heating is the specific composition, performance, spatial positioning, dimension, and design of the heater to provide focused heating. A proper selection of these elements provides for localized heating. The smaller dimension provides for greater design flexibility into products where size becomes a consideration. Simplicity of the heater allows for broader use and even multiple use within the same application. Incorporating the above considerations as well as efficient power usage criteria, a heater can be specified that allows for conventional or battery power with desirable battery life and heater performance characteristics. Pulsing the heater is integral to permitting extended use of battery power or efficient use of wall power, and safety considerations as the heater circuit is usually not closed and drawing power.

A further advantage of this technology is the simplicity that enables previously impractical applications of multiple and independent heaters because of heater size. For example, control of the heater may be analog or digital or the heater may even be remotely actuatable. This has not been previously available because of the lack of thermal responsiveness in cooling and heating that would cause effluents to emanate simultaneously, unless desired, etc. The simplicity of electrical heating coupled with the benefits of localized and pulsed heating allow for the incorporation of multiple emanators. Such an embodiment creates products

NJOY Exhibit 1002.1871

that deliver multiple fragrances to overcome human adaptation, which is manifest by the inability to detect the presence of the fragrance over time. Changing fragrances by pulsing different emanators from time to time, any adaptation is mitigated as the physiological changes associated with the environmental change are then detected. An extension of multiple emanators could include also include a combination of fragrances, odor eliminators, insect repellents, insecticides, fungicides, antibacterials, etc.

Central to the volatilization and energy use efficiency of the localized and pulsed heater is its spatial location to the emanator. Preferably the heater is in close proximity and even touching or mounted to the surface of the emanator. Because of the need for only a geometrically small heater, the emanator also need not be large and preferably would be small. This close association is not preferred in the fact that the emanator matrix will absorb heat that is then unavailable for vaporization, but such a close position to the release matrix also places the heater in close proximity to the effluent. Because of the insulative properties of many media such as air, ceramic, etc. it is advantageous to have the heater in contact with the effluent to facilitate the most efficient thermal transfer and volatilization. In connection with this, the heater becomes more supported or affixed to the matrix, becomes more robust, and maintains more consistent spatial proximity to the effluent.

Yet an additional advantage of this invention is the use of an affixed heater to the effluent refill. The refill assembly may thus include not only a reservoir containing a composition having a volatile active, and a wick having an emanating surface for the active, but also the heater element itself. The incorporation of these elements provides for the consistency and robustness suggested above with the heater. A heater affixed to a refill provides the spatial relationship most effective for volatilization of surface liquid. It also provides for a renewed heater with each refill purchase, such that there is reduced risk of matrix fouling near the heater or fouling and reduced efficiency in thermal transfer from the heater to the effluent. It

NJOY Exhibit 1002.1872

also provides a proprietary interface between refill and the support system to ensure that the safety, performance, specifically designed effluents, and other factors are preserved by using appropriate refills.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a localized cyclic heater in accordance with the present invention using NiCr resistive wire with multiple emanators;

Fig. 2 is a perspective view of the heater in Fig. 1 with its cover off exposing selected components in the circuitry and user interface;

Fig. 3 is a schematic illustration of electronic circuitry for the heater of Figs. 1 and 2 to provide for cyclic localized heating of the multiple emanators;

Figs. 4a-4e schematically illustrate various resistive wire heater designs to change the thermal characteristic of the heater;

Figs. 5a-5e schematically illustrate various thin film resistive heater designs to change the thermal characteristic of the heater;

Fig. 6 is a graph illustrating the metering capability of the heater with a fragrance;

Fig. 7 is a graph illustrating the metering capability of the heater with an insecticide;

Fig. 8 is a graph illustrating the efficacy of the heater for knockdown (kill) of Aedes aegypti female mosquitoes compared to controls and a currently marketed product using a NiCr resistive wire and wall power device;

Fig. 9 is a graph illustrating the particle size generated by the heater that facilitates rapid revaporization and continued loft without fallout;

Fig. 10 is a graph illustrating a thin film resistive heater temperature responsiveness after 0.5 to 2 seconds of current;

Fig. 11 schematically illustrates an end view of a wire heating element held in contact with the tip of a wick by a coil spring;

NJOY Exhibit 1002.1873

Fig. 12 is a top view of the embodiment of Fig. 11 with the spring not shown for clarity;

Fig. 13 is a plan view of the wire mounting used in the embodiment of Fig. 11;

Fig. 14 schematically illustrates a pair of spring fingers used to apply a spring force on the wire heating element;

Fig. 15 schematically illustrates spring force being applied by a pair of coiled sections of the wire heating element itself;

Fig. 16 schematically illustrates spring force being applied by corrugations integrally formed in the wire heating element itself;

Fig. 17 schematically illustrates spring force being applied by stretching a wire heating element;

Fig. 18 schematically illustrates a side mounting embodiment of the present invention;

Figs. 19a and 19b illustrate the use of notches formed in a wick for receiving a wire heating element;

Fig. 20 illustrates yet another embodiment which utilizes a pair of wire heating elements;

Figs. 21a and 21b illustrate a multi-part wick for delivering active to a wire heating element;

Fig. 22 illustrates an all-in-one refill unit for the present invention;

Fig. 23 illustrates the use of a fan and a baffle in the present invention;

Fig. 24 illustrates the use of a fan and a separate chamber for containing the wire heating element;

Fig. 25 illustrates the use of a fan and varying the cross sectional area of a housing for the wire heating element to control air movement past the wire heating element;

Fig. 26 illustrates the use of a cap covering the tip of a wire heating element; and

NJOY Exhibit 1002.1874

Fig. 27 illustrates a vented housing as yet another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The localized and pulsed heater 1 operates as an integrated system of electrical, mechanical, and fluid systems as shown in Figs. 1 and 2. The embodiments described herein were specifically designed for portable and semi-portable fragrancing and insecticide delivery devices. While a primary object of the invention is to provide for a portable fragrancing or insect repellent vapor-dispensing device, it should be understood that other vaporizable fluids are contemplated within the scope of the present invention, such as air fresheners, perfumes, deodorants, medicaments, and the like.

Referring now to Figs. 1 and 2, there is illustrated one embodiment of a portable cyclic localized heater 1 constructed in accordance with the principles of the present invention. More specifically, heater 1 includes a housing which comprises a base 2 for supporting the internal components of heater 1, and a cover 3 for enclosing those components. Base 2 is in the shape of a shallow tray and includes a lip 4 at its peripheral edge which engages a corresponding lip 5 formed on cover 3 so that cover 3 may be joined with base 2 in a snap-fit arrangement. Cover 3 is thus removable so as to permit access to the interior of heater 1, if desired.

Base 2 and cover 3 can be made of any suitable, lightweight material such as a wide variety of commercially available plastics that are produced by conventional processes and known to those skilled in the art. Any plastic housing material that is selected, however, must be compatible with the particular active volative fluid that is to be vaporized. Typically, base 2 and cover 3 may be made of a commercially available polycarbonate material manufactured by known injection molding methods. Base 2 and cover 3 can thus be of any suitable dimension such that it may be readily portable whenever desired.

NJOY Exhibit 1002.1875

As shown best in Fig. 1, heater 1 includes an off duration selector knob 6 on cover 3 which is connected to an off duration potentiometer 25 mounted on circuit board 8 which in turn is supported on base 2. Knob 6 can be rotated to vary the interval between vaporization cycles. Also shown in Fig. 1 is an emanator selector knob 9 which is connected to a selector switch 10 on circuit board 8. Selector knob 9 may be slid in one direction to select a corresponding emanator 11, or in the opposite direction to select emanator 12. For example, emanator 11 may vaporize an insect repellent while emanator 12 might vaporize a fragrance so that a user can choose the particular active to be vaporized, as desired. Fig. 1 also illustrates a pair of spaced openings 13, 14 formed through cover 3 at a location which is aligned with emanators 11 and 12, respectively. Openings 13, 14 thus enable the active being vaporized to exit from heater 1 into the atmosphere. Finally, an instant action button 15 extends through cover 3, and when pushed, overrides the time delay set by the off duration knob 6 and permits a user to obtain an instant or immediate burst of active from one or both emanators 11, 12 depending upon the position of selector knob 9.

Referring now to Fig. 2, circuitboard 8 is mounted on supports 16 so as to be raised above base 2 and provide sufficient room for forming a receptacle 17 for receiving a plurality of batteries 7 (schematically shown in Fig. 3) for powering heater 1. Alternately, heater 1 may be powered by an electrical cord 18 and plug for insertion into a wall mounted electrical power outlet.

Fig. 2 also illustrates the emanators 11, 12. Each emanator 11, 12 comprises a wick 19, 20, respectively and a wire heating element 21, 22, respectively. Each wick 19, 20 has a lower end received within a reservoir 23, 24, respectively for containing a solution of an active such as an insecticide, pesticide or fragrance, and an upper end having a relatively flat tip across which wire heating elements 21, 22 respectively extend. Thus, as active is drawn upwardly by capillary action through wicks 19, 20, the solution is volatized when current is passed through wires 21, 22 resulting in heating of the solution and vaporization of the active.

NJOY Exhibit 1002.1876

Each reservoir 23, 24 is arranged to contain a volatile solution or fluid, preferably biologically active, such as an evaporable liquid insecticide or an evaporable liquid insect repellent, fragrance or the like. The reservoirs 23, 24 may be unitary with base 2 and as such may be an integral part thereof. Alternately, each reservoir 23, 24 may be separately formed and then attached to base 2 so that reservoirs 23, 24 can be removable and thereby allowing for the replacement of each reservoir after desired vaporization of the fluid contained therein. This would allow for the interchanging of a variety of like dimensioned reservoirs containing a wide variety of vaporizable liquid substances. Accordingly, the reservoirs 23, 24 can be so constructed as to be disposable and replaceable by new reservoirs containing a fresh supply of active. Also, if desired, reservoirs 23, 24 may be transparent in order to provide a user with the visual ability to determine the amount of vaporizable active or liquid remaining in the heater 1. Further, although the preferred composition is one which contains the active ingredient in a liquid solution, the composition may also be a solid, semi-solid or gel formulation under ambient conditions. In each case, the composition includes the active ingredient and a carrier for the active ingredient. The carrier may include one or more blowing agents, solvents, stabilizers, synergists, dyes and perfumes. Blowing agents include azodicarbonamide, dinitrosopentamethylenetetramine, azobisisobutyronitrile, and combinations thereof. Suitable blowing agents are disclosed in U.S. Pat. No. 4,228,124, which is hereby incorporated by reference for the purpose of disclosing blowing agents.

Solvents include alcohols such as cetyl alcohol, stearyl alcohol, and mixtures thereof.

Stabilizers (e.g., for providing stability to heat, light, and oxidation) include antioxidants such as 2,6-di-tert-butyl-4-methylphenol ("BHT"), 3-tert-butyl-4-hydroxyanisole ("BHA"), 2,2'-methylene-bis(4-ethyl-6-tert-butylphenol), 2,2'-methylene-bis-(4-methyl-6-tert-butylphenol), 4,4'-butylidene-bis(5-methyl-6-tert-butylphenol), 4,4'-methylene-bis(2-methyl-6-tert-butylphenol), 4,4'-thio-bis(3-

NJOY Exhibit 1002.1877

methyl-6-tert-butylphenol), 4,4'-methylene-bis(2,6-di-tert-butylphenol), stearyl-beta(3,5-di-tert-butyl-4-hydroxyphenol)-propionate, 1,3,5-trimethyl-2,4-6-tris(3,5-di-tert-butyl-4-hydroxybenzylbenzene), 1,1,3-tris(2-methyl-4-hydroxy-5-tert-butyl)-butane, tetrakis[methylene(3,5-di-tert-butyl-4-hydroxycinnimate)]methane, dilauryl thiodipropionate, distearyl thiodipropionate, UV absorbers derived from benzophenone, triazole, and salicylate compounds, and combinations thereof. Suitable stabilizers are disclosed in U.S. Pat. No. 4,874,787 and in U.S. Pat. No. 4,515,768.

Synergists include alpha-[2-(2-butoxyethoxy)ethoxy]-4,5-methylene- dioxy-2-propyltoluene, octachlorodipropyl ether, and N-(2-ethylhexyl)-bicyclo-[2,3,2]-hept-5-en-2,3-dicarboxyimide. Suitable synergists are disclosed in U.S. Pat. No. 4,874,787 and U.S. Pat. No. 4,515,768.

Dyes in the composition can be used to show when the insect repellent is spent. For example, suitable dyes include 3-ethostearate of 9-ortho-carboxyphenyl-6-diethylamin-3-ethylamino-3-isoxanthene and electron-donating dyes. Dyes are disclosed in Japanese Patent Publication No's. 09-175906A and JP 07-324003A, International Patent Publication WO 96/33605 A1, and U.S. Pat. No. 5,891,811.

Perfumes can also be used in the composition. Perfumes can be used, e.g., to show when the insect repellent is spent or for aesthetic purposes. Perfumes must have similar volatility to the insect repellent and must not be attractive to insects. Examples of suitable perfumes include citronella, which can be used herein as a perfume, not an insect repellent.

The pulsed electrical cycling of heater 1 is achieved by solid state electronic circuitry, as shown best in Fig. 3, but is not limited to the specific circuitry illustrated. The primary function for the electronics is to switch the heater 1 on and off at predetermined intervals. The ON/OFF duty cycle reduces the energy and increases battery life as compared with a device that runs continuously. The heater Control Timing can be set to operate for a predetermined specific time duration, e.g. 2 hours, 4 hours, 8 hours, etc. or can be set to turn the heater 1 on and off for

NJOY Exhibit 1002.1878

predetermined time periods, e.g. on for 5 seconds and then off for five seconds as long as the Low Voltage Detector indicates a good battery(s). The duty cycle will be adjustable by changing a resistor 28 on the printed circuit board.

A secondary function for the electronics is to protect the battery(s) 7 from damage by monitoring the battery voltage and disconnecting the circuit when the voltage decreases to a set value. When the battery voltage is below a preset voltage, the electronics will enter into a Battery Low Mode. In this mode, the controls to the heater will be such that the heater is turned off. Low Battery detection is only performed during the heater off state to avoid false detection due to the current drain during the on state. The circuit will sample the battery voltage three times just before the heater on cycle and decide if the next state will be low voltage or normal (heater ON). In addition, there will be a hysteresis built into the low voltage detector circuit to remove oscillations of judgement around the low voltage level.

Figure 3 represents a potential electronic circuit for heater 1. It is a simple, low-cost circuit and will allow the heater to be switched ON and OFF for a predetermined time (duty cycle). The ASIC, microcontroller or discrete logic component 29 incorporates a conventional Low Battery Detection circuit as is well known in this art.

The circuit of Figure 3 will either turn the Heater ON or OFF. Depending on the heater configuration ultimately chosen, the two states of ON and OFF may not be sufficient. Take for example the situation where ON would allow too high a voltage across the heater, resulting in too high of a temperature. In that case, the ASIC, microcontroller or discrete logic component 29 will modulate the output, reducing the voltage to the heater. A pulse width modulated (PWM) method of control would be an efficient scheme for maintaining the proper voltage across the heater element 21 or 22 that is less than full ON.

NJOY Exhibit 1002.1879

The following equation is used for PWM waveforms:

$$V_{RMS} = V_{pk} \sqrt{t_{ON}/T}$$

Where: $V_{pk} = V_{batt}$

t_{ON} = ON time for the heater (seconds)

T = period of time for PWM output (seconds)

As can be seen from the equation, if one monitors battery voltage (V_{pk}) and then adjusts t_{ON}, one can keep V_{RMS} constant.

A beneficial consequence of the use of electronics is the incorporation of a clock within the circuit to create blockout periods of the day when the device is not required and battery energy conservation can take place. As a result, once powered, heater 1 does not need to include an on/off switch such as that shown as 30 in Fig. 3 to depower the board. Specific controls of heater pulsing is provided by three subcircuits. Potentiometer 25 is adjustable to control the duration of heater off cycles from 5 seconds to 30 seconds. Potentiometer 26 allows for battery energy management with variable pulse width modulation that regulates battery use during the on cycle with an on and off subcycle to manage power needs. Other power conserving methods could be used, if desired. Potentiometer 27 is included to regulate the duration of the on cycle from 0.25 seconds to 2 seconds. Other subcircuitry can be included for motion, light, or other sensor switching such that the unit could be dormant until needed.

Power is provided by batteries 7 and could be AA, C, D, or other 3 volt battery wall power transformers. Batteries 7 may also be rechargeable. Power may also be signally or simultaneously connected to a permanent power source in a tethered or untethered manner.

The wicks 19, 20 may be constructed from natural materials, fibers, nonwovens, sintered polymers, ceramics, metal foams, open capillary tubes of ceramic, glass, or other material. A critical consideration for the selection of any of these materials is the temperature required for surface heating for the effluent being

NJOY Exhibit 1002.1880

volatilized. The preferred wicking material is ceramic, in part because of its high temperature tolerance. It shares other features with some other wicks with the ability to tailor pore size to address wicking rates and fouling, it has insulative properties to further minimize heat transfer, and is readily available as a material. If the wick substrate is conductive then a dielectric material layer of a few thousandths of an inch in thickness must be placed between the electrically resistive heater and the substrate. Materials not requiring the need for dielectrics are preferred for their reduced cost, retained capillary pores for wicking, thermal stability, etc. Ceramic wicks are also preferable in that they can withstand heater deposition processing temperatures, if required. Other wick materials include wicks made from saw-dust and silica/sand mixtures that are able to withstand needed temperatures to volatize the actives.

Core to the success of this invention is the selection or creation of an appropriate electro-resistive heating element. A thermally stable material which functions as a heater when current flows from a battery is passed through it can be achieved with a wide variety of heating materials. Important to the small geometrical scale as well as the energy economy needed, heating elements from traditional materials and sources have been limited to wires, thick films, and thin films. Wire heating elements are commonly associated with alloys with trade names of Nichrome, Ohmax, Radiohm, Nirex, Nilvar, and more (Omega Engineering, Inc., Handbook and Encyclopedia, Electric Heaters, 200, pg. z-38). Pure metals that may be used, but show less resistivity and include platinum, iron, zinc, molybdenum, tungsten, and more (Omega Engineering, Inc., Handbook and Encyclopedia, Electric Heaters, 200, pg. z-38). Thin films can be derived from metallic films, oxide films, materials from nitrides, borides, carbides, stanides, and the like. Stannic oxides (SnO_2) or tin oxides can be deposited as a very thin film of 2 μm or less. The other metal oxides are formed as a thicker or intermediate film, but still considered as a thin films. Thick films are also possible sources of resistive heating elements. They can include electrically conductive adhesive

NJOY Exhibit 1002.1881

thermosetting or thermoplastic polymeric resin pastes with silver or copper powder as the conductor. Nonresin matrices of glass and ceramics with pure metals or metal oxides such as Al_2O_3, BeO, Pd/Ag, SiO2, PbO, CaO, B2 O3, Na2 O, K2 O, MgO, and other dopants have been used as thick films. Most heating elements can be obtained in different shapes and sizes while maintaining physical properties such as electrical resistivity, density, thermal conductivity, and specific heat. These properties are determined by the constituent elements, processing methods, and post-processing techniques.

The most preferred of the above resistive heating elements is either a 49 gauge Nichrome wire or a tin oxide thin film. Important to the selection of these resistive heating elements is their effectiveness at volatilizing solutions and their energy efficiency. The gauge of the wire was selected because of its higher resistance and less energy draw to generate needed wire temperatures. Like other resistive materials, there is an issue of thinning wire diameter and the propensity for failure. The Nichrome large gauge wires are relatively fragile and are subject to mechanical failure during manufacturing, transportation, consumer handling, and use. More significantly, thermal cycling induces stresses and fatigue in the heating elements, which may result in heater failure. Undesirable oxidation of the heater material can also occur causing weakening and possible failure. Figs. 4a through 4f illustrate various resistive wire heater designs showing a wire heating element 123a-123f touching an emanating surface 124a-124f located at the tip of a ceramic wick 125a-125f, respectively. More specifically, Fig. 4a illustrates a single straight wire heating element 123a touching a flat emanating surface 124a at the outer tip end of wick 125a. Fig. 4b illustrates a simple or single serpentine wire heating element 123b touching the flat emanating surface 124b at the tip end of ceramic wick 125b. Fig. 4c illustrates a multi-serpentine design for wire heating element 123c touching the flat emanating surface 124c at the tip end of wick 125c. Fig. 4d illustrates a wire heating element 123d that is wrapped around the circumference of the tip end of wick 125d such that the emanating surface 124d comprises the outer

NJOY Exhibit 1002.1882

circumferential surface of wick 125d. Fig. 4e illustrates a pair of spaced wire heating elements 123e touching the flat emanating surface 124e at the tip end of wick 125e. It should be noted that although two wires 123e are illustrated, multiple wires could also be used, i.e. 2, 3 or more, if desired. Fig. 4f illustrates a side mounting embodiment wherein wire heating element 123f touches one side of the tip end of wick 125f such that an arcuate portion of the circumferential surface of wick 125f comprises the emanating surface 124f.

Another type of preferred resistive heating element is a vapor deposited thin film of tin oxide (SnO_2) or other resistive deposited films. An important consideration is the direct deposition of the oxide on the ceramic substrate that creates a mechanically robust heater that may not be as susceptible to mechanical failure. It also does not suffer, as a wire resistive heater does, from inconsistent position with respect to the wick at manufacturing and changes that occur with use. An important consideration with the use of SnO_2 is that its thermal expansion and that of the ceramic do not substantially differ. As a result, there is no debonding or other failures from thermal stresses that occur with pulsed or cyclic heating. Additionally the SnO_2 does not suffer from detrimental additional oxidation with use.

In consideration of minimizing energy use, the heating element material must have a resistivity sufficiently low to allow for rapid heating and cooling. It is therefore desirable that the heater resistance correspond to the energy density of the power source in order to minimize power consumption. Suitable heater materials of low mass, such as SnO_2 can be created with very low density. Not only is the composition of the resistive material important in achieving this, but also the thickness and other geometric consideration with a relationship such as $R=\rho(L/(WT))$. Where R is resistance of the heater, ρ is resistivity of the heater material, L is length, W is width, and T is thickness. The deposition of the thin film by atmospheric, vacuum, electro-spray, thermal, or other vapor deposition allows

NJOY Exhibit 1002.1883

the resistive oxide to be applied to contoured surfaces, which also includes some internal pore surfaces.

Another advantage of a thin film heating element is that there can be an increase in surface area. This allows for increased liquid contact with the heating element to create more efficient thermal transfer and volatilization of the solution. Because of the vapor deposition method, this surface coverage can also extend into the pores of the wick, capillaries, or other structures. Yet because of the thinness of the oxide film it does not close the porous structure and does not inhibit loading performance and volatilization sites. The thin 2 μm thick films allows for the potential to layer thin films as needed to achieve desired resistivity of the heater material, in conjunction with composition, and heater design variables. Possible disadvantages of thin film resistors include: (1) some designs may actually require more energy to achieve the same temperature as a Nichrome wire; (2) some designs may become fragile especially if the substrate on which it is deposited is also thin to help minimize heat transfer; and (3) random temperature variations can occur throughout the film depending on the thickness of the film. Figs. 5a through 5e illustrate various resistive thin film heater designs showing a thin film heating element 126a-126e located at the tip of a ceramic wick 127a-127e, respectively. More specifically, Fig. 5a illustrates a thin film heating element 126a deposited on the flat tip end of wick 127a. Fig. 5b illustrates a thin film heating element 126b deposited on flat tip end of wick 127b as well as the outer circumferential surface of wick 127b which is adjacent the flat tip end and comprising the outer edge margin of wick 127b. Fig. 5c illustrates a thin film heating element 126c deposited only around the outer circumferential surface along the edge margin and adjacent to the flat tip end of wick 127c. Fig. 5d illustrates a grid-shaped thin film heating element 126d deposited on the flat tip end of wick 127d. It should be noted that various other designs could be deposited on the flat tip end or on the circumference of wick 127d, e.g. a mesh, a spiral, a polygonal-shaped grid or some other network

NJOY Exhibit 1002.1884

of spaced lines. Fig. 5e illustrates a thin film heating element 126e in the form of a thin ribbon deposited on the flat tip end of wick 127e.

As set forth above, one of the primary uses of heater 1 is for providing an insect repellant and insecticidal function. Those insecticidal or insect repellant evaporable fluids which are useful in heater 1 are limited only to the extent that such fluids are vaporizable, are of a composition which is capable of vaporization, and are registered for use with humans. The composition comprises one or more active insect repellent and one or more optional carrier ingredients. Optional carrier ingredients include blowing agents, solvents, stabilizers, synergists, dyes, and fragrances well known to those skilled in this art. Suitable insect repellents are exemplified by DEET, pyrethrins, chrysanthemic acid derivatives, and pyrethroids. Examples of some suitable pyrethroids are Allethrin, d-Allethrin, Bioallethrin, S-Bioallethrin, Empenthrin, Prallethrin, and Transfluthrin. A preferred volatile insecticidal fluid substance is 3-allyl-2-methylcyclopenta-2-ene-4-one sold under the brand name Pynamin-Forte by Sumitomo Chemical Co., Ltd. of Japan. A preferred volatile insect-repellent fluid substance is N,N-diethyl meta-toluamide (commonly known as DEET).

In additional to insect repellants, insecticides, and pesticides, the portable device of the present invention can also be utilized to evaporate other evaporable fluid substances such as evaporable fluid antiseptics, evaporable fluid agricultural fungicides, evaporable fluid plant-growth regulants, e.g. fertilizers and the like, evaporable fluid herbicides, air fresheners, perfumes, deodorants, medicaments, and the like.

A Nichrome wire will expand and contract approximately 0.001 inches during the process of heating to 160°C and cooling. A spring mechanism is to be used to keep each Nichrome wire in constant tension against its corresponding wick. However, too much force on the wire will result in permanent deformation (stretching) of the wire or even breakage. The yield strength is the amount of stress required on the wire to permanently stretch the wire. The tensile strength is the

NJOY Exhibit 1002.1885

amount of stress that would break the wire. The heater assembly must be constructed such that the stresses on the wire do not exceed one-half the yield strength. The yield and tensile strength for a 35 AWG Nichrome wire is typically 550 MPa (megapascal) and 880 MPa respectively. Therefore, $\leq$ 300 MPa of stress would be a likely target for the spring mechanism.

Figs. 11-13 schematically illustrate one embodiment of an electro resistive wire heating element or filament 32 being held in contact with the flat tip end 33 of a wick 34. The opposite end of wick 34 is in communication with a composition containing an active ingredient within reservoir or vial 35. A cup 36 having a central opening (not shown) is used to support wick 34 in an upright position, and a seal between this opening and wick 34 prevents excessive evaporation and spillage of the composition within vial 35.

As shown best in Fig. 13, wire heating element 32 is mounted on a bowtie shaped plate 37 which includes a central annular member 38 and oppositely extending triangular shaped wing members 39 and 40. Central member 38 has an opening therein that has a diameter substantially the same as the diameter of wick 34. Wire 32 is disposed across opening 41 and has opposite ends affixed to plate 37 by rivets 41 and 42 which in turn are electrically connected to a battery 7 by wires 43 and 44 respectively.

Plate 37 and wire heating element 32 are captured within a cylindrical spring housing 45 in such a manner that plate 37 freely slides vertically therein, i.e., is free-floating in housing 45. Housing 45 includes an inwardly projecting annular lip 46 at its upper end that provides an annular lower surface 47. One end of a coil spring 48 bears against surface 47 and the other end of spring 48 bears against plate 37 so as to provide a downward force to maintain wire heating element 32 against the emanating surface, i.e., the flat tip end 33, of wick 34, as indicated by arrow 4.

Although a coil spring 48 is illustrated in Fig. 11, other types of springs are also contemplated for use in the present assembly. Fig. 14 schematically illustrates a floating wire heating element 50 mounted across a pair of spring fingers 51, 52

NJOY Exhibit 1002.1886

for movement in the direction of arrow 53. Fig. 15 schematically illustrates spring force being applied by a pair of coiled sections 54 and 55 integrally formed as part of a wire heating element 56. Fig. 16 schematically illustrates spring force being applied by corrugations 57 integrally formed as a part of a wire heating element 58. Fig. 17 schematically illustrates spring force being applied by stretching a wire heating element 59. In this embodiment, wick 60 is shouldered against the underside of plate 61 so that the flat tip end thereof projects through the central opening therein to stretch wire element 59 upwardly which provides a downward force against wick 60.

Fig. 18 schematically illustrates a side mounting embodiment for the present invention wherein a wire heating element 62 is mounted against the side of a wick 63 at a location beneath the flat tip end 64 thereof and above cap 65 of vial or reservoir 66. Wire 62 is affixed to a U-shaped plate 67 and extends across the opening formed by the U to engage or bear against the side of wick 63. A pair of spaced apart conductors 68 and 69 provide an electrical connection to the electronic circuitry schematically illustrated by 70 and battery 71. Conductors 68 and 69 are preferably composed of spring steel so as to inherently function as a spring to provide a force to maintain the wire heating element 62 in contact with the emanating surface, i.e., the side of wick 63.

Fig. 18 also illustrates a holder for removably mounting reservoir 66, cap 65 and wick 63 (comprising one embodiment of a refill assembly) to the apparatus. The holder comprises a base member 72 for supporting the underside of reservoir 66 and a pair of opposing spring finger members 73 and 74 that grab opposite sides of reservoir 66. Finger members 73 and 74 thus provide a snap-fit assembly for removably mounting reservoir 66, cap 65 and wick 63.

Fig. 19a illustrates that a wick 75 can have a notch 76 formed in its flat tip end 77 to receive a wire heating element 78. Notch 76 holds the wire heating element 78 in proper position and also increases the wetting effect at the wire

NJOY Exhibit 1002.1887

heating element 78. Fig. 19b illustrates a notch 79 formed in the side of a wick 80 to receive a wire heating element 81 for the same reasons noted for Fig. 19a.

Fig. 20 illustrates yet another embodiment wherein two spaced apart wire heating elements 82 and 83 contact the flat tip end 84 of a wick 85. Multiple wire heating elements might be used if desired to volatize more effectively, to volatize at a higher rate, or as a redundant system.

Fig. 21a illustrates a multi-part delivery system wherein the device includes a two-piece (or more) wick comprised of a permanent wick portion 86 and a refill wick portion 87. The permanent wick portion 86 and a wire heating element 88 would be affixed or attached to the device so as to be non-removable while the refill wick portion 87 would be part of a refill assembly which is removable and replaceable by a user. In the case of refills, a user interacts with the device and thus it may be beneficial to isolate the heater element 88 from user interaction, thereby preventing damage to the heater, maintaining the relationship of heater-to-wick, preventing contact with a hot surface, and allowing use of a less expensive low-temperature refill wick (permanent wick portion 86 would be high-temp).

Fig. 21b illustrates that when using a two-piece, or multiple-piece wick a coupling medium 89 may need to be disposed along the interface and between portions 86 and 87 to enhance fluid transfer between the refill wick portion 87 and the permanent wick portion 86. Examples of coupling medium 89 include felt type materials, cotton, absorbent paper (e.g. filter paper) and woven fabrics. Coupling medium 89 could be affixed to either refill wick portion 87 or permanent wick portion 86.

Fig. 22 illustrates an "all-in-one" refill assembly or unit comprised of a wire heating element 90, a wick 91 and a reservoir 92 of active solution. Reservoir 92 can be formed integrally as part of a laminated plastic film package 93. The outer edges of the lamination 93 may contain holes 94, or any other desired and convenient means, for aligning the all-in-one refill unit in the device.

NJOY Exhibit 1002.1888

Contacts 95 and 96 provide an electrical connection for wire heating element 90 to a battery or other source of power via electronic circuitry (not shown). There are advantages to an all-in-one refill unit where a simple replacement assembly provides a new heater, a new delivery system (wick), and the refill active solution all at once. This method reduces the life expectancy required of the components, and eliminates the need for expensive robust hardware.

To conserve energy, it is desirable to minimize the air velocity in contact with the heater element. This is because the moving air cools the heater element and takes the heat away, and as a result more power must be supplied to the heater element to maintain a desired temp. However, one also would benefit from evacuating the air inside the housing rapidly, to reduce the active concentration surrounding the pinpoint heater because a lower concentration allows easier volatilizing. Therefore, it is desirable to move air inside the housing, but utilize an air regulation means to reduce its velocity across the heater element. Figs. 23-26 illustrate several different methods of accomplishing this goal when used in combination with a fan while Fig. 27 illustrates another arrangement without a fan.

Fig. 23 illustrates the use of a baffle 97 as the air regulation means. Baffle 97 is disposed between a fan 98 and a wire heater element 99 in the path of the air currents 100 created by fan 98 to prevent direct contact of the air currents 100 with the wire heater element 99.

Fig. 24 illustrates the provision of a chamber 101 to receive a wire heater element 102 below (or above) a passageway 103 as the air regulation means. In Fig. 24, passageway 103 includes an air inlet 104 and an air outlet 105 formed adjacent to chamber 101 and through which air currents 106 from a fan 107 move. Passageway 103 communicates via an opening 108 with chamber 101 so that as air currents 106 flow past opening 108 active vaporized by heater element 102 is drawn into passageway 103 to flow downstream and exit the device via air outlet 105.

NJOY Exhibit 1002.1889

Fig. 25 illustrates varying the cross sectional area of a housing containing a wire heater element 109 as the air regulation means. Fig. 25 illustrates a passageway 110 formed downstream of a fan 111 through which air currents 112 move. Passageway 110 has a defined cross sectional area and opens into a larger chamber 113 having a greater cross sectional area than passageway 110 which contains wire heater element 109 therein. As a result, the velocity of the air currents 112 passing through chamber 113 and thus over wire heater element 109 is reduced as compared to the velocity of the air currents in passageway 110.

Fig. 26 illustrates an embodiment wherein the air regulation means comprises a cap 114 covering a wire heater element 115 located in contact with a flat tip end 116 of a wick 117. The cap 114 acts in a manner similar to baffle 97 in Fig. 23 to prevent direct contact of air from a fan (not shown) on wire heater element 115. In this embodiment, cap 114 also includes a plurality of slots 118 formed therein to allow active volatized by wire heater element 115 to escape the interior thereof. Cap 114 may be held on wick 117 by one or more spring clips 119 which provides a snap-fit retainer for cap 114.

Fig. 27 illustrates yet another embodiment wherein a vented housing 120 is used as the air regulation means. In Fig. 27, housing 120 includes a plurality of spaced openings 121 formed therein so that movement of ambient air therethrough will expel volatized active from the interior of housing 120. Alternatively, housing 120 may be attached via a wrist-band 122 to a user so that as a user swings or moves his or her arm, air moves through openings 121 to expel volatized active.

It should be noted that all of the embodiments illustrated and described herein may be attached to and be wearable by a user so that the device is portable and wearable. In addition to wrist band 122 noted above, other attachment means could include various clips, pins, adhesives, hook and loop fasteners, magnets, ties, necklaces, straps, bands and buckles, as is well known in the art.

NJOY Exhibit 1002.1890

It should also be noted that various types of fans can be incorporated into the device to enhance efficacy by distributing the volatized active and moving it away from the wick. For example, in addition to a conventional fan that utilizes a motor driven rotating blade, one could also use a piezo flapper device. The piezo flapper comprises a piezo device that vibrates, causing an attached material to vibrate and move air (low CFM). Alternatively, a conventional fan can be used to provide higher air velocity, as measured using cubic feet per minute (CFM). A piezo flapper uses a piezo ceramic disc or film material attached to a rectangular "flapper". The piezo vibrates at a low frequency (typically 100hz) when excited with the proper voltage. The vibration is mechanically transferred to the flapper creating a fan that moves air. Key benefits of piezo flappers are the low energy required to activate the device, small size and high reliability. Such fans are available under the trade names Piezoelectric Bender, Piezoelectric Flapper, or Piezoelectric Chopper from companies such as Piezo Systems, Physik Instrumente GmbH & Co., and East Electronics. Fig. 3 illustrates an electronic circuit that incorporates a subcircuit including a potentiometer 128 for controlling a piezo fan 129.

EXAMPLES

Fig. 6 is a graph that illustrates the ability of localized and cyclic heating used in heater 1 to meter the release of fragrance. This method of dispensing provides for increased control and flexibility. Current heated systems create an equilibrium release between temperature, surface area, and effluent physical properties. By controlling the amount of heat or more directly the magnitude of temperature reached, the on-time duration, and the frequency of the cycle this heating method can provide a wide range of effluent release, as shown. This experiment was conducted as shown in Table 1 with a 15G NiCr wire resistive heating element.

NJOY Exhibit 1002.1891

TABLE 1

Temp +/- 5 (F)	Weight per Dispensings (μg)	Weight			Dispensings (or minutes)	Dispensing Cycle (min)
		Change (g)	Initial (g)	Final (g)		
110	18.18	0.00020	14.0901	14.0899	11	1
130	20.00	0.00020	14.0894	14.0892	10	1
150	20.00	0.00020	14.0887	14.0885	10	1
170	40.00	0.00040	14.0882	14.0878	10	1
190	81.82	0.00090	14.0173	14.0164	11	1
210	120.00	0.00120	14.0853	14.0841	10	1
230	200.00	0.00200	14.0830	14.0810	10	1
250	510.00	0.00510	14.0751	14.0700	10	1
270	680.00	0.00680	14.0303	14.0235	10	1
290	815.38	0.01060	14.0098	13.9992	13	1
310	800.00	0.00880	13.9033	13.8945	11	1

Current from wall power was passed through the wire for one minute and then turned off. The amperes were controlled such that the maximum temperature achieved was that shown. Increasing the current increased the temperature and subsequently increased the weight loss per cycle. Ten to thirteen cycles were performed to obtain the average weight loss. The inflection in the profile indicates that there are temperatures that volatilize fragrance at a rate faster than fragrance can feed the heat zone during the on-cycle for volatilization. As a result, the weight loss per dispensing begins to fall with greater temperatures until a plateau occurs. During the off-cycle there is time for the emanator to recharge for another heat cycle.

Fig. 7 is an example of the control of an insecticide by a similar experimental protocol as that described for Fig. 6. This experiment was conducted as shown in Table 2 also with a 15G NiCr wire resistive heating element.

NJOY Exhibit 1002.1892

TABLE 2

Temp +/- 5 (F)	Weight per Dispensings (μg)	Weight			Dispensings (or minutes)	Dispensing Cycle (min)
		Change (g)	Initial (g)	Final (g)		
100	3.18	0.0005	8.8945	8.8940	157	1
150	7.58	0.0005	9.0076	9.0071	66	1
200	18.48	0.0017	8.8962	8.8945	92	1
250	46.34	0.0038	9.0010	8.9972	82	1
300	109.84	0.0067	8.9972	8.9905	61	1
350	154.41	0.0105	8.9905	8.9800	68	1
400	195.96	0.0158	8.9800	8.9642	81	1
450	231.37	0.0118	8.9642	8.9524	51	1
500	352.85	0.0434	8.8940	8.8506	123	1
550	90.54	0.0067	8.9379	8.9312	74	1

The insecticides showed a similar rate limiting behavior as that with fragrances with increasing temperature.

Fig. 8 represents a bioefficacy example where the same localized heating and cyclic control device used as in Fig. 7. Figure 8 represents the adjustable performance of localized and cyclic heating against experimental controls and marketed products. Data was gathered by preparing 6.12 m^2 enclosed chamber with ventilation control. The chamber was cleaned with soap and water for any residual insecticide from previous tests and ventilation stopped. 100 female Aedes Aegypti mosquitoes were released in the chamber and observed for the number of mosquitoes that fell unresponsive over the course of time. Figure 8 indicates that no mosquitoes were lost during the control experiment. The performance standard for mosquito kill or knockdown is that of the pre-burned coil. This occurs by burning a standard coil treated with an insecticide solution. Upon burning the insecticide is released and fills the chamber. A sample of 100 mosquitoes is released in this treated chamber and observed for knockdown over time. It is observed that 90% of the insects are killed with about three minutes of exposure and the remainder within the next few minutes. The "45-Night" designation represents a currently marketed product in a common form, which provides

NJOY Exhibit 1002.1893

nighttime protection for 45 nights. In this and all remaining experiments in this example the chambers were prepared to control standards, the mosquitoes released and then the insecticide product released by the various devices or methods. These experiments required the device to treat the room and begin causing insect knockdown. The 45 night product showed a twelve minute lag to first efficacy. The coil from a cold start showed a seven minute lag with steeper effect against the mosquitoes. PPH represents the localized and cyclic heater and shows that it can be operated with adjustable temperature magnitude, on-time duration, and frequency to have very fast two minute onset and steep bioefficacy slope for such reasons as initial space treatment and then can be adjusted for slower onset at seven minutes and shallower slope which may represent a maintenance treatment, adjustment for smaller space, or for personal preference.

Table 3 shows an important additional conclusion from this example is the observation that the insecticide active was not destroyed by the intensive localized heating. It has been shown that the amount of active released is that which is theoretically needed for knockdown. Such theoretical values have been shown experimentally and correspond to the performance of this technology. This indicating that there is limited destruction of the chemical entity through localized cyclic heating.

TABLE 3

Active Delivered:

Wt. Of Formula Used (g)

	Test 1	Test 2
Before	10.3947	10.3938
After	10.3938	10.3917
Total used	0.0009	0.0021
ug Al used	27	63

Theoretical Air Concentration

	Test 1	Test 2
Volume (L)	420	6120
ug Al	27	63
ug/L	0.0643	0.0103

NJOY Exhibit 1002.1894

Test 1:

Test: 0.42 M3 chamber.
Insect: A. aegypti.
Formula: Raid Electric 45 night
3% EBT, 1% BHT, 96% Isopar V
Heater cycle time: 1:03 min.

Dispensing No.	Temp. (C)	Time (Min)	KD (#)	Total No.	KD (%)
1	116	1	0	9	0
2	119	2	0	9	0
3	121	3	0	9	0
4	118	4	1	9	11
5	120	5	1	9	11
6	115	6	1	9	11
7	116	7	3	9	33
8	116	8	7	9	78
9	118	9	8	9	89
10	119	10	8	9	89
11	119	11	8	9	89
12	120	12	9	9	100

Similarly, by the use of fragrance and human panelist trained in fragrance hedonics, it has been qualitatively shown that the quality of a fragrance is also not degraded with localized cyclic heating. The burst of high temperature heating preferentially facilitates volatilization rather than degradation.

Fig. 9 and Table 4 illustrate the favorable particle sizes created by the operation of the localized and cyclic heating of heater 1.

TABLE 4

	10	20	30	40	50
0.3 um Profile	69269.38	26828	17878.5	15459.63	14119
0.5 um Profile	57631.25	18322.38	10794.13	8980.25	7921
0.7 um Profile	47058.5	10181.75	5176.75	4096.875	3425.875
1 um Profile	39238	6952.125	3285.375	2535.125	2073.75
5 um Profile	730.625	21.5	12.375	10.625	9.75
10 um Profile	5	0.25	0.25	0.25	0.25

NJOY Exhibit 1002.1895

The mechanism of molecular volatilization and detection of particles results form the condensation of the vapor within the vicinity of the emanator. The size and energy (retained heat) of these particles is important in their post condensation behavior. Particles that are too large suffer from lack of time aloft and lack of surface area. Large particles of 2 - 3 μm and particularly above 10 μm in diameter or more are affected by gravity and will fall out of suspension in the air near the emanator. Because of the lack of loft the particles are not able to drift to lower concentrated areas where they can revaporize. Contributing to the difficulty to revolatilize is the reduced surface area per volume of the larger particles, which limits the amount of surface available for volatilizations. Just the opposite is available from the localize cyclic heating method of the present invention. These particles have reduced diameter below 1 μm, which are too small to settle out from gravitational forces, are too small to deposit in human respiratory system, and have large surface to volume ratios such that revolatilization is quickly promoted. The particles from the localized cyclic heat source of heater 1 efficiently disperse and remain dispersed in air.

Fig. 10 and Table 5 demonstrate the variable temperatures that are achievable with a single thin film oxide heater with variable current input.

TABLE 5

Amp	0.5 Temp (F)	1 Temp (F)	1.5 Temp (F)	2 Temp (F)
0.3	119.72	103.30	85.66	63.14
0.35	130.19	111.89	92.43	69.01
0.4	126.72	106.92	89.96	67.46
0.45	0.45	0.45	0.45	0.45
0.5	0.50	0.50	0.50	0.50
0.55	120.75	106.80	88.93	65.50
0.6	128.90	111.11	91.01	67.34

This example illustrates one composition with surface temperatures can vary over broad ranges. It also represents that final temperatures are largely achieved

NJOY Exhibit 1002.1896

within the first half second of current application. There is little temperature change between one-half second and two seconds. This example confirms the rapid heating characteristics of the thin film heating element within appropriate ranges for use within the fields described by this application.

NJOY Exhibit 1002.1897

CLAIMS

I claim:

1. A portable apparatus for dispersing a volatile active into air, comprising:

a base;

a reservoir containing a composition having a volatile active;

a holder for mounting said reservoir to said base;

a wick having an emanating surface and communicating with said composition for delivering said composition to said emanating surface;

a heating element in contact with said emanating surface; and

a source of power communicating with said heating element to heat said heating element and vaporize said volatile active.

2. The apparatus of claim 1 wherein said volatile active is selected from the group consisting of an insect repellant, an insecticide, a pesticide, an antiseptic, a fungicide, a plant growth regulator, a herbicide, an air freshener, a perfume, a deodorant, a medicament, and mixtures thereof.

3. The apparatus of claim 1 wherein said volatile active is an insect repellant.

4. The apparatus of claim 3 wherein said insect repellant is selected from the group consisting of pyrethrins, chrysanthemic acid derivatives, pyrethroids, and mixtures thereof.

5. The apparatus of claim 4 wherein said insect repellant is a pyrethroid and is selected from the group consisting of allethrin, d-allethrin, bioallethrin, S-bioallethrin, empenthrin, prallethrin, and transfluthrin, and combinations thereof.

6. The apparatus of claim 3 wherein said insect repellant is 3-allyl-2-methylcyclopenta-2-ene-4-one.

7. The apparatus of claim 3 wherein said insect repellant is N,N-diethyl meta-toluamide.

NJOY Exhibit 1002.1898

8. The apparatus of claim 1 wherein said holder provides a removable mounting for said reservoir.

9. The apparatus of claim 8 wherein said reservoir and wick are integral with each other to provide removable and replaceable refill assembly.

10. The apparatus of claim 9 wherein said refill assembly further includes said heating element.

11. The apparatus of claim 8 wherein said holder provides a snap-fit mounting for said refill assembly.

12. The apparatus of claim 1 wherein said wick is composed of a material selected from the group consisting of natural materials, fibers, nonwovens, sintered polymers, ceramics, metal foams and glass.

13. The apparatus of claim 1 wherein said heating element is an electro-resistive heating element.

14. The apparatus of claim 13 wherein said electro-resistive heating element is selected from the group consisting of a wire, a thin film and a thick film.

15. The apparatus of claim 13 wherein said electro-resistive heating element is a wire composed of nichrome.

16. The apparatus of claim 13 wherein said electro-resistive heating element is a thin film composed of tin oxide.

17. The apparatus of claim 1 wherein said composition is in the form of a liquid, solid, semi-solid or gel at ambient conditions.

18. The apparatus of claim 1 further including a spring providing a force to maintain said heating element in contact with said emanating surface.

19. The apparatus of claim 18 wherein said wick includes a relatively flat tip end defining said emanating surface and said heating element contacts said flat tip end.

20. The apparatus of claim 18 wherein said wick includes opposite ends and at least one side surface between said opposite ends defining said emanating surface and said heating element contacts said side surface.

NJOY Exhibit 1002.1899

21. A portable apparatus for dispersing a volatile active into air, comprising:

a base;

a reservoir containing a composition having a volatile active;

a holder for mounting said reservoir to said base;

a wick having an emanating surface and communicating with said composition for delivering said composition to said emanating surface;

a wire heating element in contact with said emanating surface;

a spring providing a force to maintain said wire heating element in contact with said emanating surface; and

a source of power communicating with said heating element to heat said heating element and vaporize said volatile active.

22. The apparatus of claim 21 wherein said volatile active is selected from the group consisting of an insect repellant, an insecticide, a pesticide, an antiseptic, a fungicide, a plant growth regulator, a herbicide, an air freshener, a perfume, a deodorant, a medicament, and mixtures thereof.

23. The apparatus of claim 21 wherein said volatile active is an insect repellant.

24. The apparatus of claim 23 wherein said insect repellant is selected from the group consisting of pyrethrins, chrysanthemic acid derivatives, pyrethroids, and mixtures thereof.

25. The apparatus of claim 24 wherein said insect repellant is a pyrethroid and is selected from the group consisting of allethrin, d-allethrin, bioallethrin, S-bioallethrin, empenthrin, prallethrin, and transfluthrin, and combinations thereof.

26. The apparatus of claim 23 wherein said insect repellant is 3-allyl-2-methylcyclopenta-2-ene-4-one.

27. The apparatus of claim 23 wherein said insect repellant is N,N-diethyl meta-toluamide.

NJOY Exhibit 1002.1900

28. The apparatus of claim 21 wherein said holder provides a removable mounting for said reservoir.

29. The apparatus of claim 28 wherein said reservoir and wick are integral with each other to provide removable and replaceable refill assembly.

30. The apparatus of claim 29 wherein said refill assembly further includes said heating element.

31. The apparatus of claim 28 wherein said holder provides a snap-fit mounting for said refill assembly.

32. The apparatus of claim 21 wherein said wick is composed of a material selected from the group consisting of natural materials, fibers, nonwovens, sintered polymers, ceramics, metal foams and glass.

33. The apparatus of claim 21 wherein said wire heating element is composed of nichrome.

34. The apparatus of claim 21 wherein said composition is in the form of a liquid, solid, semi-solid or gel at ambient conditions.

35. The apparatus of claim 21 wherein said wick includes a relatively flat tip end defining said emanating surface and said heating element contacts said flat tip end.

36. The apparatus of claim 21 wherein said wick includes opposite ends and at least one side surface between said opposite ends defining said emanating surface and said heating element contacts said side surface.

37. A portable apparatus for dispersing a volatile active into air, comprising:

a base;

a refill assembly comprising a reservoir containing a composition having a volatile active, a wick having an emanating surface and communicating with said composition for delivering said composition to said emanating surface, and a heating element in contact with said emanating surface;

a holder for removably mounting said refill assembly to said base;

NJOY Exhibit 1002.1901

a source of power communicating with said heating element to heat said heating element and vaporize said volatile active;

a spring providing a force to maintain said heating element in contact with said emanating surface;

a cover attachable to said base to enclose said refill assembly, holder and spring, and including at least one air inlet and one air outlet; and

a fan mounted to move a current of air from said inlet past said emanating surface to cause egress of said volatile active from said air outlet.

38. The apparatus of claim 37 wherein said volatile active is selected from the group consisting of an insect repellant, an insecticide, a pesticide, an antiseptic, a fungicide, a plant growth regulator, a herbicide, an air freshener, a perfume, a deodorant, a medicament, and mixtures thereof.

39. The apparatus of claim 37 wherein said volatile active is an insect repellant.

40. The apparatus of claim 39 wherein said insect repellant is selected from the group consisting of pyrethrins, chrysanthemic acid derivatives, pyrethroids, and mixtures thereof.

41. The apparatus of claim 40 wherein said insect repellant is a pyrethroid and is selected from the group consisting of allethrin, d-allethrin, bioallethrin, S-bioallethrin, empenthrin, prallethrin, and transfluthrin, and combinations thereof.

42. The apparatus of claim 39 wherein said insect repellant is 3-allyl-2-methylcyclopenta-2-ene-4-one.

43. The apparatus of claim 39 wherein said insect repellant is N,N-diethyl meta-toluamide.

44. The apparatus of claim 37 wherein said holder provides a removable mounting for said reservoir.

45. The apparatus of claim 44 wherein said holder provides a snap-fit mounting for said refill assembly.

NJOY Exhibit 1002.1902

46. The apparatus of claim 37 wherein said wick is composed of a material selected from the group consisting of natural materials, fibers, nonwovens, sintered polymers, ceramics, metal foams and glass.

47. The apparatus of claim 37 wherein said heating element is an electro-resistive heating element.

48. The apparatus of claim 47 wherein said electro-resistive heating element is selected from the group consisting of a wire, a thin film and a thick film.

49. The apparatus of claim 47 wherein said electro-resistive heating element is a wire composed of nichrome.

50. The apparatus of claim 47 wherein said electro-resistive heating element is a thin film composed of tin oxide.

51. The apparatus of claim 37 further including a battery housing mounted on said base, and wherein said source of power comprises at least one battery receivable in said battery housing for powering said heating element and fan.

52. The apparatus of claim 37 further including air regulation means for minimizing the velocity of said air current across said heater element.

53. The apparatus of claim 52 wherein said air regulation means includes a baffle disposed between said fan and said heater element to prevent direct contact of said air current with said heater element.

54. The apparatus of claim 52 wherein said air regulation means comprises a passageway formed adjacent to said heater element and communicating with said air inlet and said air outlet and through which said air current moves, said passageway communicating with said heater element to draw active vaporized by said heater element into said passageway as said air moves downstream therein.

55. The apparatus of claim 52 wherein said air regulation means comprises a passageway formed downstream of said fan through which said air current moves and having a first cross sectional area, and a chamber downstream of

NJOY Exhibit 1002.1903

said passageway through which said air current moves and having a second cross sectional area, said second cross sectional area being greater than said first cross sectional area to thereby reduce the velocity of said air current through said chamber, and said heater element is disposed in said chamber.

56. The apparatus of claim 37 further including a non-removable permanent wick portion engageable with said wick of said refill assembly.

57. The apparatus of claim 56 further including a fluid coupling medium disposed between said permanent wick portion and said wick of said refill assembly.

58. The apparatus of claim 37 wherein said source of power includes electronic circuitry providing pulsed heating of said heating element.

NJOY Exhibit 1002.1904

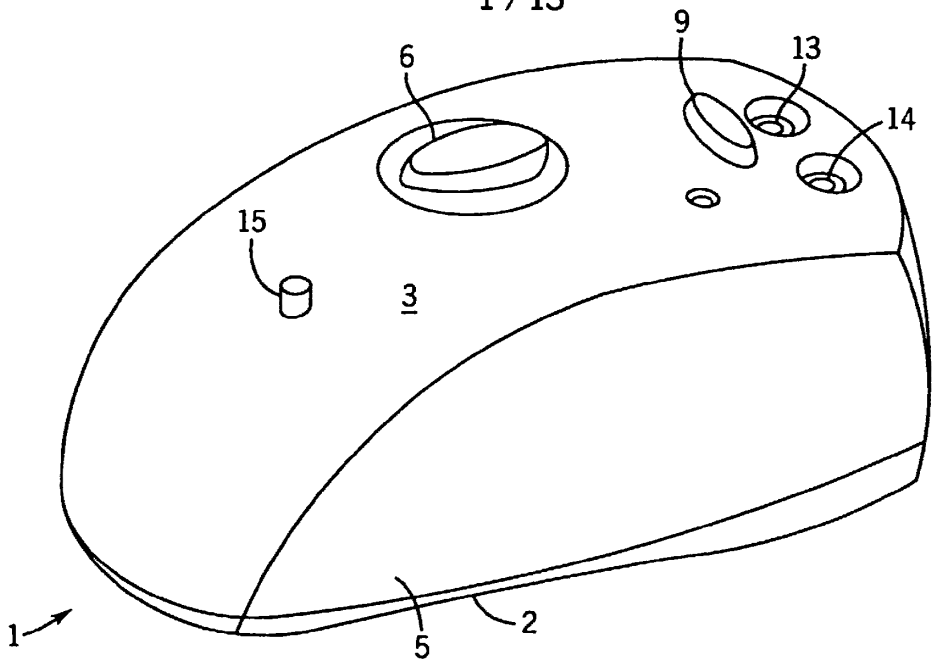


FIG. 1

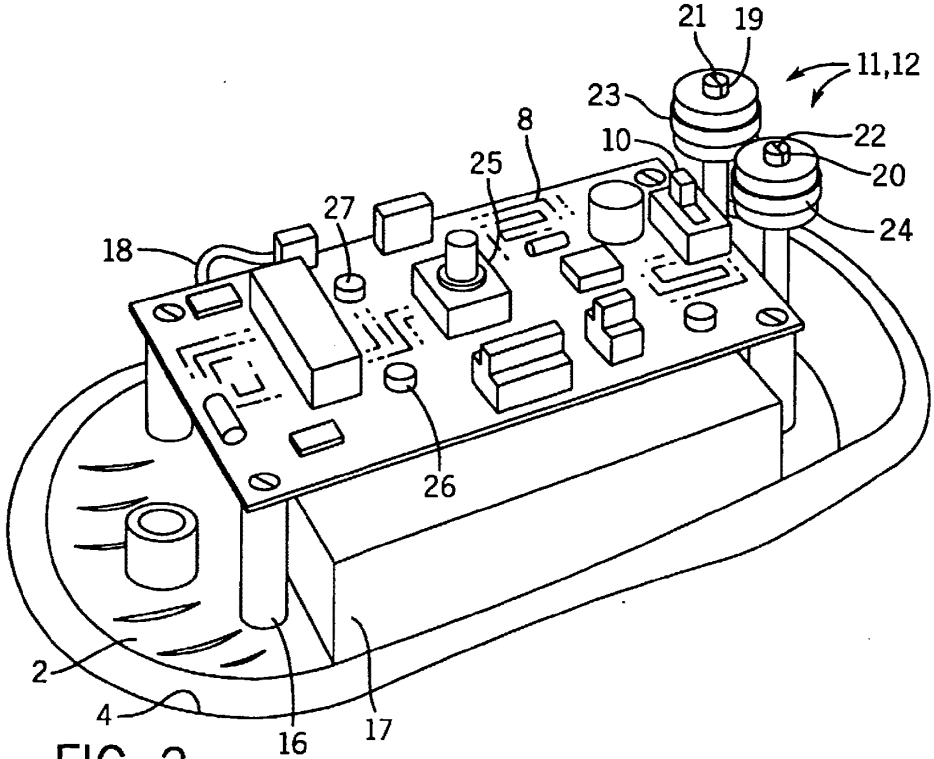


FIG. 2

NJOY Exhibit 1002.1905

FIG. 3

SUBSTITUTE SHEET (RULE 26)

NJOY Exhibit 1002.1906

FIG. 4a

FIG. 4b

FIG. 4c

FIG. 4d

FIG. 4e

FIG. 4f

FIG. 5a

FIG. 5b

FIG. 5c

FIG. 5d

FIG. 5e

SUBSTITUTE SHEET (RULE 26)

NJOY Exhibit 1002.1907

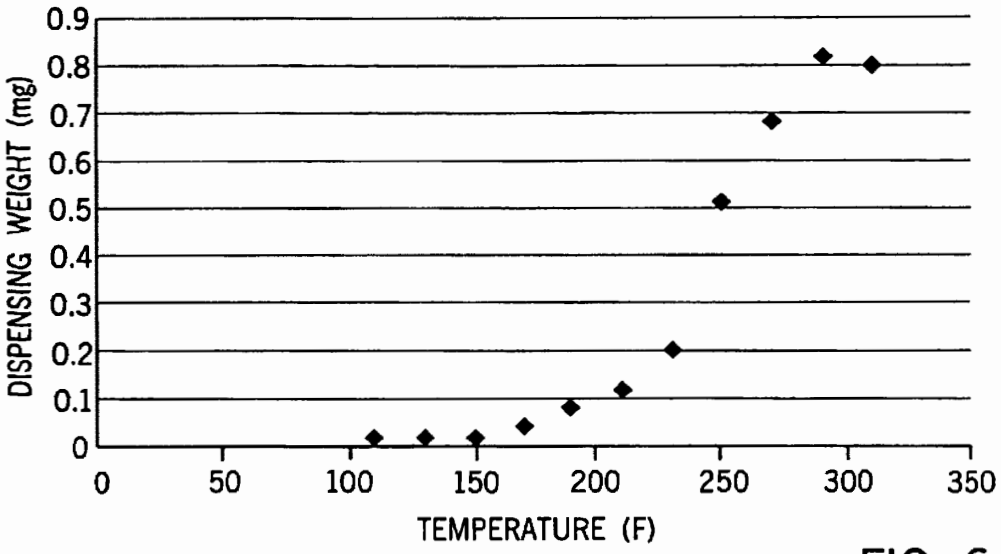


FIG. 6

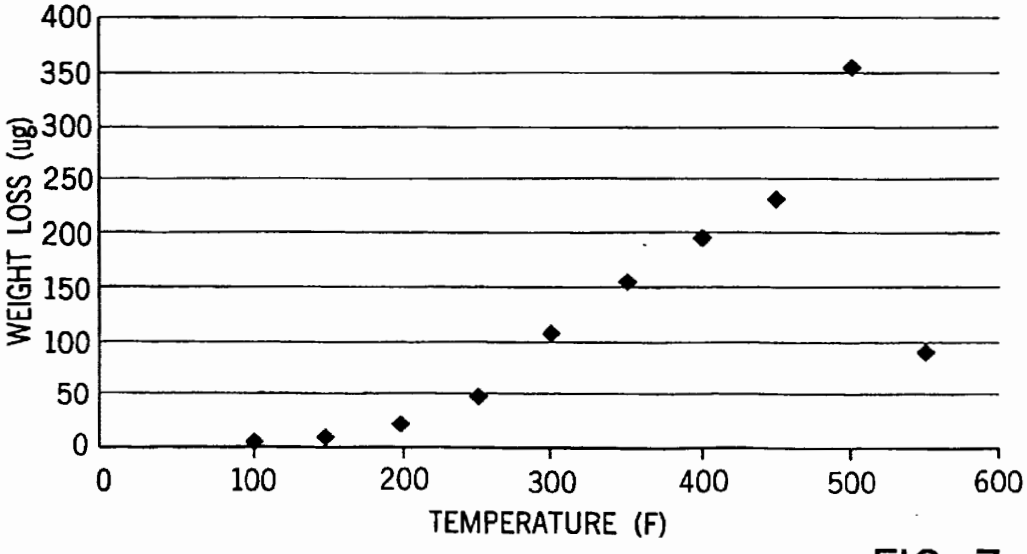


FIG. 7

NJOY Exhibit 1002.1908

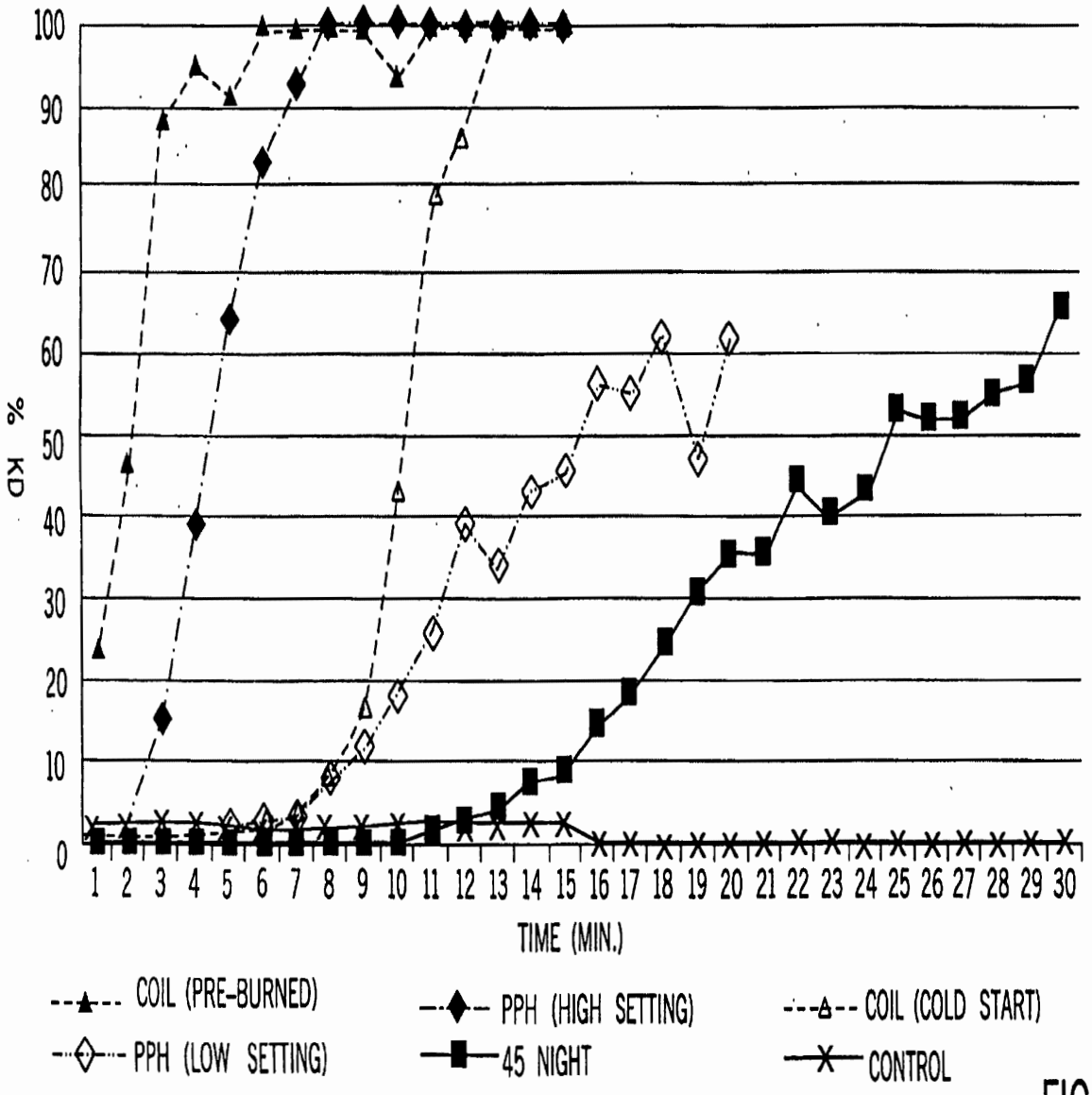


FIG. 8

SUBSTITUTE SHEET (RULE 26)

NJOY Exhibit 1002.1909

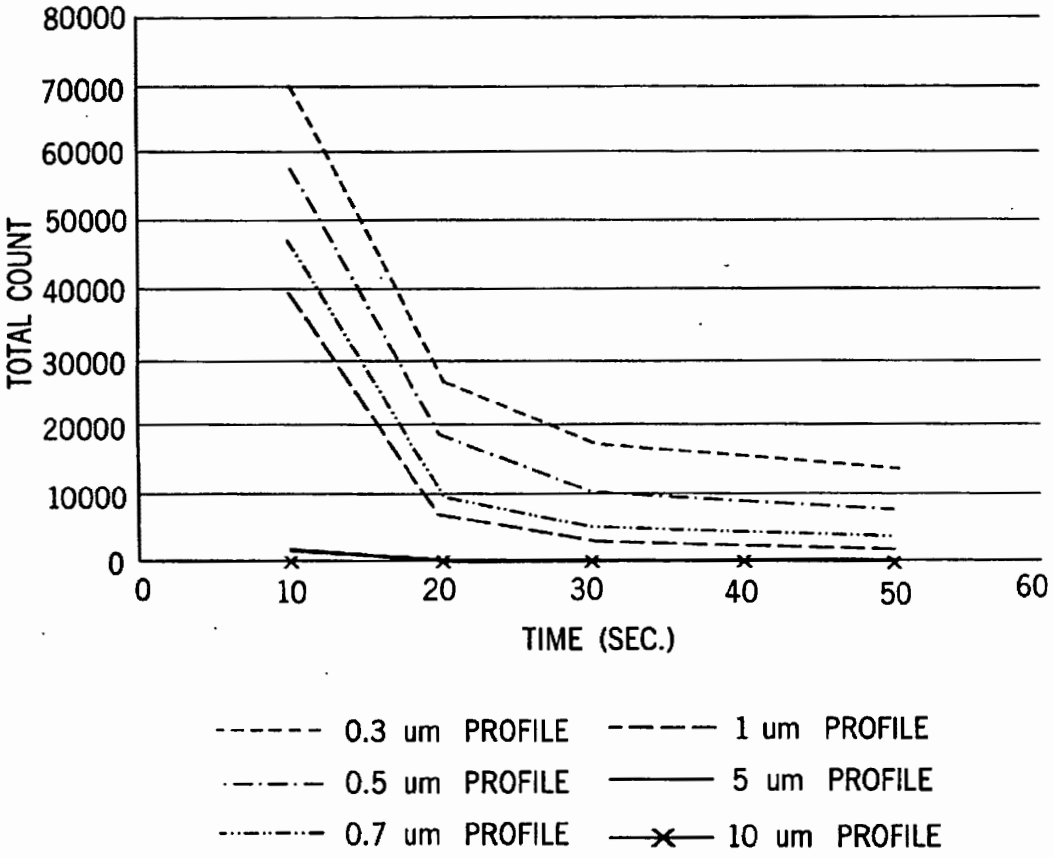


FIG. 9

NJOY Exhibit 1002.1910

FIG. 10

SUBSTITUTE SHEET (RULE 26)

NJOY Exhibit 1002.1911

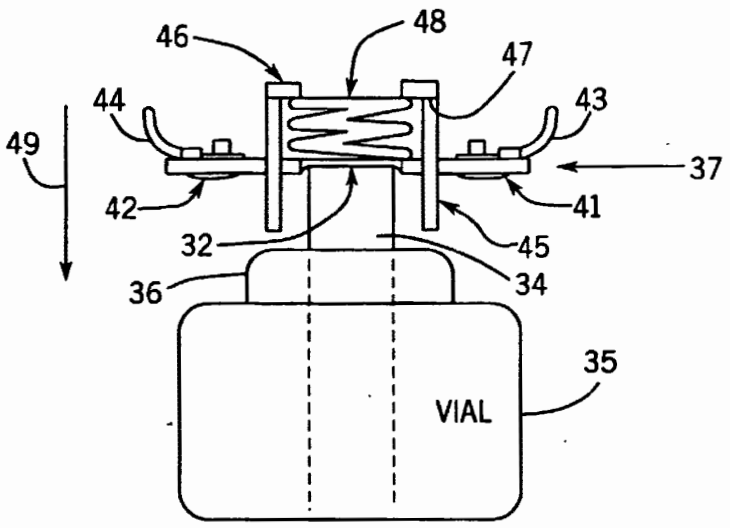


FIG. 11

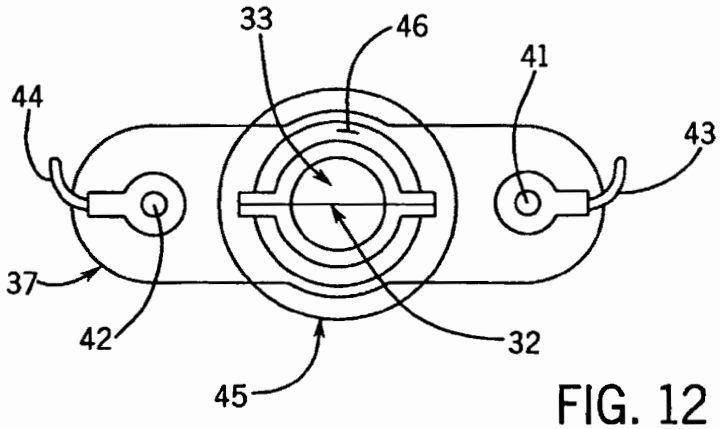


FIG. 12

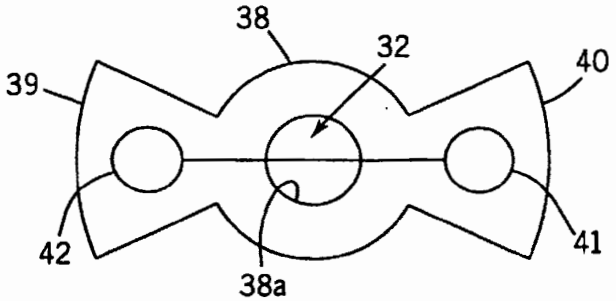


FIG. 13

NJOY Exhibit 1002.1912

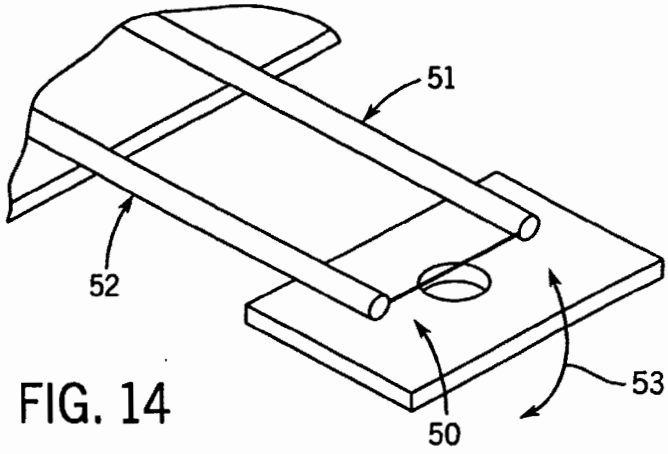


FIG. 14

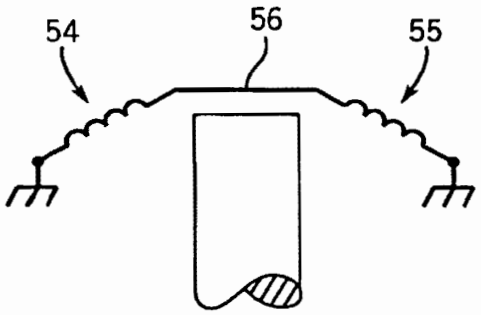


FIG. 15

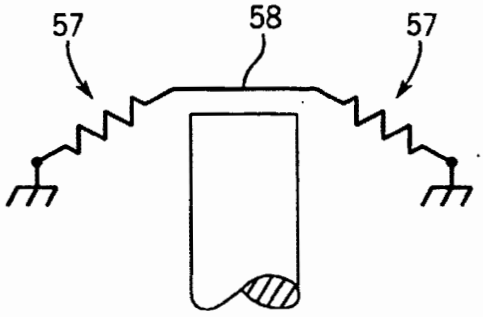


FIG. 16

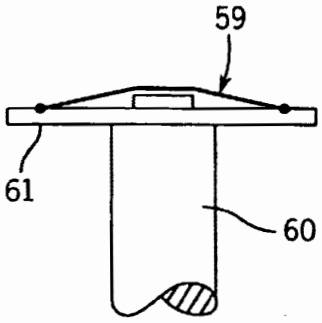


FIG. 17

NJOY Exhibit 1002.1913

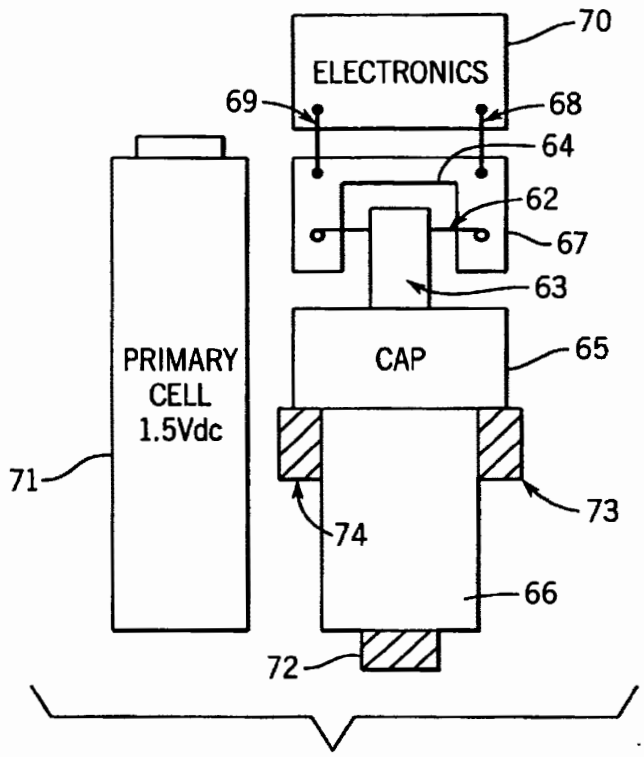


FIG. 18

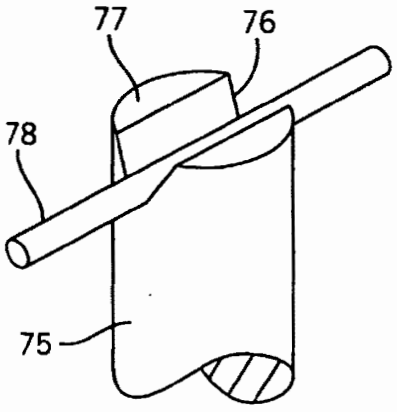


FIG. 19a

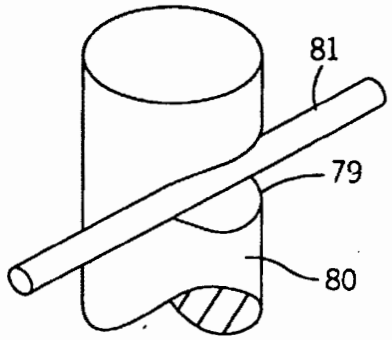


FIG. 19b

NJOY Exhibit 1002.1914

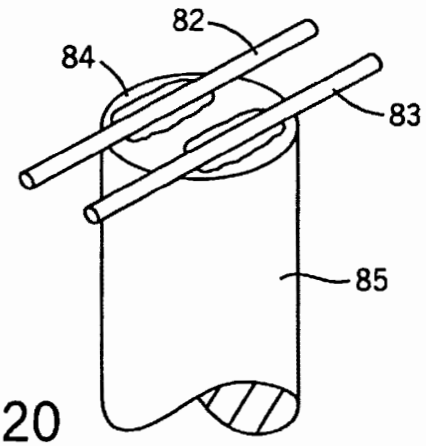


FIG. 20

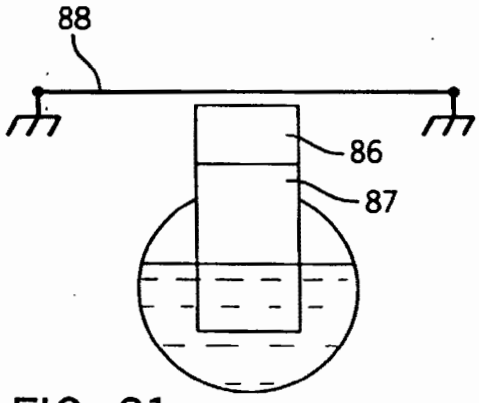


FIG. 21a

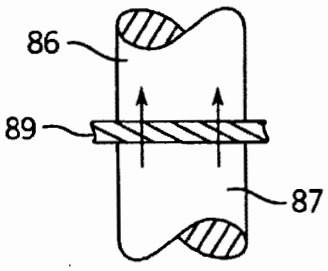


FIG. 21b

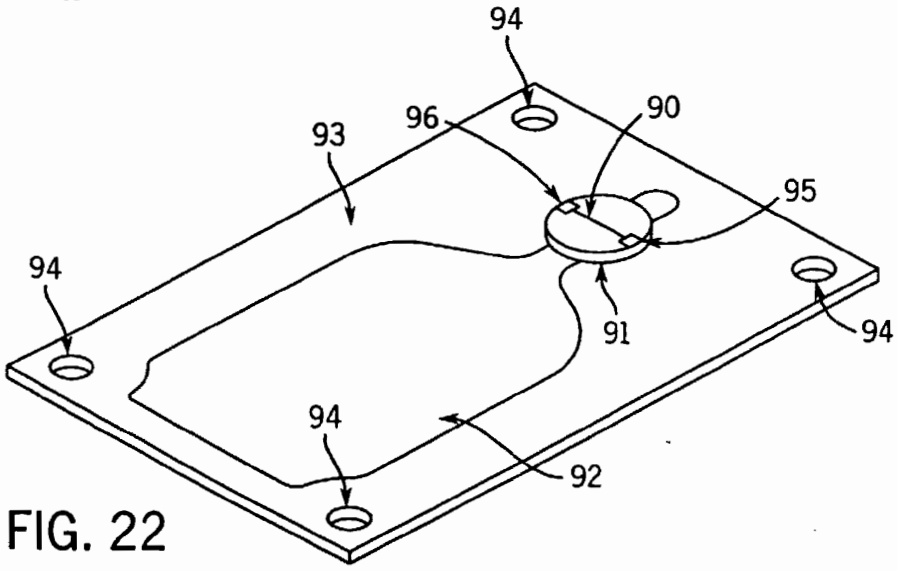


FIG. 22

NJOY Exhibit 1002.1915

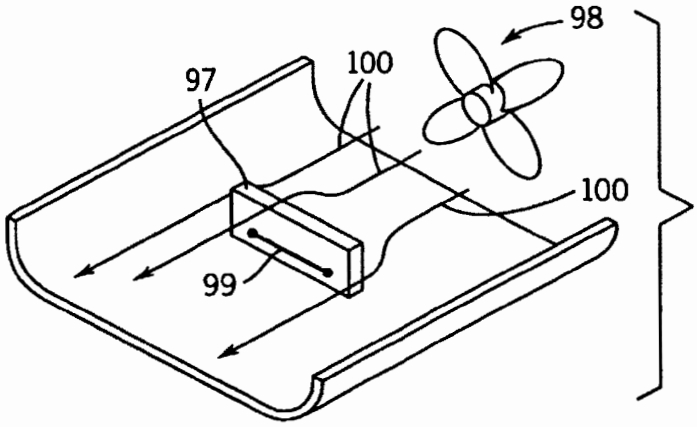


FIG. 23

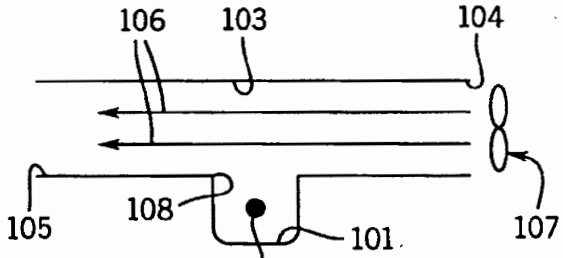


FIG. 24

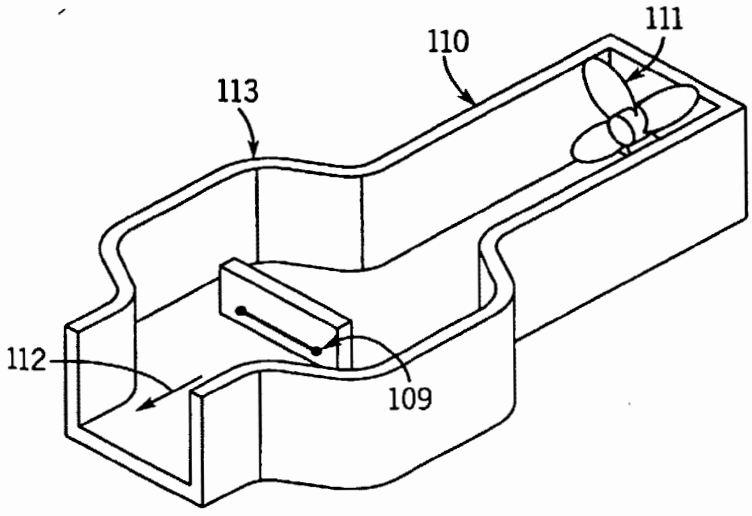


FIG. 25

NJOY Exhibit 1002.1916

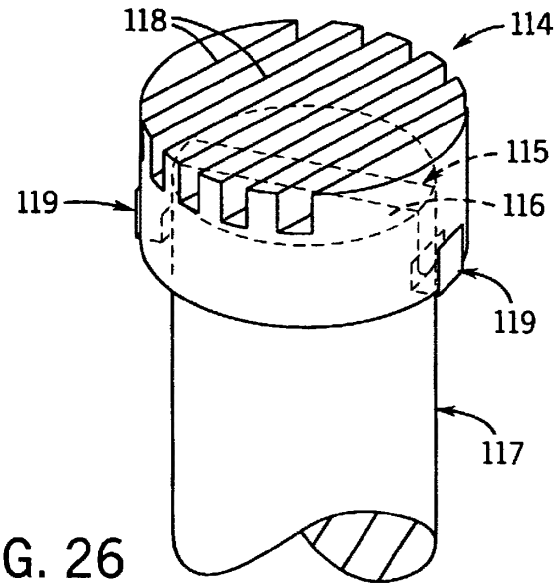


FIG. 26

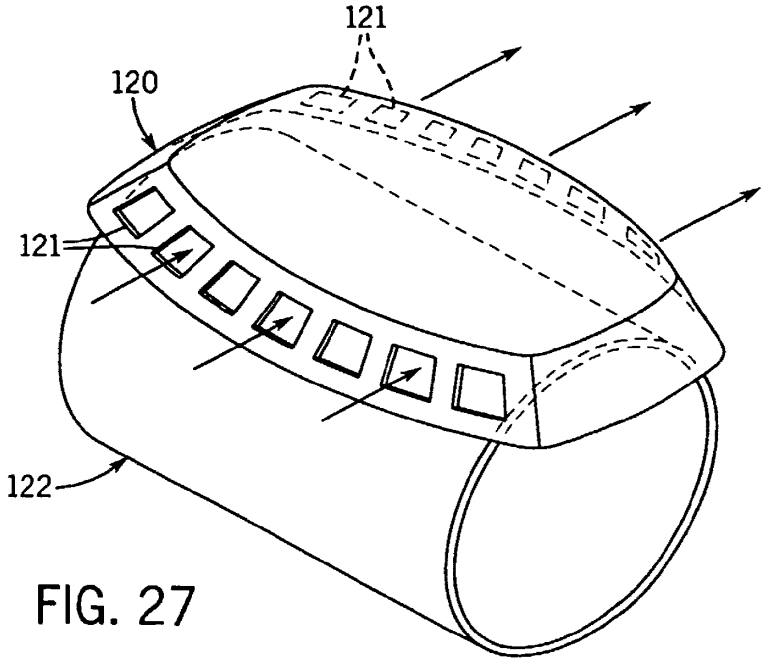


FIG. 27

NJOY Exhibit 1002.1917

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 November 2011 (24.11.2011)

PCT

(10) International Publication Number
WO 2011/146174 A2

(51) International Patent Classification: Not classified

(21) International Application Number:
PCT/US2011/032016

(22) International Filing Date:
12 April 2011 (12.04.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

12/780,877	15 May 2010 (15.05.2010)	US
12/780,876	15 May 2010 (15.05.2010)	US
12/780,875	15 May 2010 (15.05.2010)	US
12/780,874	15 May 2010 (15.05.2010)	US
12/780,873	15 May 2010 (15.05.2010)	US
12/780,872	15 May 2010 (15.05.2010)	US
12/780,871	15 May 2010 (15.05.2010)	US

(72) Inventors; and
(71) Applicants : **TERRY, Nathan, Andrew** [US/US]; 3653 24th St. #4, San Francisco, California 94110 (US). **MINSKOFF, Noah, Mark** [US/US]; 1054 E. 200 South, Salt Lake City, Utah 84102 (US).

(74) Agent: **NEUDECK, Alexander, J.**; c/o CPA Global, P.O. Box 52050, Minneapolis, Minnesota 55402 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

(54) **Title**: VOLUME LIQUID STORAGE RESERVOIR IN A PERSONAL VAPORIZING INHALER

(57) **Abstract**: A personal vapor inhaling unit is disclosed. An electronic flameless vapor inhaler unit that may simulate a cigarette may have a volume liquid storage reservoir. When the unit is activated, and the user provides suction, the liquid to be vaporized may be drawn out of the volume liquid storage reservoir, to be vaporized by an atomizer assembly. Vapors may then be aspirated by the user through an oral aspiration tube, where they may be inhaled.

WO 2011/146174 A2

NJOY Exhibit 1002.1918

VOLUME LIQUID STORAGE RESERVOIR IN A PERSONAL VAPORIZING INHALER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is related to the following applications filed on or about the same day as the present application: PCT Serial No. XX,XXX,XXX, entitled "ELECTRICAL ACTIVATION IN A PERSONAL VAPORIZING INHALER", docket number 1222.0014; and this application is a CIP of the following U.S. applications filed on May 15th, 2010: Serial No. 12/780,871, entitled "PERSONAL VAPORIZING INHALER WITH MOUTHPIECE COVER", docket number 1222.0002; Serial No. 12/780,872, entitled "ACTIVATION TRIGGER FOR A PERSONAL VAPORIZING INHALER", docket number 1222.0003; Serial No. 12/780,873, entitled "PERSONAL VAPORIZING INHALER CARTRIDGE", docket number 1222.0004; Serial No. 12/780,874, entitled "ATOMIZER-VAPORIZER FOR A PERSONAL VAPORIZING INHALER", docket number 1222.0005; Serial No. 12/780,875, entitled "PERSONAL VAPORIZING INHALER WITH INTERNAL LIGHT SOURCE", docket number 1222.0006; Serial No. 12/780,876, entitled "DATA LOGGING PERSONAL VAPORIZING INHALER", docket number 1222.0007; and, Serial No. 12/780,877, entitled "PERSONAL VAPORIZING INHALER ACTIVE CASE", docket number 1222.0008; whose applications are hereby incorporated herein by reference for all purposes.

TECHNICAL FIELD

[0002] This invention relates to personal vapor inhaling units and more particularly to an atomizer/vaporizer of an electronic flameless vapor inhaler unit that may simulate a cigarette or deliver nicotine and other medications to the oral mucosa, pharyngeal mucosa, tracheal, and pulmonary membranes.

BACKGROUND

[0003] An alternative to smoked tobacco products, such as cigarettes, cigars, or pipes is a personal vaporizer. Inhaled doses of heated and atomized flavor provide a physical sensation similar to smoking. However, because a personal vaporizer is typically electrically

NJOY Exhibit 1002.1919

powered, no tobacco, smoke, or combustion is usually involved in its operation. For portability, and to simulate the physical characteristics of a cigarette, cigar, or pipe, a personal vaporizer may be battery powered. In addition, a personal vaporizer may be loaded with a nicotine bearing substance and/or a medication bearing substance. The personal vaporizer may provide an inhaled dose of nicotine and/or medication by way of the heated and atomized substance. Thus, personal vaporizers may also be known as electronic cigarettes, or e-cigarettes. Personal vaporizers may be used to administer flavors, medicines, drugs, or substances that are vaporized and then inhaled.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Figure 1 is a perspective view of a personal vaporizer unit.

[0005] Figure 2 is a side view of a personal vaporizer unit.

[0006] Figure 3 is an end view of the proximal end of a personal vaporizer unit.

[0007] Figure 4 is an end view of the distal end of a personal vaporizer unit.

[0008] Figure 4A is an end view of the distal end of a personal vaporizer unit having an embossed cartridge.

[0009] Figure 5 is a figure map of Figures 6 and 7.

[0010] Figure 6 is a cross-section of the proximal portion of a personal vaporizer unit along the cut line shown in Figure 2.

[0011] Figure 7 is a cross-section of the distal portion of a personal vaporizer unit along the cut line shown in Figure 2.

[0012] Figure 8 is an exploded side view of components of a personal vaporizer unit.

[0013] Figure 9 is an exploded cross-section of components of a personal vaporizer unit along the cut line shown in Figure 2.

[0014] Figure 10 is a perspective view of a mouthpiece cover of a personal vaporizer unit.

[0015] Figure 11 is a distal end view of the mouthpiece cover of Figure 10.

[0016] Figure 12 is a cross-section of the mouthpiece cover along the cut line shown in Figure 11.

[0017] Figure 13 is a perspective view of a mouthpiece of a personal vaporizer unit.

[0018] Figure 14 is a side view of the mouthpiece of Figure 13.

NJOY Exhibit 1002.1920

[0019] Figure 15 is a cross-section of the mouthpiece along the cut line shown in Figure 14.

[0020] Figure 16 is a perspective view of a mouthpiece insulator of a personal vaporizer unit.

[0021] Figure 17 is a distal end view of the mouthpiece insulator of Figure 16.

[0022] Figure 18 is a side view of the mouthpiece insulator of Figure 16.

[0023] Figure 19 is a cross-section of the mouthpiece insulator along the cut line shown in Figure 18.

[0024] Figure 20 is a perspective view of a main housing of a personal vaporizer unit.

[0025] Figure 21 is a distal end view of the main housing of Figure 20.

[0026] Figure 22 is a proximal end view of the main housing of Figure 20.

[0027] Figure 23 is a side view of the main housing of Figure 20.

[0028] Figure 24 is a cross-section of the main housing along the cut line shown in Figure 23.

[0029] Figure 25 is a perspective view of a main housing of a personal vaporizer unit.

[0030] Figure 26 is a second perspective view of the main housing of Figure 25.

[0031] Figure 27 is a distal end view of the main housing of Figure 25.

[0032] Figure 28 is a proximal end view of the main housing of Figure 25.

[0033] Figure 29 is a side view of the main housing of Figure 25.

[0034] Figure 30 is a cross-section of the main housing along the cut line shown in Figure 29.

[0035] Figure 31 is a perspective view of a printed circuit board (PCB or PC-board) assembly of a personal vaporizer unit.

[0036] Figure 32 is a distal end view of the PCB assembly of Figure 31.

[0037] Figure 33 is a perspective exploded view of the PCB assembly of Figure 31.

[0038] Figure 34 is a side exploded view of the PCB assembly of Figure 31.

[0039] Figure 35 is a perspective view of a proximal wick element of a personal vaporizer unit.

[0040] Figure 35A is a perspective view of a heating element disposed through a proximal wick element of a personal vaporizer unit.

[0041] Figure 35B is a perspective view of a heating element of a personal vaporizer unit.

[0042] Figure 36 is a distal end view of the wick element of Figure 35.

NJOY Exhibit 1002.1921

[0043] Figure 37 is a cross-section of the wick element along the cut line shown in Figure 35.

[0044] Figure 38 is a perspective view of a distal wick element of a personal vaporizer unit.

[0045] Figure 39 is a distal end view of the wick element of Figure 38.

[0046] Figure 40 is a cross-section of the wick element along the cut line shown in Figure 39.

[0047] Figure 41 is a perspective view of a distal wick element of a personal vaporizer unit.

[0048] Figure 42 is a distal end view of the wick element of Figure 41.

[0049] Figure 43 is a cross-section of the wick element along the cut line shown in Figure 42.

[0050] Figure 44 is a perspective view of an atomizer housing of a personal vaporizer unit.

[0051] Figure 45 is a distal end view of the atomizer housing of Figure 44.

[0052] Figure 46 is a side view of the atomizer housing of Figure 44.

[0053] Figure 47 is a top view of the atomizer housing of Figure 44.

[0054] Figure 48 is a cross-section of the atomizer housing along the cut line shown in Figure 47.

[0055] Figure 49 is a perspective view of an atomizer housing of a personal vaporizer unit.

[0056] Figure 50 is a distal end view of the atomizer housing of Figure 49.

[0057] Figure 51 is a side view of the atomizer housing of Figure 49.

[0058] Figure 52 is a top view of the atomizer housing of Figure 49.

[0059] Figure 53 is a cross-section of the atomizer housing along the cut line shown in Figure 52.

[0060] Figure 54 is a perspective view of an atomizer housing and wicks of a personal vaporizer unit.

[0061] Figure 55 is an exploded view of the atomizer housing, wire guides, and wicks of Figure 54.

[0062] Figure 56 is a side view of the atomizer housing and wicks of Figure 54.

[0063] Figure 57 is a distal end view of the atomizer housing and wicks of Figure 54.

NJOY Exhibit 1002.1922

[0064] Figure 58 is a cross-section of the atomizer housing and wicks along the cut line shown in Figure 57.

[0065] Figure 59 is a perspective view of the proximal end wick and wire guides of Figures 54-58.

[0066] Figure 59A is a perspective view showing a heating element disposed through the proximal end wick and around the wire guides of Figures 54-58.

[0067] Figure 59B is a perspective view of the heating element of a personal vaporizer unit.

[0068] Figure 60 is a distal end view of the wick element of Figures 54-58.

[0069] Figure 61 is a cross-section of the wick element and wire guides along the cut line shown in Figure 60.

[0070] Figure 62 is a perspective view of a light pipe sleeve of a personal vaporizer unit.

[0071] Figure 63 is an end view of the light pipe sleeve of Figure 62.

[0072] Figure 64 is a cross-section of the light pipe sleeve along the cut line shown in Figure 63.

[0073] Figure 65 is a perspective view of a cartridge of a personal vaporizer unit.

[0074] Figure 66 is a proximal end view of the cartridge of Figure 65.

[0075] Figure 67 is a side view of the cartridge of Figure 65.

[0076] Figure 68 is a top view of the cartridge of Figure 65.

[0077] Figure 69 is a cross-section of the cartridge along the cut line shown in Figure 66.

[0078] Figure 70 is a side view of a battery of a personal vaporizer unit.

[0079] Figure 71 is an end view of the battery of Figure 70.

[0080] Figure 72 is a perspective view of a battery support of a personal vaporizer unit.

[0081] Figure 73 is a perspective view of a personal vaporizer unit case.

[0082] Figure 74 is a perspective view of a personal vaporizer unit case.

[0083] Figure 75 is a block diagram of a computer system.

[0084] Figures 76A-76L show various views of another vaporizer embodiment.

[0085] Figures 77A-77F are various sequential views illustrating vaporizer operation.

[0086] Figure 78 shows an alternative embodiment.

[0087] Figure 79 shows another alternative embodiment.

NJOY Exhibit 1002.1923

[0088] Figure 80 is a flow diagram of a vaporizer operation process according to one embodiment.

DETAILED DESCRIPTION

[0089] In an embodiment a personal vaporizer unit comprises a mouthpiece configured for contact with the mouth of a person. At least part of this mouthpiece has an antimicrobial surface. This mouthpiece may also comprise silicone rubber, thermoplastic elastomer, organosilane, silver impregnated polymer, silver impregnated thermoplastic elastomer, and/or polymer. The mouthpiece may be removed from the personal vaporizing for washing or replacement, without using a tool. The mouthpiece may be provided in different colors. Designs or other patterns may be visible on the outside of the mouthpiece.

[0090] In an embodiment, a personal vaporizer unit comprises a first conductive surface configured to contact a first body part of a person holding the personal vaporizer unit, and a second conductive surface, conductively isolated from the first conductive surface, configured to contact a second body part of the person. When the personal vaporizer unit detects a change in conductivity between the first conductive surface and the second conductive surface, a vaporizer is activated to vaporize a substance so that the vapors may be inhaled by the person holding unit. The first body part and the second body part may be a lip or parts of a hand(s). The two conductive surfaces may also be used to charge a battery contained in the personal vaporizer unit. The two conductive surfaces may also form, or be part of, a connector that may be used to output data stored in a memory.

[0091] In an embodiment, a personal vaporizer unit comprises a chamber configured to receive a cartridge. The cartridge may hold a substance to be vaporized. The chamber may be configured at the distal end of the personal vaporizer unit. A user may inhale the vaporized substance at the proximal end of the personal vaporizer unit. At least one space between the exterior surface of the cartridge, and an interior surface of the chamber, may define a passage for air to be drawn from outside the personal vaporizer unit, near the distal end, through the personal vaporizer unit to be inhaled by the user along with the vaporized substance. The personal vaporizer unit may also include a puncturing element that breaks a seal on the cartridge to allow a substance in the cartridge to be vaporized. An end surface of the cartridge may be translucent to diffuse light produced internally to the personal vaporizer

NJOY Exhibit 1002.1924

unit. The translucent end may be etched or embossed with letters, symbols, or other indicia that are illuminated by the light produced internally to the personal vaporizer unit.

[0092] In an embodiment, a personal vaporizer unit comprises a first wick element and a second wick element having a porous ceramic. The first wick element is adapted to directly contact a liquid held in a reservoir. The reservoir may be contained by a cartridge that is removable from the personal vaporizer unit. A heating element is disposed through the second wick element. An air gap is defined between the first wick element and the second wick element with the heating element exposed to the air gap. Air enters the first wick element through a hole in a housing holding the first wick element.

[0093] In an embodiment, a personal vaporizer unit comprises a light source internal to an opaque cylindrical housing that approximates the appearance of a smoking article. A cylindrical light tube is disposed inside the opaque cylindrical housing to conduct light emitted by the light source to an end of the opaque cylindrical housing. This allows the light to be visible outside of the opaque cylindrical housing of the vaporizer.

[0094] In an embodiment, a personal vaporizer unit comprises a microprocessor, memory, and a connector. The connector outputs data stored in the memory. The microprocessor may gather, and store in the memory, information including, but not limited to, the number of cycles the device has been triggered, the duration of the cycles, the number cartridges of fluid that are delivered. The microprocessor may also gather and store times and dates associated with the other information gathered and stored. The microprocessor may detect an empty cartridge by detecting a specific change in resistance between a wick and a housing that is equivalent to a "dry wick", and thus signifies an empty cartridge.

[0095] In an embodiment, a case comprises a cradle adapted to hold a personal vaporizer unit. The personal vaporizer unit has dimensions approximating a smoking article. The case includes a battery and at least two contacts. The two contacts may form an electrical contact with the personal vaporizer unit when the personal vaporizer unit is in the cradle. The two contacts may conduct charge from the battery to the personal vaporizer unit to charge the personal vaporizer unit. The case may also download and store data retrieved from the personnel vaporizing unit. The case may download and store this data via the at least two contacts. The case may send this data to a computer via wired or wireless links. The case may have more than one cradle and sets of contacts (*e.g.,* two sets of two contacts in order to hold and charge two personal vaporizer units).

NJOY Exhibit 1002.1925

[0096] Figure 1 is a perspective view of a personal vaporizer unit. In Figure 1, personal vaporizer unit 100 comprises outer main shell 102, mouthpiece cover 114, mouthpiece 116, and mouthpiece insulator 112. The mouthpiece 116 and mouthpiece cover 114 define the proximal end of personal vaporizer unit 100. The opposite end of personal vaporizer unit 100 will be referred to as the distal end. A cartridge 150 may be inserted into the distal end of personal vaporizer unit 100. Cartridge 150 may hold the substance to be vaporized by personal vaporizer unit 100. The substance after vaporizing may be inhaled by a user holding the personal vaporizer unit 100. The substance may be in the form of a liquid or gel.

[0097] Figure 2 is a side view of a personal vaporizer unit. Figure 2 illustrates personal vaporizer unit 100 as viewed from the side. Figure 2 illustrates personal vaporizer unit 100 comprising outer main shell 102, mouthpiece cover 114, mouthpiece 116, and mouthpiece insulator 112. Figure 2 also illustrates cartridge 150 inserted into the distal end of personal vaporizer unit 100.

[0098] Figure 3 is an end view of the proximal end of a personal vaporizer unit. Figure 3 shows the proximal end view of personal vaporizer unit 100 comprising mouthpiece cover 114. Figure 4 is an end view of the distal end of a personal vaporizer unit. Figure 4 shows the distal end view personal vaporizer unit 100 comprising the visible portion of cartridge 150. Figure 4A is an alternative end view of personal vaporizer unit 100 comprising a visible portion of cartridge 150 that has visible logos, letters, or other symbols. These visible logos, letters, or other symbols may be illuminated or backlit by a light source internal to the personal vaporizer unit 100. The light source may be activated intermittently under the control of a microprocessor or other electronics internal to personal vaporizer unit 100. The light source may be activated in such a manner as to simulate the glowing ash of a cigar or cigarette.

[0099] Figure 5 is a figure map of Figures 6 and 7. Figure 6 is a cross-section of the proximal portion of a personal vaporizer unit along the cut line shown in Figure 2. In Figure 6, the proximal portion of personal vaporizer unit 100 comprises mouthpiece cover 114, mouthpiece 116, mouthpiece insulator 112, outer main shell 102, battery support 106, and battery 104. The mouthpiece cover 114 surrounds and is engaged with the distal end of mouthpiece 116. Mouthpiece 116 and outer main shell 102 are preferably made of an electrically conductive material(s). Mouthpiece 116 is separated from outer main shell 102

NJOY Exhibit 1002.1926

by mouthpiece insulator 112. Mouthpiece 116 and outer main shell 102 are thus electrically isolated from each other by mouthpiece insulator 112.

[00100] In an embodiment, personal vaporizer unit 100 is configured such that other main shell 102 comprises a first conductive surface configured to contact a first body part of a person holding personal vaporizer unit 100. Mouthpiece 116 comprises a second conductive surface, which is conductively isolated from the first conductive surface. This second conductive surface is configured to contact a second body part of the person. When personal vaporizer unit 100 detects a change in conductivity between the first conductive surface and the second conductive surface, a vaporizer internal to personal vaporizer unit 100 is activated to vaporize a substance in cartridge 150 so that the vapors may be inhaled by the person holding personal vaporizer unit 100. The first body part and the second body part may be a lip or parts of a hand(s). The two conductive surfaces of outer main shell 102 and mouthpiece 116, respectively, may also be used to charge battery 104 contained in the personal vaporizer unit 100. The two conductive surfaces of outer main shell 102 and mouthpiece 116, respectively, may also be used to output (or input) data stored (or to be stored) in a memory (not shown).

[00101] Battery support 106 functions to hold battery 104 in a position which is fixed relative to our main shell 102. Battery support 106 is also configured to allow air and vaporized substance to pass from the distal end of personal vaporizer unit 100 past battery 104 along one or more passageways. After air and the vapors of the vaporized substance pass by battery 104, they may pass through openings in mouthpiece 116, mouthpiece cover 114, and mouthpiece insulator 112, to be inhaled by a user.

[00102] Figure 7 is a cross-section of the distal portion of a personal vaporizer unit along the cut line shown in Figure 2. In Figure 7, the distal end portion of personal vaporizer unit 100 comprises outer main shell 102, light pipe sleeve 140, and atomizer housing 132, distal wick 134, proximal wick 136, PC board 123, PC board 124, spacer 128, and main housing 160. Figure 7 also illustrates cartridge 150 inserted into the distal end of personal vaporizer unit 100. As can be seen in Figure 7, cartridge 150 may hold a substance (e.g., a liquid or gel) in direct contact with distal wick 134. The substance may be drawn through distal wick 134 to be vaporized inside atomizer assembly. The atomizer assembly comprises atomizer housing 132, distal wick 134, proximal wick 136, and a heating element (not shown).

NJOY Exhibit 1002.1927

[00103] Figure 8 is an exploded side view of components of a personal vaporizer unit. Figure 9 is an exploded cross-section of components of a personal vaporizer unit along the cut line shown in Figure 2.

[00104] In Figures 8 and 9, personal vaporizer unit 100 comprises (from left to right) mouthpiece cover 114, mouthpiece 116, mouthpiece insulator 112, battery 104, battery support 106, PC board 123, spacer 128, PC board 124, main housing 160, proximal wick 136, distal wick 134, atomizer housing 132, light pipe sleeve 140, and cartridge 150. Mouthpiece cover 114 surrounds and covers the proximal end of mouthpiece 116. The distal end of mouthpiece 116 is inserted into mouthpiece insulator 112. Battery 104 is held in place by battery support 106. PC board 123, spacer 128 and PC board 124 are disposed within main housing 160. Proximal wick 136 and distal wick 134 are disposed within atomizer housing 132.

[00105] Atomizer housing 132 (and therefore proximal wick 136, distal wick 134) are disposed inside light pipe sleeve 140 and main shell 102. (Note: for clarity, main shell 102 is not shown in Figures 8 and 9.) Light pipe sleeve 140 is disposed within main shell 102. Light pipe sleeve 140 is positioned such that light emitted from a light source mounted on PC board 124 may be conducted via light pipe sleeve 140 to a location where it is visible on the outside of personal vaporizer unit 100.

[00106] Cartridge 150 is disposed within light pipe sleeve 140. When assembled, a substance contained within cartridge 150 is held in direct contact with distal wick 134. When cartridge 150 is inserted into personal vaporizer unit 100 atomizer housing 132 or distal wick 134 may puncture a seal or cap that contains the substance to be vaporized within cartridge 150. Once punctured, the substance held within a reservoir of cartridge 150 may come in direct contact with distal wick 134.

[00107] Figure 10 is a perspective view of a mouthpiece cover of a personal vaporizer unit. Figure 11 is a distal end view of the mouthpiece cover of Figure 10. Figure 12 is a cross-section of the mouthpiece cover along the cut line shown in Figure 11. As can be seen in Figures 10-12, mouthpiece cover 114 has an opening 114-1 that allows air and the vaporized substance to be drawn through mouthpiece cover 114. Mouthpiece cover 114 is configured for contact with the mouth of a person. In an embodiment, at least part of the mouthpiece cover has an antimicrobial surface. This antimicrobial surface of mouthpiece cover 114 may comprise, but is not limited to: silicone rubber, thermoplastic elastomer, organosilane, silver impregnated polymer, silver impregnated thermoplastic elastomer, and/or

NJOY Exhibit 1002.1928

polymer. Mouthpiece cover 114 is also configured to be removable from personal vaporizer unit 100 by a user without the use of tools. This allows mouthpiece cover 114 to be replaced and/or washed. In an embodiment, mouthpiece cover 114 may be held in place on personal vaporizer unit 100 by annular ridge 114-2 which interfaces with a groove on mouthpiece 116 of personal vaporizer unit 100 to secure mouthpiece cover 114 in place. In another embodiment, mouthpiece cover 114 may be held in place on personal vaporizer unit 100 by a friction fit.

[00108] Figure 13 is a perspective view of a mouthpiece of a personal vaporizer unit. Figure 14 is a side view of the mouthpiece of Figure 13. Figure 15 is a cross-section of the mouthpiece along the cut line shown in Figure 14. As can be seen in Figures 13-15, mouthpiece 116 has a passageway 116-1 that allows air and the vaporized substance to be drawn through mouthpiece 116. Mouthpiece 116 may comprise a conductive surface or material configured to contact a first body part of a person holding personal vaporizer unit 100. This first body part may be part of a hand, or at least one lip of the person holding personal vaporizer unit 100. In an embodiment, mouthpiece 116 has an annular groove 116-2 around an outside surface. This groove is configured to receive annular ridge 114-2. Thus, annular groove 116-2 helps secure mouthpiece cover 114 to personal vaporizer unit 100.

[00109] Figure 16 is a perspective view of a mouthpiece insulator of a personal vaporizer unit. Figure 17 is a distal end view of the mouthpiece insulator of Figure 16. Figure 18 is a side view of the mouthpiece insulator of Figure 16. Figure 19 is a cross-section of the mouthpiece insulator along the cut line shown in Figure 18. As discussed previously, mouthpiece insulator 112 is disposed between main shell 102 and mouthpiece 116. As can be seen in Figures 16-18, mouthpiece insulator 112 has a passageway 112-1 that allows air and the vaporized substance to be drawn through mouthpiece insulator 112. Because mouthpiece insulator 112 is disposed between main shell 102 and mouthpiece 116, mouthpiece insulator 112 can electrically isolate main shell 102 and mouthpiece 116. Thus, in an embodiment, mouthpiece insulator 112 comprises, or is made of, a non-electrically conductive material. This electrical isolation between main shell 102 and mouthpiece 116 allow electrical impedance changes between main shell 102 and mouthpiece 116 to be detected.

[00110] For example, a first conductive surface on mouthpiece 116 may be configured to contact a first body part of a person holding personal vaporizer unit 100. A second conductive surface on main shell 102 (which is conductively isolated from said first

NJOY Exhibit 1002.1929

conductive surface by mouthpiece insulator 112) may be configured to contact a second body part of the person. Personal vaporizer unit 100 may then activate in response to detecting a change in conductivity between the first conductive surface and the second conductive surface. In an embodiment, this change in conductivity may comprise a drop in impedance between the first conductive surface and the second conductive surface. In an embodiment, the change in conductivity may comprise a change in capacitance between the first conductive surface and the second conductive surface. The first body part may be a finger. The second body part may be a lip. The second body part may be a second finger. In an embodiment, the first conductive surface and the second conductive surfaces may be used to pass a charging current to battery 104. The first and second conductive surfaces may also be used to transfer data to or from personal vaporizer unit 100.

[00111] Figure 20 is a perspective view of a main housing of a personal vaporizer unit. Figure 21 is a distal end view of the main housing of Figure 20. Figure 22 is a proximal end view of the main housing of Figure 20. Figure 23 is a side view of the main housing of Figure 20. Figure 24 is a cross-section of the main housing along the cut line shown in Figure 23. Main housing 160 is configured to hold PC-boards 123 and 124, and spacer 128. Main housing 160 is configured to fit within main shell 102 via a friction fit. Main housing 160 has several holes 166 that allow light generated by a light source(s) on PC-board 124 to pass. Once this light passes through holes 166, it may be coupled into light pipe sleeve 140 where it is conducted to a visible location on the outside of personal vaporizer unit 100.

[00112] Main housing 160 also has a hole 165 that allows an electrical conductor (not shown) to run from PC-board 123 or PC-board 124 through main housing 160. This electrical conductor may be, or connect to, a heating element (not shown). This heating element may help vaporize the substance to be inhaled by the user of personal vaporizer unit 100. This heating element may be controlled by circuitry on PC-board 123 or PC-board 124. This heating element may be activated in response to a change in conductivity between the first conductive surface and the second conductive surface, described previously.

[00113] The exterior of main housing 160 may also have a flat surface 164 (or other geometry) forming a galley that is configured to allow the vaporized substance and air to pass between the main housing 160 and the main shell 102. Once the vaporized substance and air pass by main housing 160, they may travel through passageway 112-1, passageway 116-1, and opening 114-1 to be inhaled by a user of personal vaporizer unit 100. The exterior of main housing 160 may also have one or more standoffs 167 (or other geometries) that are

NJOY Exhibit 1002.1930

configured to allow air and the vaporized substance to reach the passageway formed by flat surface 164 and main shell 102.

[00114] Figure 25 is a perspective view of a main housing of a personal vaporizer unit. Figure 26 is a second perspective view of the main housing of Figure 25. Figure 27 is a distal end view of the main housing of Figure 25. Figure 28 is a proximal end view of the main housing of Figure 25. Figure 29 is a side view of the main housing of Figure 25. Figure 30 is a cross-section of the main housing along the cut line shown in Figure 29. Main housing 260 may be used as an alternative embodiment to main housing 160.

[00115] Main housing 260 is configured to hold PC-boards 123 and 124, and spacer 128. Main housing 260 is configured to fit within main shell 102 via a friction fit. Main housing 260 has several holes 266 that allow light generated by a light source(s) on PC-board 124 to pass. Once this light passes through holes 266, it may be coupled into light pipe sleeve 140 where it is conducted to a visible location on the outside of personal vaporizer unit 100.

[00116] Main housing 260 also has a hole 265 that allows an electrical conductor (not shown) to run from PC-board 123 or PC-board 124 through main housing 260. This electrical conductor may be, or connect to, a heating element (not shown). This heating element may help vaporize the substance to be inhaled by the user of personal vaporizer unit 100. This heating element may be controlled by circuitry on PC-board 123 or PC-board 124. This heating element may be activated in response to a change in conductivity between the first conductive surface and the second conductive surface, described previously.

[00117] The exterior of main housing 260 may also have flat surfaces 264 (or other geometry) that form a galley that is configured to allow the vaporized substance and air to pass between the main housing 260 and the main shell 102. Once the vaporized substance and air pass by main housing 260, they may travel through passageway 112-1, passageway 116-1, and opening 114-1 to be inhaled by a user of personal vaporizer unit 100. The exterior of main housing 260 may also have one or more standoffs 267 (or other geometries) that are configured to allow air and the vaporized substance to reach the passageway formed by flat surfaces 264 and main shell 102.

[00118] Figure 31 is a perspective view of a printed circuit board assembly of a personal vaporizer unit. Figure 32 is a distal end view of the PCB assembly of Figure 31. Figure 33 is a perspective exploded view of the PCB assembly of Figure 31. Figure 34 is a side exploded view of the PCB assembly of Figure 31. As can be seen in Figures 31-34, the

NJOY Exhibit 1002.1931

PCB assembly is comprised of PC-board 123 and PC-board 124 separated by a spacer 128. PC-board 124 may have mounted upon it light emitting diodes (LEDs) 125-127 or other light sources. LEDs 125-127 are configured and positioned such that when they produce light, that light passes through holes 166 or 266 in main housings 160 and 260, respectively. This light may then be conducted by light pipe sleeve 140 to a location where it will be visible exterior to personal vaporizer unit 100.

[00119] PC-board 123 may have mounted on it a microprocessor, memory, or other circuitry (not shown) to activate or otherwise control personal vaporizer unit 100. This microprocessor may store data about the operation of personal vaporizer unit 100 in the memory. For example, the microprocessor may determine and store the number of cycles personal vaporizer unit 100 has been triggered. The microprocessor may also store a time and/or date associated with one or more of these cycles. The microprocessor may cause this data to be output via a connector. The connector may be comprised of the first and second conductive surfaces of mouthpiece 116 and/or main shell 102.

[00120] In an embodiment, the microprocessor may determine a duration associated with various cycles where personal vaporizer unit 100 has been triggered. These durations (or a number based on these duration, such as an average) may be stored in the memory. The microprocessor may cause these numbers to be output via the connector. The microprocessor may determine an empty cartridge condition and stores a number associated with a number of times said empty cartridge condition occurs. The microprocessor, or other circuitry, may determine an empty cartridge condition determined based on a resistance between atomizer housing 132 or 232 and a wick 134, 234, 136, or 236. The microprocessor may also store a time and/or date associated with one or more of these empty cartridge conditions. The number of times an empty cartridge condition is detected, and or times and/or dates associated with these empty cartridge conditions may be output via the connector.

[00121] Battery 104, PC-board 123, PC-board 124, and all electronics internal to personal vaporizer unit 100 may be sealed in a plastic or plastic and epoxy compartment within the device. This compartment may include main housing 160 or 260. All penetrations in this compartment may be sealed. Thus, only wires will protrude from the compartment. The compartment may be filled with epoxy after the assembly of battery 104, PC-board 123, PC-board 124, and LEDs 125-127. The compartment may be ultrasonically welded closed after assembly of battery 104, PC-board 123, PC-board 124, and LEDs 125-127. This sealed

NJOY Exhibit 1002.1932

compartment is configured such that all vapor within personal vaporizer unit 100 does not come in contact with the electronics on PC-boards 123 or 124.

[00122] Figure 35 is a perspective view of a proximal wick element of a personal vaporizer unit. Figure 35A is a perspective view of a heating element disposed through a proximal wick element of a personal vaporizer unit. Figure 35B is a perspective view of a heating element of a personal vaporizer unit. Figure 36 is a distal end view of the wick element of Figure 35. Figure 37 is a cross-section of the wick element along the cut line shown in Figure 35. Proximal wick 136 is configured to fit within atomizer housing 132. As can be seen in Figures 35-37, proximal wick 136 includes internal wire passageway 136-1 and external wire passageway 136-2. These wire passageways allows a conductor or a heating element 139 to be positioned through proximal wick 136 (via internal wire passageway 136-1). This conductor or heating element 139 may also be positioned in external wire passageway 136-2. Thus, as shown in Figure 35A, a conductor or heating element 139 may be wrapped around a portion of proximal wick 136 by running the conductor or heating element 139 through internal wire passageway 136-1, around the distal end of proximal wick 136, and through external wire passageway 136-2 to return to approximately its point of origin. The heating element 139 may, when personal vaporizer 100 is activated, heat proximal wick 136 in order to facilitate vaporization of a substance.

[00123] Figure 38 is a perspective view of a distal wick element of a personal vaporizer unit. Figure 39 is a distal end view of the wick element of Figure 38. Figure 40 is a cross-section of the wick element along the cut line shown in Figure 39. Distal wick 134 is configured to fit within atomizer housing 132. As can be seen in Figures 38-40, distal wick 134 comprises two cylinders of different diameters. A chamfered surface transitions from the smaller diameter of the distal end of distal wick 134 to a larger diameter at the proximal end of distal wick 134. The cylinder at the distal end terminates with a flat surface end 134-1. This flat surface end 134-1 is the end of distal wick 134 is a surface that is placed in direct contact with a substance to be vaporized when cartridge 150 is inserted into the distal end of personal vaporizer 100. The proximal end of distal wick 134 is typically in contact with proximal wick 136. However, at least a part of proximal wick 136 and distal wick 134 are separated by an air gap. When distal wick 134 and proximal wick 136 are used together, this air gap is formed between distal wick 134 and proximal wick 136 by stand offs 136-3 as shown in Figure 37.

NJOY Exhibit 1002.1933

[00124] Figure 41 is a perspective view of a distal wick element of a personal vaporizer unit. Figure 42 is a distal end view of the wick element of Figure 41. Figure 43 is a cross-section of the wick element along the cut line shown in Figure 42. Proximal wick 234 may be used as an alternative embodiment to distal wick 134. Proximal wick 234 is configured to fit within atomizer housing 232. As can be seen in Figures 41-43, proximal wick 234 comprises two cylinders of different diameters, and a cone or pointed end 234-1. A chamfered surface transitions from the smaller diameter of the distal end of proximal wick 234 to a larger diameter at the proximal end of proximal wick 234. The cylinder at the distal end terminates with a pointed end 234-1. This pointed end 234-1 is the end of proximal wick 234 that is in direct contact with a substance to be vaporized. This pointed end 234-1 may also break a seal on cartridge 150 to allow the substance to be vaporized to come in direct contact with proximal wick 234. The proximal end of proximal wick 234 is typically in contact with proximal wick 136. However, at least a part of proximal wick 136 and proximal wick 234 are separated by an air gap. When distal wick 134 and proximal wick 236 are used together, this air gap is formed between proximal wick 234 and proximal wick 136 by stand offs 136-3 as shown in Figure 37.

[00125] Figure 44 is a perspective view of an atomizer housing of a personal vaporizer unit. Figure 45 is a distal end view of the atomizer housing of Figure 44. Figure 46 is a side view of the atomizer housing of Figure 44. Figure 47 is a top view of the atomizer housing of Figure 44. Figure 48 is a cross-section of the atomizer housing along the cut line shown in Figure 47. Atomizer housing 132 is configured to fit within main shell 102. As can be seen in Figures 44-48, atomizer housing 132 comprises roughly two cylinders of different diameters. A chamfered surface 132-3 transitions from the smaller diameter of the distal end of atomizer housing 132 to a larger diameter at the proximal end of atomizer housing 132. The larger diameter at the proximal end of atomizer housing 132 is configured to be press fit into light pipe sleeve 140. The cylinder at the distal end terminates with a spade shaped tip 132-2. This spade shaped tip 132-2 may break a seal on cartridge 150 to allow the substance to be vaporized to come in direct contact with distal wick 134. Other shaped tips are possible (e.g., needle or spear shaped).

[00126] Chamfered surface 132-3 has one or more holes 132-1. These holes allow air to pass, via suction, through atomizer housing 132 into distal wick 134. This suction may be supplied by the user of personal vaporizer 100 sucking or inhaling on mouthpiece cover 114 and/or mouthpiece 116. The air that is sucked into distal wick 134 enters distal wick 134 on

NJOY Exhibit 1002.1934

or near the chamfered surface between the two cylinders of distal wick 134. The air that is sucked into distal wick 134 displaces some of the substance being vaporized that has been absorbed by distal wick 134 causing it to be atomized as it exits distal wick 134 into the air gap formed between distal wick 134 and proximal wick 136. The heating element disposed around proximal wick 136 may then vaporize at least some of the atomized substance. In an embodiment, one or more holes 132-1 may range in diameter between 0.02 and 0.0625 inches.

[00127] In an embodiment, placing holes 132-1 at the leading edge of the chamfered surface places a set volume of the substance to be vaporized in the path of incoming air. This incoming air has nowhere to go but through the large diameter (or "head") end of the distal end wick 134. When the air enters this area in distal end wick 134 it displaces the substance to be vaporized that is suspended in distal end wick 134 towards an air cavity between distal end wick 134 and proximal end wick 136. When the displaced substance to be vaporized reaches the surface of distal end wick 134, it is forced out of the wick by the incoming air and the negative pressure of the cavity. This produces an atomized cloud of the substance to be vaporized. In an embodiment, the diameter of the head of distal end wick 134 may be varied and be smaller than the diameter of the proximal end wick 136. This allows for a tuned volume of air to bypass proximal end wick 136 and directly enter the cavity between distal wick 134 and distal wick 136 without first passing through distal wick 136.

[00128] Figure 49 is a perspective view of an atomizer housing of a personal vaporizer unit. Figure 50 is a distal end view of the atomizer housing of Figure 49. Figure 51 is a side view of the atomizer housing of Figure 49. Figure 52 is a top view of the atomizer housing of Figure 49. Figure 53 is a cross-section of the atomizer housing along the cut line shown in Figure 52. Atomizer housing 232 is an alternative embodiment, for use with proximal wick 234, to atomizer house 132. Atomizer housing 232 is configured to fit within main shell 102 and light pipe sleeve 140. As can be seen in Figures 49-53, atomizer housing 232 comprises roughly two cylinders of different diameters. A chamfered surface 232-3 transitions from the smaller diameter of the distal end of atomizer housing 232 to a larger diameter at the proximal end of atomizer housing 232. The larger diameter at the proximal end of atomizer housing 232 is configured to be press fit into light pipe sleeve 140. The cylinder at the distal end terminates with an open cylinder tip 232-2. This open cylinder tip 232-2 allows the pointed end 234-1 of proximal wick 234 to break a seal on cartridge 150 to allow the substance to be vaporized to come in direct contact with proximal wick 234.

NJOY Exhibit 1002.1935

[00129] Chamfered surface 232-3 has one or more holes 232-1. These holes allow air to pass, via suction, through atomizer housing 232 into proximal wick 234. The air that is sucked into proximal wick 234 enters proximal wick 234 on or near the chamfered surface between the two cylinders of proximal wick 234. The air that is sucked into proximal wick 234 displaces some of the substance being vaporized that has been absorbed by proximal wick 234 causing it to be atomized as it exits proximal wick 234 into the air gap formed between proximal wick 234 and proximal wick 136. The heating element disposed around proximal wick 136 may then vaporize at least some of the atomized substance being vaporized. In an embodiment, one or more holes 232-1 may range in diameter between 0.02 and 0.0625 inches.

[00130] In an embodiment, placing holes 232-1 at the leading edge of the chamfered surface places a set volume of the substance to be vaporized in the path of incoming air. This incoming air has nowhere to go but through the head of the distal end wick 234. When the air enters this area in distal end wick 234 it displaces the substance to be vaporized that is suspended in distal end wick 234 towards an air cavity between distal end wick 234 and proximal end wick 236. When the displaced substance to be vaporized reaches the surface of distal end wick 232, it is forced out of the wick by the incoming air and the negative pressure of the cavity. This produces an atomized cloud of the substance to be vaporized. In an embodiment, the diameter of the head of distal end wick 234 may be varied and be smaller than the diameter of the proximal end wick 236. This allows for a tuned volume of air to bypass distal wick 236 and directly enter the cavity between proximal wick 234 and distal wick 236 without first passing through distal wick 236.

[00131] Figure 54 is a perspective view of an atomizer housing and wicks of a personal vaporizer unit. Figure 55 is an exploded view of the atomizer housing, wire guides, and wicks of Figure 54. Figure 56 is a side view of the atomizer housing and wicks of Figure 54. Figure 57 is a distal end view of the atomizer housing and wicks of Figure 54. Figure 58 is a cross-section of the atomizer housing and wicks along the cut line shown in Figure 57. The atomizer housing and wicks shown in Figures 54-58 is an alternative embodiment for use with proximal wick 236. The embodiment shown in Figures 54-58 use atomizer housing 232, proximal wick 234, proximal wick 236, wire guide 237, and wire guide 238. Proximal wick 236 is configured to fit within atomizer housing 232. As can be seen in Figures 54-58, proximal wick 236 includes internal wire passageway 236-1. This wire passageway 236-1 allows a conductor or a heating element (not shown) to be positioned through proximal wick

NJOY Exhibit 1002.1936

236 (via internal wire passageway 236-1). The conductor or heating element may be positioned around wire guide 237 and wire guide 238. Thus, a conductor or heating element may run the through wire passageway 236-1, around wire guides 237 and 238, and then back through wire passageway 236-1 to return to approximately its point of origin. The heating element may, when personal vaporizer unit 100 is activated, heat proximal wick 236 in order to facilitate vaporization of a substance.

[00132] Figure 59 is a perspective view of the proximal end wick assembly of Figures 54-58. Figure 59A is a perspective view showing a heating element disposed through the proximal end wick and around the wire guides of Figures 54-58. Figure 59B is a perspective view of the heating element of a personal vaporizer unit. Figure 60 is a distal end view of the wick element and wire guides of Figures 54-58. Figure 61 is a cross-section of the wick element and wire guides along the cut line shown in Figure 60. As can be seen in Figure 59A, a conductor or heating element 239 may run through wire passageway 236-1, around wire guides 237 and 238, and then back through wire passageway 236-1 to return to approximately its point of origin.

[00133] In an embodiment, distal wicks 134, 234, and proximal wicks 136, 236, may be made of, or comprise, for example a porous ceramic. Distal wicks 134, 234, and proximal wicks 136, 236, may be made of, or comprise aluminum oxide, silicon carbide, magnesia partial stabilized zirconia, yttria tetragonal zirconia polycrystal, porous metal (e.g., steel, aluminum, platinum, titanium, and the like), ceramic coated porous metal, woven metal, spun metal, metal wool (e.g., steel wool), porous polymer, porous coated polymer, porous silica (i.e., glass), and/or porous Pyrex. Distal wicks 134, 234, and proximal wicks 136, 236, may be made of or comprise other materials that can absorb a substance to be vaporized.

[00134] The conductor or heating element that is disposed through proximal wick 136 or 236 may be made of, or comprise, for example: nickel chromium, iron chromium aluminum, stainless steel, gold, platinum, tungsten molybdenum, or a piezoelectric material. The conductor or heating element that is disposed through proximal wick 136 can be made of, or comprise, other materials that become heated when an electrical current is passed through them.

[00135] Figure 62 is a perspective view of a light pipe sleeve of a personal vaporizer unit. Figure 63 is an end view of the light pipe sleeve of Figure 62. Figure 64 is a cross-section of the light pipe sleeve along the cut line shown in Figure 63. Light pipe sleeve 140 is configured to be disposed within main shell 102. Light pipe sleeve 140 is also configured

NJOY Exhibit 1002.1937

to hold cartridge 150 and atomizer housing 132 or 232. As discussed previously, light pipe sleeve 140 is configured to conduct light entering the proximal end of light pipe sleeve 140 (e.g., from LEDs 125-127) to the distal end of light pipe sleeve 140. Typically, the light exiting the distal end of light pipe sleeve 140 will be visible from the exterior of personal vaporizer 100. The light exiting the distal end of light pipe sleeve 140 may be diffused by cartridge 150. The light exiting the distal end of light pipe sleeve 140 may illuminate characters and/or symbols drawn, printed, written, or embossed, etc., in an end of cartridge 150. In an embodiment, light exiting light pipe sleeve 140 may illuminate a logo, characters and/or symbols cut through outer main shell 102. In an embodiment, light pipe sleeve 140 is made of, or comprises, a translucent acrylic plastic.

[00136] Figure 65 is a perspective view of a cartridge of a personal vaporizer unit. Figure 66 is a proximal end view of the cartridge of Figure 65. Figure 67 is a side view of the cartridge of Figure 65. Figure 68 is a top view of the cartridge of Figure 65. Figure 69 is a cross-section of the cartridge along the cut line shown in Figure 66. As shown in Figures 65-69, cartridge 150 comprises a hollow cylinder section with at least one exterior flat surface 158. The flat surface 158 forms, when cartridge 150 is inserted into the distal end of personal vaporizer unit 100, an open space between the exterior surface of the cartridge and an interior surface of light pipe sleeve 140. This space defines a passage for air to be drawn from outside personal vaporizer unit 100, through personal vaporizer unit 100 to be inhaled by the user along with the vaporized substance. This space also helps define the volume of air drawn into personal vaporizer unit 100. By defining the volume of air typically drawn into the unit, different mixtures of vaporized substance to air may be produced.

[00137] The hollow portion of cartridge 150 is configured as a reservoir to hold the substance to be vaporized by personal vaporizer unit 100. The hollow portion of cartridge 150 holds the substance to be vaporized in direct contact with distal wick 134 or 234. This allows distal wick 134 or 234 to become saturated with the substance to be vaporized. The area of distal wick 134 or 234 that is in direct contact with the substance to be vaporized may be varied in order to deliver different doses of the substance to be vaporized. For example, cartridges 150 with differing diameter hollow portions may be used to deliver different doses of the substance to be vaporized to the user.

[00138] Cartridge 150 may be configured to confine the substance to be vaporized by a cap or seal (not shown) on the proximal end. This cap or seal may be punctured by the end of atomizer housing 132, or the pointed end 234-1 of proximal wick 234.

NJOY Exhibit 1002.1938

[00139] When inserted into personal vaporizer unit 100, cartridge standoffs 157 define an air passage between the end of light pipe sleeve 140 and main shell 102. This air passage allows air to reach the air passage defined by flat surface 158.

[00140] The hollow portion of cartridge 150 also includes one or more channels 154. The end of these channels are exposed to air received via the air passage(s) defined by flat surface 158. These channels allow air to enter the hollow portion of cartridge 150 as the substance contained in cartridge 150 is drawn into a distal wick 134 or 234. Allowing air to enter the hollow portion of cartridge 150 as the substance contained in cartridge 150 is removed prevents a vacuum from forming inside cartridge 150. This vacuum could prevent the substance contained in cartridge 150 from being absorbed into distal wick 134 or 234.

[00141] In an embodiment, cartridge 150 may be at least partly translucent. Thus cartridge 150 may act as a light diffuser so that light emitted by one or more of LEDs 125-127 is visible external to personal vaporizer unit 100.

[00142] Figure 70 is a side view of a battery of a personal vaporizer unit. Figure 71 is an end view of the battery of Figure 70. Figure 72 is a perspective view of a battery support of a personal vaporizer unit. As can be seen in Figure 72, battery support 106 does not form a complete cylinder that completely surrounds battery 104. This missing portion of a cylinder forms a passageway that allows air and the vaporized substance to pass by the battery from the atomizer assembly to the mouthpiece 116 so that it may be inhaled by the user.

[00143] Figure 73 is a top perspective view of a personal vaporizer unit case. Figure 74 is a bottom perspective view of a personal vaporizer unit case. Personal vaporizer case 500 is configured to hold one or more personal vaporizer units 100. Personal vaporizer case 500 includes a connector 510 to interface to a computer. This connector allows case 500 to transfer data from personal vaporizer unit 100 to a computer via connecter 510. Case 500 may also transfer data from personal vaporizer unit 100 via a wireless interface. This wireless interface may comprise an infrared (IR) transmitter, a Bluetooth interface, an 802.11 specified interface, and/or communicate with a cellular telephone network. Data from a personal vaporizer unit 100 may be associated with an identification number stored by personal vaporizer unit 100. Data from personal vaporizer unit 100 may be transmitted via the wireless interface in association with the identification number.

NJOY Exhibit 1002.1939

[00144] Personal vaporizer case 500 includes a battery that may hold charge that is used to recharge a personal vaporizer unit 100. Recharging of personal vaporizer unit 100 may be managed by a charge controller that is part of case 500.

[00145] When case 500 is holding a personal vaporizer unit 100, at least a portion of the personal vaporizer unit 100 is visible from the outside of case 500 to allow a light emitted by personal vaporizer unit 100 to provide a visual indication of a state of personal vaporizer unit 500. This visual indication is visible outside of case 500.

[00146] Personal vaporizer unit 100 is activated by a change in impedance between two conductive surfaces. In an embodiment, these two conductive surfaces are part of main shell 102 and mouthpiece 116. These two conductive surfaces may also be used by case 500 to charge battery 104. These two conductive surfaces may also be used by case 500 to read data out of personal vaporizer unit 100.

[00147] In an embodiment, when a user puts personal vaporizer unit 100 in his/her mouth and provides "suction," air is drawn into personal vaporizer unit 100 though a gap between the end of main shell 102 and cartridge 150. In an embodiment, this gap is established by standoffs 157. Air travels down galley(s) formed by flat surface(s) 158 and the inner surface of light pipe sleeve 140. The air then reaches a "ring" shaped galley between atomizer housing 132, cartridge 150, and light pipe sleeve 140. Air travels to distal wick 134 via one or more holes 132-1, in chamfered surface(s) 132-3. Air travels to distal wick 234 via one or more holes 232-1, in chamfered surface(s) 232-3. Air is also allowed to enter cartridge 150 via one or more channels 154. This air entering cartridge 150 via channels 154 "back fills" for the substance being vaporized which enters distal wick 134. The substance being vaporized is held in direct contact with distal wick 134 or 234 by cartridge 150. The substance being vaporized is absorbed by and may saturate distal wick 134 or 234 and proximal wick 136 or 236.

[00148] The incoming air drawn through holes 132-1 displaces from saturated distal wick 134 the substance being vaporized. The displaced substance being vaporized is pulled from wick elements 134 into a cavity between distal wick 134 and 136. This cavity may also contain a heating element that has been heated to between 150-200°C. The displaced substance being vaporized is pulled from wick elements 134 in small (e.g., atomized) droplets. These atomized droplets are vaporized by the heating element.

[00149] In an embodiment, when a user puts personal vaporizer unit 100 in his/her mouth and provides "suction," air is drawn into personal vaporizer unit 100 though a gap

NJOY Exhibit 1002.1940

between the end of main shell 102 and cartridge 150. In an embodiment, this gap is established by standoffs 157. Air travels down galley(s) formed by flat surface(s) 158 and the inner surface of light pipe sleeve 140. The air then reaches a "ring" shaped galley between atomizer housing 232, cartridge 150, and light pipe sleeve 140. Air travels to proximal wick 234 via one or more holes 232-1, in chamfered surface(s) 232-1. Air is also allowed to enter cartridge 150 via one or more channels 154. This air entering cartridge 150 via channels 154 "back fills" for the substance being vaporized which enters proximal wick 234. The substance being vaporized is held in direct contact with proximal wick 234 by cartridge 150. The substance being vaporized is absorbed by and may saturate distal wick 243 and proximal wick 236.

[00150] The incoming air drawn through holes 232-1 displaces from saturated proximal wick 234 the substance being vaporized. The displaced substance being vaporized is pulled from wick elements 234 into a cavity between wick distal wick 234 and proximal wick 236. This cavity may also contain a heating element that has been heated to between 150-200˚C. The displaced substance being vaporized is pulled from distal wick 234 in small (e.g., atomized) droplets. These atomized droplets are vaporized by the heating element.

[00151] In both of the previous two embodiments, the vaporized substance and air are drawn down a galley adjacent to battery 104, through mouthpiece insulator 112, mouthpiece 116, and mouthpiece cover 114. After exiting personal vaporizer unit 100, the vapors may be inhaled by a user.

[00152] The systems, controller, and functions described above may be implemented with or executed by one or more computer systems. The methods described above may be stored on a computer readable medium. Personal vaporizer unit 100 and case 500 may be, comprise, or include computers systems. Figure 75 illustrates a block diagram of a computer system. Computer system 600 includes communication interface 620, processing system 630, storage system 640, and user interface 660. Processing system 630 is operatively coupled to storage system 640. Storage system 640 stores software 650 and data 670. Processing system 630 is operatively coupled to communication interface 620 and user interface 660. Computer system 600 may comprise a programmed general-purpose computer. Computer system 600 may include a microprocessor. Computer system 600 may comprise programmable or special purpose circuitry. Computer system 600 may be distributed among multiple devices, processors, storage, and/or interfaces that together comprise elements 620-670.

NJOY Exhibit 1002.1941

[00153] Communication interface 620 may comprise a network interface, modem, port, bus, link, transceiver, or other communication device. Communication interface 620 may be distributed among multiple communication devices. Processing system 630 may comprise a microprocessor, microcontroller, logic circuit, or other processing device. Processing system 630 may be distributed among multiple processing devices. User interface 660 may comprise a keyboard, mouse, voice recognition interface, microphone and speakers, graphical display, touch screen, or other type of user interface device. User interface 660 may be distributed among multiple interface devices. Storage system 640 may comprise a disk, tape, integrated circuit, RAM, ROM, network storage, server, or other memory function. Storage system 640 may be a computer readable medium. Storage system 640 may be distributed among multiple memory devices.

[00154] Processing system 630 retrieves and executes software 650 from storage system 640. Processing system may retrieve and store data 670. Processing system may also retrieve and store data via communication interface 620. Processing system 650 may create or modify software 650 or data 670 to achieve a tangible result. Processing system may control communication interface 620 or user interface 670 to achieve a tangible result. Processing system may retrieve and execute remotely stored software via communication interface 620.

[00155] Software 650 and remotely stored software may comprise an operating system, utilities, drivers, networking software, and other software typically executed by a computer system. Software 650 may comprise an application program, applet, firmware, or other form of machine-readable processing instructions typically executed by a computer system. When executed by processing system 630, software 650 or remotely stored software may direct computer system 600 to operate as described herein.

[00156] Figures 76A-76L show various views of another vaporizer 76000 embodiment. In particular, Figure 76A shows a perspective view of vaporizer 76000, while Figure 76B shows a side view of vaporizer 76000. Vaporizer 76000 may have a housing 76002 comprising an oral aspiration tube 76004 for transporting vapor to a user's mouth. As the user's mouth aspirates at the oral aspiration tube 76004, taking in vapor, air may be taken into the vaporizer 76000 through air intake ports 76006.

[00157] A battery carrier sleeve 76008 may be slidably coupled with the housing 76002 for guiding alternative movement of the battery carrier sleeve 76008 between an extended position and a retracted position. The vaporizer 76000 may be electrically activated to

NJOY Exhibit 1002.1942

produce vapor when the battery carrier sleeve is moved into the extended position. Vapor production may be suspended, and the vaporizer 76000 may be temporarily deactivated, when the battery carrier sleeve is moved into the retracted position.

[00158] The battery carrier sleeve 76008 may be disposed within the housing 76002. The housing 76002 may have an aperture 76010 extending into the housing 76002 and arranged adjacent to a surface of the battery carrier sleeve 76008. The surface of the battery carrier sleeve 76008 may be arranged so as to be manually accessible through the aperture 76010 by a user for controlling the movement of battery carrier sleeve 76008 between the retracted position and the extended position.

[00159] Figures 76C shows an exploded view of vaporizer 76000. Vaporizer 76000 may comprise oral aspiration tube 76004, vaporizer assembly 76020, contact pellet 76034, bushing 76036, resilient member 76038 and contact post 76040. Battery carrier sleeve 76008 may be adapted for receiving a battery 76042. The battery carrier sleeve 76008 may comprise an air circulation vent 76043, which may extend through the battery carrier sleeve 76008 for cooling the battery 76042. Material of the battery carrier sleeve 76008 may be selected so that the battery carrier sleeve 76008 may have a high thermal conductivity, substantially greater than approximately ten Watts per Kelvin-Meter, for sinking heat from the battery during operation of the vaporizer. Further, material of the battery carrier sleeve 76008 may be selected so that the battery carrier sleeve 76008 may have a very high thermal conductivity, substantially greater than approximately one-hundred Watts per Kelvin-Meter, for sinking of heat from the battery during operation of the vaporizer. For example, the battery carrier sleeve 76008 may comprise aluminum.

[00160] Battery 76042 may have at least one battery terminal. Battery 76042 may have a positive polarity battery terminal 76044 at one extremity of the battery 76042. Battery 76042 may have a negative polarity battery terminal 76046 at opposing extremity of the battery 76042. Battery carrier sleeve 76008 may be slidably coupled with housing sleeve 76048. The surface of the battery carrier sleeve 76008 may be arranged so as to be manually accessible through aperture 76010 by a user for controlling the movement of battery carrier sleeve 76008 between the retracted position and the extended position.

[00161] It should be understood that the invention is not limited to the battery polarity arrangement just discussed and shown in exploded view in Figure 76C, since battery polarity may be reversed with respect to that which is explicitly shown in Figure 76C, without substantial adverse affect on operation of vaporizer 76000. More specifically, the battery

NJOY Exhibit 1002.1943

carrier sleeve 76008 may receive battery 76042 having positive and negative polarity battery terminals 76044, 76046, and contact post 76042 may be arranged for electrically coupling with either battery terminal 76044, 76046, independent of any polarity of either battery terminal 76044, 76046.

[00162] Figure 76D shows a detailed side view of vaporizer assembly 76020. Figure 76E shows a detailed perspective view of vaporizer assembly 76020. Figure 76F shows a perspective exploded view of vaporizer assembly 76020.

[00163] As shown in the exploded view of Figure 76F, the vaporizer assembly 76020 may comprise a cap 76021, an outer reservoir cover 76022, a resilient o-ring 76023, absorptive ceramic reservoir 76024, a supportive inner reservoir sleeve 76025, an atomizer assembly 76050 and a supportive atomizer fluid interface 76027. Cap 76024 may be removable, and in particular absorptive ceramic reservoir 76024 may removable by a user of the vaporizer, so as to provide for cleaning or replacement of the absorptive ceramic reservoir 76024

[00164] The oral aspiration tube discussed previously herein may be fluidly coupled with the atomizer assembly 76050 for transporting vapor from the atomizer assembly to the user's mouth. When electrically activated, atomizer assembly 76050 can change liquid into vapor. Absorptive ceramic reservoir 76024 may provide for volume storage of the liquid. For example, the liquid may comprises a miscible liquid, and the absorptive ceramic reservoir 76024 may be adapted for volume storage of the miscible liquid.

[00165] Absorptive ceramic reservoir 76024 may be fluidly coupled with the atomizer assembly 76050 for providing the liquid to the atomizer assembly 76050, in response to aspiration by the user. In particular, air intake ports 76006 may extend through outer reservoir cover 76022, and may be fluidly coupled with the absorptive ceramic reservoir 76024 for bubbling air into the absorptive ceramic reservoir in response to aspiration by the user.

[00166] A first set of liquid transport apertures 76026A may extend through supportive inner reservoir sleeve 76025, for transporting liquid aspirated from the absorptive ceramic reservoir 76024 through the supportive inner reservoir sleeve 76025. Similarly, a second set of liquid transport apertures 76026B may extend through supportive atomizer fluid interface 76027, for transporting liquid aspirated from the absorptive ceramic reservoir 76024 through the supportive atomizer fluid interface 76027. Similarly, a third set of liquid transport

NJOY Exhibit 1002.1944

apertures 76026C may extend into atomizer assembly 76050, for transporting liquid aspirated from the absorptive ceramic reservoir 76024 into atomizer assembly 76050.

[00167] In other words, the first and second sets of liquid transport apertures 76062A, 76062B may form at least one liquid aspiration channel 76062A, 76062B, which may be fluidly coupled between the atomizer assembly 76050 and the absorptive ceramic reservoir 76024 for aspirating the liquid from the absorptive ceramic reservoir 76024 in response to aspiration by the user. As shown in exploded view in Figure 76F, air intake ports 76006 and the liquid aspiration channel 76062A, 76062B may each be arranged at respective opposing surfaces of the absorptive ceramic reservoir 76024, so as to promote the aspiration of liquid from the absorptive ceramic reservoir 76024.

[00168] As shown in Figure 76F, the absorptive ceramic reservoir 76024 may have a substantially annular cross section. The absorptive ceramic reservoir 76024 may be substantially cylindrically shaped. Atomizer assembly 76050 may be coaxially arranged with such substantially cylindrical shape of the absorptive ceramic reservoir 76024. As shown in Figure 76F, resilient o-ring 76023 may be arranged adjacent to an extremity of the substantially cylindrical shape of the absorptive ceramic reservoir 76024, for providing at least some shock protection to the absorptive ceramic reservoir 76024.

[00169] As shown in Figure 76F the substantially cylindrical shape of absorptive ceramic reservoir 76024 may comprise a cylinder wall having a thickness dimension "T". To provide for volume storage of the liquid, and to provide for some strength of the absorptive ceramic reservoir 76024, the thickness dimension "T" may be greater than approximately a couple of millimeters. To provide for some user convenience and some compact thinness of the absorptive ceramic reservoir 76024, the thickness dimension "T" may be less than approximately tens of millimeters. Accordingly, the thickness dimension "T" may be within a range from approximately a couple of millimeters to approximately tens of millimeters.

[00170] To provide for some user convenience, and to avoid an excessive need to refill the absorptive ceramic reservoir 76024 continually, the absorptive ceramic reservoir 76024 may have liquid absorption volume of greater than approximately half a milliliter. In particularly, the absorptive ceramic reservoir 76024 may have a liquid absorption volume sufficient for more than approximately seventy-five full aspiration cycles through the user's mouth and substantially filling a user's lungs. To provide for some user convenience and some compactness of the absorptive ceramic reservoir 76024, the absorptive ceramic reservoir 76024 may have liquid absorption volume less then approximately ten milliliters.

NJOY Exhibit 1002.1945

Accordingly, the absorptive ceramic reservoir 76024 may have a liquid absorption volume within a range from approximately half a milliliter to approximately ten milliliters.

[00171] The absorptive ceramic reservoir 76024 may comprise a macroporous ceramic. The macroporous ceramic may be substantially hydrophilic. Further, the macroporous ceramic may comprise a substantially open pore structured ceramic. Moreover, the macroporous ceramic may comprise a substantially interconnected macroporous ceramic.

[00172] The macroporous ceramic may comprise an oxide ceramic. More particularly, the macroporous ceramic may comprise Aluminum Oxide. Since the atomizer assembly 76050 may generate heat, to provide for some user safety the absorptive ceramic reservoir 76024 may be substantially a non-flammable. To provide for some safety of the user inhaling vapors of the vaporizer, the absorptive ceramic reservoir 76024 may be substantially chemically inert.

[00173] Parameters of the macroporous ceramic may be chosen so as to provide for some ease of use of the user aspirating the liquid from the absorptive ceramic reservoir 76024. The macroporous ceramic may have an air entry value within a range from approximately one fifth of a pound per square inch to approximately eight pounds per square inch. The macroporous ceramic may have a porosity within a range from approximately forty percent to approximately ninety percent. The macroporous ceramic may have an average pore size within a range from approximately twenty five microns to approximately one hundred and fifty microns.

[00174] In addition to providing some ease of aspiration, parameters such as porosity greater than approximately forty percent and/or average pore size greater than approximately twenty five microns may provide some wicking efficiency, in filing the absorptive ceramic reservoir 76024 with liquid. Parameters such as porosity less than approximately ninety percent and/or average pore size less than approximately one hundred and fifty microns may provide for some strength of the absorptive ceramic reservoir 76024. To provide some balance between ease of aspiration, wicking efficiency and strength, the macroporous ceramic may have an average pour size of approximately seventy microns.

[00175] Figure 76G shows a detailed side view of atomizer assembly 76050. Figure 76H shows a detailed cutaway view of atomizer assembly 76050. The atomizer assembly may comprise a first electrical contact 76051 including at least an inner contact sleeve 76051 having an aperture extending into an extremity of the inner contact sleeve 76051, as shown in Figure 76G. Atomizer assembly 76050 may further comprise a second electrical contact

NJOY Exhibit 1002.1946

76053 including at least an outer contact sleeve 76053. Atomizer assembly 76050 may further comprise a heating element 76054 electrically coupled between the inner contact sleeve and the outer contact sleeve, for example by insulated wires 76055. Heating element 76054 may be made of, or comprise, for example: nickel chromium, iron chromium aluminum, stainless steel, gold, platinum, tungsten molybdenum, or a piezoelectric material. When electrically activated, heating element 76054 may heat liquid into vapor. The atomizer assembly 76050 may further comprise annular electrical insulation 76056 interposed between the inner contact sleeve 76051 and the outer contact sleeve 76053.

[00176] Figure 76H shows the third set of liquid transport apertures 76026C, which may extend into atomizer assembly 76050, for transporting liquid aspirated from the absorptive ceramic reservoir into atomizer assembly 76050, as mentioned previously herein. The atomizer assembly 76050 may comprise a first wick 76057 arranged for directly contacting liquid aspirated from the absorptive ceramic reservoir in response to aspiration by the user. Supportive cross bar 76052 may be coupled across outer contact sleeve 76053 for supporting first wick 76057.

[00177] As shown in Figure 76H, a second wick 76058 may be separated from the first wick 76057 by an air gap, and may be arranged for receiving liquid aspirated from the first wick in response to aspiration the user. Second wick 76058 may be thermally coupled with heating element 76054. For example, as shown in Figure 76H, heating element may be coiled about second wick 76058. As shown in Figure 76H, atomizer assembly 76050 may further comprise an atomizer cup 76059 having at least one aperture extending there through, so as to provide for aspiration, and more particularly to provide for liquid transport between first wick 76057 and second wick 76058.

[00178] Figure 76I of vaporizer assembly 76020 is in cut away view to show cap 76021, outer reservoir cover 76022, a resilient o-ring 76023, absorptive ceramic reservoir 76024, a supportive inner reservoir sleeve 76025, an atomizer assembly 76050 and a supportive atomizer fluid interface 76027, which were discussed previously herein with respect to the exploded view of vaporizer assembly 76020 in Figure 76F. A shown in cut away view in Figure 76I, absorptive ceramic reservoir 76024 may be fluidly coupled with the atomizer assembly 76050 for providing the liquid to the atomizer assembly 76050, in response to aspiration by the user. As shown, air intake ports 76006 may extend through outer reservoir cover 76022, and may be fluidly coupled with the absorptive ceramic

NJOY Exhibit 1002.1947

reservoir 76024 for bubbling air into the absorptive ceramic reservoir in response to aspiration by the user.

[00179] Figure 76I shows in cut away view the first set of liquid transport apertures 76026A, which may extend through supportive inner reservoir sleeve 76025, for transporting liquid aspirated from the absorptive ceramic reservoir 76024 through the supportive inner reservoir sleeve 76025. Similarly, Figure 76I shows in cut away view the second set of liquid transport apertures 76026B, which may extend through supportive atomizer fluid interface 76027, for transporting liquid aspirated from the absorptive ceramic reservoir 76024 through the supportive atomizer fluid interface 76027. Similarly, Figure 76I shows in cut away view the third set of liquid transport apertures 76026C, which may extend into atomizer assembly 76050, for transporting liquid aspirated from the absorptive ceramic reservoir 76024 into atomizer assembly 76050. The atomizer assembly 76050 may comprise first wick 76057 arranged for directly contacting liquid aspirated from the absorptive ceramic reservoir in response to aspiration by the user.

[00180] In other words, Figure 76I shows in cut away view the first and second sets of liquid transport apertures 76062A, 76062B, which may form at least one liquid aspiration channel 76062A, 76062B, and which may be fluidly coupled between the atomizer assembly 76050 and the absorptive ceramic reservoir 76024 for aspirating the liquid from the absorptive ceramic reservoir 76024 in response to aspiration by the user. As shown in cut away view in Figure 76I, air intake ports 76006 and the liquid aspiration channel 76062A, 76062B may each be arranged at respective opposing surfaces of the absorptive ceramic reservoir 76024, so as to promote the aspiration of liquid from the absorptive ceramic reservoir 76024.

[00181] The absorptive ceramic reservoir of the vaporizer may be arranged for filling, or refilling, by the user dripping liquid. For example, Figure 76J shows a side view of vaporizer 76000, for illustrating filling or re-filling of the absorptive ceramic reservoir of the vaporizer 76000 with liquid, by dripping drops of liquid as show in Figure 76J down oral aspiration tube 76004. As shown in further detail in detailed cutaway partial view in Figure 76K of the vaporizer, drops of liquid may flow through first wick 76057 of atomizer assembly 76050 as depicted by notional lines and associated arrowheads. As further depicted by notional lines and associated arrowheads in Figure 76J, liquid may flow from first wick 76057, out of atomizer assembly 76050 through the third set of liquid transport apertures extending into atomizer assembly 76050, through the second and first sets of liquid transport

NJOY Exhibit 1002.1948

apertures forming the liquid aspiration channel, and into the absorptive ceramic reservoir 76024, so as to fill or refill the absorptive ceramic reservoir 76024 with liquid. Accordingly, the absorptive ceramic reservoir 76024 may be arranged with the liquid aspiration channel for filling or refilling the absorptive ceramic reservoir 76024 by disposing liquid into the liquid aspiration channel.

[00182] Figure 76L is a detailed cutaway partial view of the vaporizer to illustrate aspiration of liquid into the atomizer assembly 76050, and to illustrate the atomizer assembly 76050 when activated to change the liquid into vapor. Air, as depicted in Figure 76L by notional arrows, may be bubbled into the absorptive ceramic reservoir 76024 through air intake ports 76006 of outer reservoir cover 76022, in response to aspiration by the user. As depicted in Figure 76L by notional arrows, liquid may be mixed with air and aspirated from absorptive ceramic reservoir 76024 through first and second sets of liquid transport apertures, which may form the liquid aspiration channel. The liquid aspiration channel may be fluidly coupled between the atomizer assembly 76050 and the absorptive ceramic reservoir 76024 for aspirating the liquid from the absorptive ceramic reservoir 76024 to the first wick 76057 and second wick 76058 of the atomizer assembly 76050, in response to aspiration by the user. As depicted in Figure 76L by notional dashed arrows, vapors may flow from second wick 76058 when heated by electrical activation of heating element 76054, for changing the liquid into the vapors.

[00183] Operation of vaporizer 76000 is depicted in various sequential views in Figures 77A-77F. In initial sequential side view, FIG. 77A shows vaporizer 76000 , which may have housing 76002 comprising oral aspiration tube 76004 for aspiration by user's mouth. For illustrative purposes, a profile of the user's mouth is depicted using dashed lines. As discussed previously herein, battery carrier sleeve 76008 may be slidably coupled with housing 76002 for guiding alternative movement of the battery carrier sleeve 76008 between an extended position and a retracted position. The vaporizer 76000 may be electrically activated to produce vapor when the battery carrier sleeve is moved into the extended position. Vapor production may be suspended, and the vaporizer 76000 may be temporarily deactivated, when the battery carrier sleeve is moved into the retracted position.

[00184] The battery carrier sleeve 76008 may be disposed within the housing 76002. The housing 76002 may have aperture 76010 extending into the housing 76002 and arranged adjacent to the surface of the battery carrier sleeve 76008. The surface of the battery carrier sleeve 76008 may be arranged so as to be manually accessible through the aperture 76010 by

NJOY Exhibit 1002.1949

the user for controlling the movement of battery carrier sleeve 76008 between the retracted position and the extended position. In Figurer 77A, the battery carrier sleeve 76008 is shown in retracted position. Similarly, the user's thumb, which is depicted in dashed line as engaging the surface of the battery carrier sleeve 76008, is likewise retracted. Figure 77B is a detailed cut away partial view showing the battery carrier sleeve in the retracted position as in Figure 77A.

[00185] In subsequent sequential side view in Figure 77C, the battery carrier sleeve 76008 is shown in extended position for electrically activating the atomizer assembly of vaporizer 76000 to change liquid into vapor. Similarly, the user's thumb, which is depicted in dashed line as engaging the surface of the battery carrier sleeve 76008, is likewise extended. Figure 77D is a detailed cut away partial view showing the battery carrier sleeve in the extended position as in Figure 77C. Vapors produced by the vaporizer in response to such manual activation by the user are representatively illustrated in Figure 77C by dashed arrows extending from oral aspiration tube 76004. The vapors depicted as dashed arrows are shown extending into the user's mouth in response to aspiration by user's mouth. For illustrative purposes, the profile of the user's mouth is depicted using dashed lines.

[00186] In subsequent sequential side view in Figure 77E, the battery carrier sleeve 76008 is shown once again in retracted position for electrically deactivating the atomizer assembly of vaporizer 76000. Similarly, the user's thumb, which is depicted in dashed line as engaging the surface of the battery carrier sleeve 76008, is likewise retracted. Figure 77F is a detailed cut away partial view showing the battery carrier sleeve in the retracted position as in Figure 77E. Figure 77F shows remainder aspirated vapors depicted as dashed line curls in the mouth of the user. For illustrative purposes, the profile of the user's mouth is depicted using dashed lines.

[00187] As particularly shown in Figure 77D, the atomizer assembly 76050 may comprise first electrical contact 76051 (for example, including at least inner contact sleeve 76051) for selectively conducting a flow of battery power from battery 76042 to the atomizer assembly 76050 when the battery carrier sleeve 76008 is in the extended position as shown in Figures 77D. First electrical contact 76051 (for example, including at least inner contact sleeve 76051) may selectively interrupt the flow of battery power from battery 76042 to the atomizer assembly 76050 when the battery carrier sleeve 76008 is in the retracted position, as shown in Figures 77B and 77F.

NJOY Exhibit 1002.1950

[00188] As particularly shown in Figure 77D, the battery carrier sleeve 76008 and contact post 76042 may be arranged for electrically coupling battery terminal 76044 of battery 76042 with contact pellet 76034 and first electrical contact 76051 of the atomizer assembly 76050, when the battery carrier sleeve 76008 is in the extended position. Battery carrier sleeve 76008 and contact post 76042 may be arranged for electrically isolating the battery terminal 76044 from contact pellet 76034 and first electrical contact 76051 of the atomizer assembly 76050, when the battery carrier sleeve 76008 is in the retracted position, as shown in Figures 77B and 77F. In particular, when the battery carrier sleeve 76008 is in the retracted position as shown in Figures 77B and 77F, there may be an air gap interposed between the contact post 76042 and contact pellet/first electrical contact 76034,76051 of the atomizer assembly 76050, for electrically isolating contact post 76042 from contact pellet/first electrical contact 76034,76051. As shown in Figures 77B, 77D and 77F, bushing 76036 may retain contact pellet 76034 in electrical coupling with the first electrical contact 76051 of the atomizer assembly 76050 (for example, with the extremity of inner contact sleeve 76051 of the atomizer assembly 76050).

[00189] Figures 77B and 77F show expanded resilient member 76038, for example expanded spring 76038, which may be disposed within the housing sleeve 76048 and bushing 76036. Resilient member76038 may be coupled with the battery carrier sleeve 76008 for urging the battery carrier sleeve 76008 into the retracted position, as shown in Figures 77B and 77F. Figure 77D shows resilient member 76038 as compressed, for example compressed spring 76038, when battery carrier sleeve 76008 is in the extended position shown in Figure 77D.

[00190] In other words, Figures 77A-77F show operation of an electrical switch comprising battery carrier sleeve 76008 slidably coupled with the housing for guiding alternative movement of the battery carrier sleeve 76008 between an extended position and a retracted position. The electrical switch may be closed for activating the atomizer assembly 76050 to change the liquid into the vapor when the battery carrier sleeve 76008 is in the extended position. The electrical switch may be open for deactivating the atomizer assembly 76050 when the battery carrier sleeve 76008 is in the retracted position. The electrical switch may be manually controllable by the user of the vaporizer, by manual control of the movement of the battery carrier sleeve 76008.

[00191] The electrical switch may be a momentary on-off switch. Momentary on-off switch may be "on", as shown in Figure 77D, so long as the user may hold the battery carrier

NJOY Exhibit 1002.1951

sleeve 76008 in the extended position, against restoring force of compressed resilient member 76038 (in other words, against restoring force of compressed spring 76038.) Momentary on-off switch may be "off", as shown in Figure 77B and 77F, so long as the user may relax hold on the battery carrier sleeve 76008, so that battery carrier sleeve is restored to retracted position, by restoring force as resilient member 76038 expands (in other words, as spring 76038 expands.) Accordingly, the electrical switch may be normally open, until closed by operation of the electrical switch.

[00192] Figure 78 shows an alternative embodiment, which is generally similar to the other embodiment just discussed for Figures 76A-76L and 77A-77F, except that in the alternative embodiment of Figure 78, the previously discussed resilient member may be omitted. In the alternative embodiment of Figure 78, magnetically opposing magnetic members 78034, 78040 may provide the restoring force to urge the battery carrier 78008 back into the retracted position. In other words, contact pellet 78034 and contact post 78040 may be magnetized and arranged with magnetically opposing and magnetically repulsive polarities. Notional arrows are shown in Figure 78 to depict lines of repulsive magnetic force, for urging the battery carrier 78008 into the retracted position.

[00193] Figure 79 shows another alternative embodiment, which is generally similar to the other embodiment just discussed for Figures 76A-76L and 77A-77F, except that in the alternative embodiment of Figure 79, the previously discussed absorbent ceramic reservoir may be omitted (and associated outer reservoir cover, resilient o-ring 76023 and supportive inner reservoir sleeve may likewise be omitted.) Without the absorbent ceramic reservoir for volume storage of liquid, liquid capacity of the alternative embodiment shown in Figure 79 may be different. For example, liquid capacity may be liquid disposed in first and second wicks of the atomizer assembly.

[00194] Without absorbent ceramic reservoir, vaporizer 79000 shown in Figure 79 may have a more slender housing 79002 coupled with oral aspiration tube 79004 for transporting vapor to a user's mouth. Battery carrier sleeve 79008 may be slidably coupled with the housing 79002 for guiding alternative movement of the battery carrier sleeve 79008 between extended position and retracted position. Vaporizer 79000 may be electrically activated to produce vapor when the battery carrier sleeve is moved into the extended position. Vapor production may be suspended, and the vaporizer 79000 may be temporarily deactivated, when the battery carrier sleeve is moved into the retracted position.

NJOY Exhibit 1002.1952

[00195] The battery carrier sleeve 79008 may be disposed within the housing 79002. The housing 79002 may have an aperture 79010 extending into the housing 79002 and arranged adjacent to a surface of the battery carrier sleeve 79008. The surface of the battery carrier sleeve 79008 may be arranged so as to be manually accessible through the aperture 79010 by a user for controlling the movement of battery carrier sleeve 79008 between the retracted position and the extended position.

[00196] FIG. 80 is a flow diagram of a vaporizer operation process 8000 according to one embodiment. In accordance with process 8000 shown in FIG. 80, the process may begin with sliding 8002 a battery carrier into an extended position. The process 8000 may continue with electrically activating 8004 the vaporizer in response to sliding the battery carrier into the extended position. The process 8000 may continue with changing 8006 a liquid into a vapor in response to electrical activation of the vaporizer. The process 8000 may continue with sliding 8008 the battery carrier into a retracted position. The process 8000 may continue with deactivating 8010 the vaporizer in response to sliding the battery carrier into the retracted position. Once the vaporizer has been deactivated 8010, the process 8000 can end.

[00197] The above description and associated figures teach the best mode of the invention. The following claims specify the scope of the invention. Note that some aspects of the best mode may not fall within the scope of the invention as specified by the claims. Those skilled in the art will appreciate that the features described above can be combined in various ways to form multiple variations of the invention. As a result, the invention is not limited to the specific embodiments described above, but only by the following claims and their equivalents.

NJOY Exhibit 1002.1953

CLAIMS

What is claimed is:

1. A vaporizer comprising:

an atomizer assembly for changing a liquid into a vapor;

an oral aspiration tube fluidly coupled with the atomizer assembly for transporting the vapor from the atomizer assembly to a user's mouth; and

an absorptive ceramic reservoir for volume storage of the liquid, and fluidly coupled with the atomizer assembly for providing the liquid to the atomizer assembly in response to aspiration by the user.

2. A vaporizer as recited in claim 1 further comprising a liquid aspiration channel fluidly coupled between the atomizer assembly and the absorptive ceramic reservoir for aspirating the liquid from the absorptive ceramic reservoir in response to aspiration by the user.

3. A vaporizer as recited in claim 1 further comprising an air intake port fluidly coupled with the absorptive ceramic reservoir for bubbling air into the absorptive ceramic reservoir in response to aspiration by the user.

4. A vaporizer as recited in claim 1 further comprising:

a liquid aspiration channel fluidly coupled between the atomizer assembly and the absorptive ceramic reservoir for aspirating the liquid from the absorptive ceramic reservoir in response to aspiration by the user; and

an air intake port fluidly coupled with the absorptive ceramic reservoir for bubbling air into the absorptive ceramic reservoir in response to aspiration by the user,

wherein the air intake port and the liquid aspiration channel are each arranged at respective opposing surfaces of the absorptive ceramic reservoir, so as to promote the aspiration of the liquid from the absorptive ceramic reservoir.

NJOY Exhibit 1002.1954

5. A vaporizer as recited in claim 1 wherein the atomizer assembly comprises a first wick arranged for directly contacting liquid aspirated from the absorptive ceramic reservoir in response to aspiration by the user.

6. A vaporizer as recited in claim 1 wherein the atomizer assembly comprises a heating element for heating the liquid into the vapor.

7. A vaporizer as recited in claim 1 wherein the atomizer assembly comprises:

a first wick arranged for directly contacting liquid aspirated from the absorptive ceramic reservoir in response to aspiration by the user; and

a second wick separated from the first wick by an air gap and arranged for receiving liquid aspirated from the first wick in response to aspiration the user.

8. A vaporizer as recited in claim 1 wherein the atomizer assembly comprises:

a first wick arranged for directly contacting liquid aspirated from the absorptive ceramic reservoir in response to aspiration by the user;

a heating element; and

a second wick thermally coupled with the heating element.

9. A vaporizer as recited in claim 1 wherein the atomizer assembly further comprises an atomizer cup having at least one aperture extending there through.

10. A vaporizer as recited in claim 1 wherein the absorptive ceramic reservoir is arranged for refilling by the user dripping liquid.

11. A vaporizer as recited in claim 1 further comprising:

a liquid aspiration channel fluidly coupled between the atomizer assembly and the absorptive ceramic reservoir for aspirating the liquid from the absorptive ceramic reservoir in response to aspiration by the user,

wherein the absorptive ceramic reservoir is arranged with the liquid aspiration channel for refilling the absorptive ceramic reservoir by disposing liquid into the liquid aspiration channel.

NJOY Exhibit 1002.1955

12. A vaporizer comprising:

an atomizer assembly for changing a liquid into a vapor; and

an absorptive ceramic reservoir for volume storage of the liquid, and fluidly coupled with the atomizer assembly for providing the liquid to the atomizer assembly,

wherein the absorptive ceramic reservoir comprises a macroporous ceramic.

13. A vaporizer as recited in claim 12 wherein the macroporous ceramic is substantially hydrophilic.

14. A vaporizer as recited in claim 12 wherein:

the liquid comprises a miscible liquid; and

the absorptive ceramic reservoir is adapted for volume storage of the miscible liquid.

15. A vaporizer as recited in claim 12 wherein the absorptive ceramic reservoir has a liquid absorption volume within a range from approximately half a milliliter to approximately ten milliliters.

16. A vaporizer as recited in claim 12 wherein the absorptive ceramic reservoir has a liquid absorption volume sufficient for more than approximately seventy-five full aspiration cycles through the user's mouth and substantially filling a user's lungs.

17. A vaporizer as recited in claim 12 wherein the macroporous ceramic comprises a substantially open pore structured ceramic.

18. A vaporizer as recited in claim 12 wherein the macroporous ceramic comprises a substantially interconnected macroporous ceramic.

19. A vaporizer as recited in claim 12 wherein the macroporous ceramic has a porosity within a range from approximately forty percent to approximately ninety percent.

20. A vaporizer as recited in claim 12 wherein the macroporous ceramic has an air entry value within a range from approximately one fifth of a pound per square inch to approximately eight pounds per square inch.

NJOY Exhibit 1002.1956

21. A vaporizer as recited in claim 12 wherein the macroporous ceramic has an average pore size within a range from approximately twenty five microns to approximately one hundred and fifty microns.

22. A vaporizer as recited in claim 12 wherein the macroporous ceramic has an average pour size of approximately seventy microns.

23. A vaporizer as recited in claim 12 wherein the macroporous ceramic comprises an oxide ceramic.

24. A vaporizer as recited in claim 12 wherein the macroporous ceramic comprises Aluminum Oxide.

25. A vaporizer comprising:

an atomizer assembly for changing a liquid into a vapor; and

an absorptive ceramic reservoir for volume storage of the liquid, and fluidly coupled with the atomizer assembly for providing the liquid to the atomizer assembly,

wherein the absorptive ceramic reservoir is substantially cylindrically shaped.

26. A vaporizer as recited in claim 25 wherein the atomizer assembly is coaxially arranged with the substantially cylindrically shaped absorptive ceramic reservoir.

27. A vaporizer as recited in claim 25 wherein:

the substantially cylindrically shaped absorptive ceramic reservoir comprises a cylinder wall having a thickness dimension; and

the thickness dimension is within a range from approximately a couple of millimeters to approximately tens of millimeters.

28. A vaporized as recited in claim 25 further comprising a resilient o-ring arranged adjacent to an extremity of the substantially cylindrically shaped absorptive ceramic reservoir for providing at least some shock protection to the substantially cylindrically shaped absorptive ceramic reservoir.

NJOY Exhibit 1002.1957

29. A vaporizer comprising:

an atomizer assembly for changing a liquid into a vapor; and

a non-flammable absorptive reservoir for volume storage of the liquid, and fluidly coupled with the atomizer assembly for providing the liquid to the atomizer assembly,

wherein the non-flammable absorptive reservoir is substantially chemically inert.

30. A vaporizer as recited in claim 29 wherein the non-flammable absorptive reservoir is removable by a user of the vaporizer.

NJOY Exhibit 1002.1958

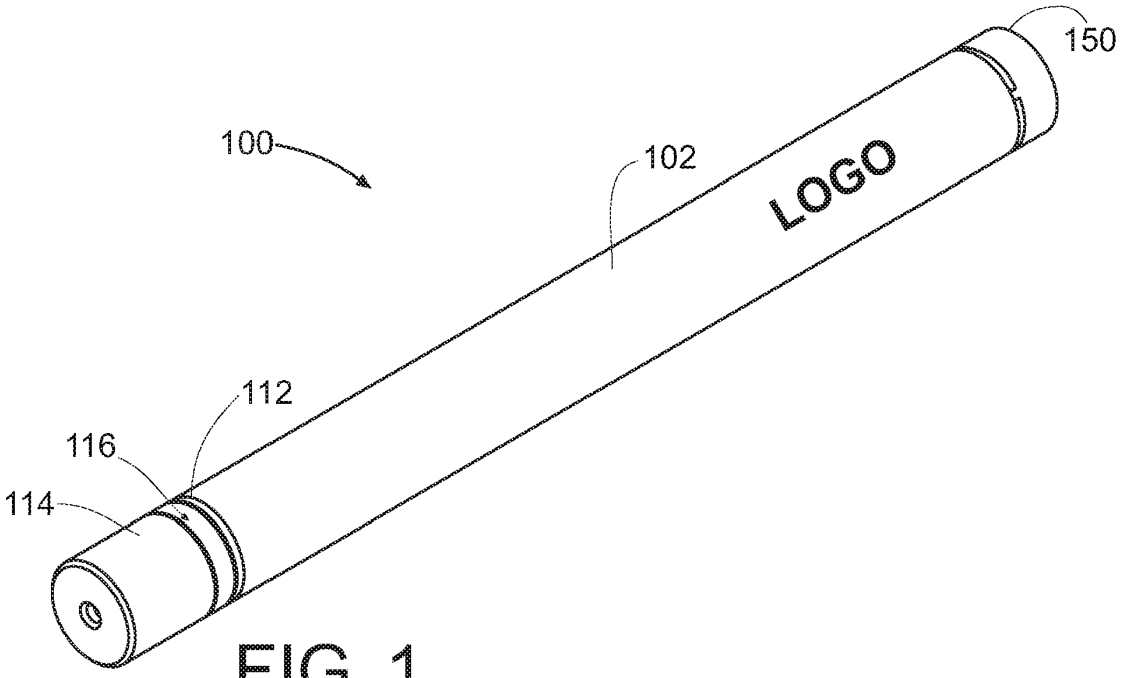


FIG. 1

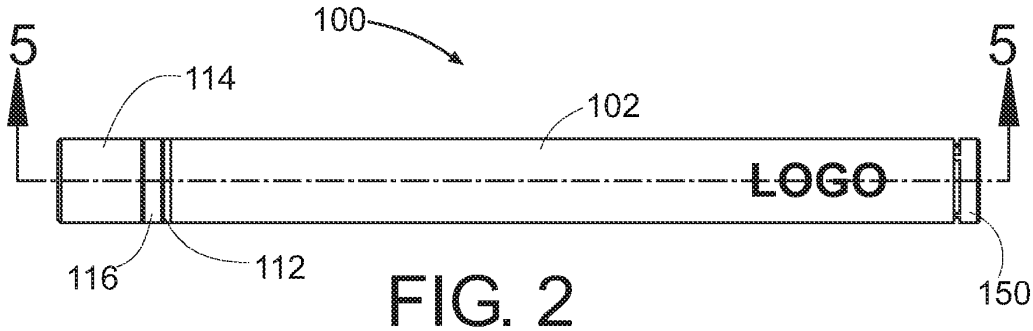


FIG. 2

NJOY Exhibit 1002.1959

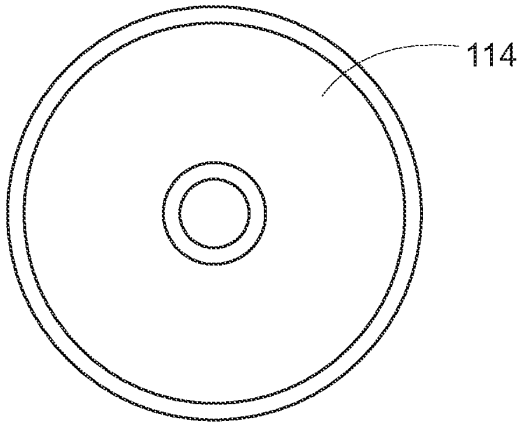


FIG. 3

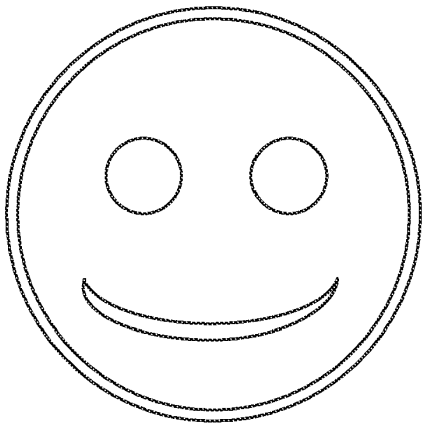


FIG. 4A

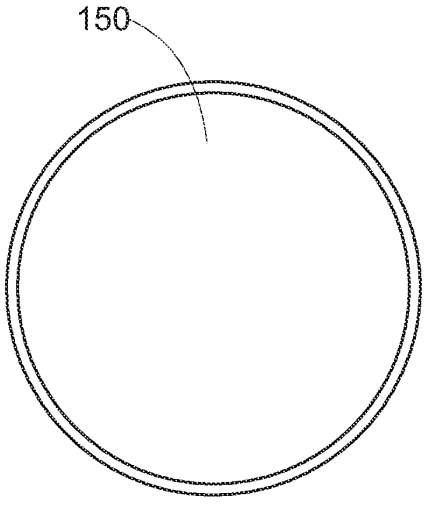


FIG. 4

NJOY Exhibit 1002.1960

FIG. 5

NJOY Exhibit 1002.1961

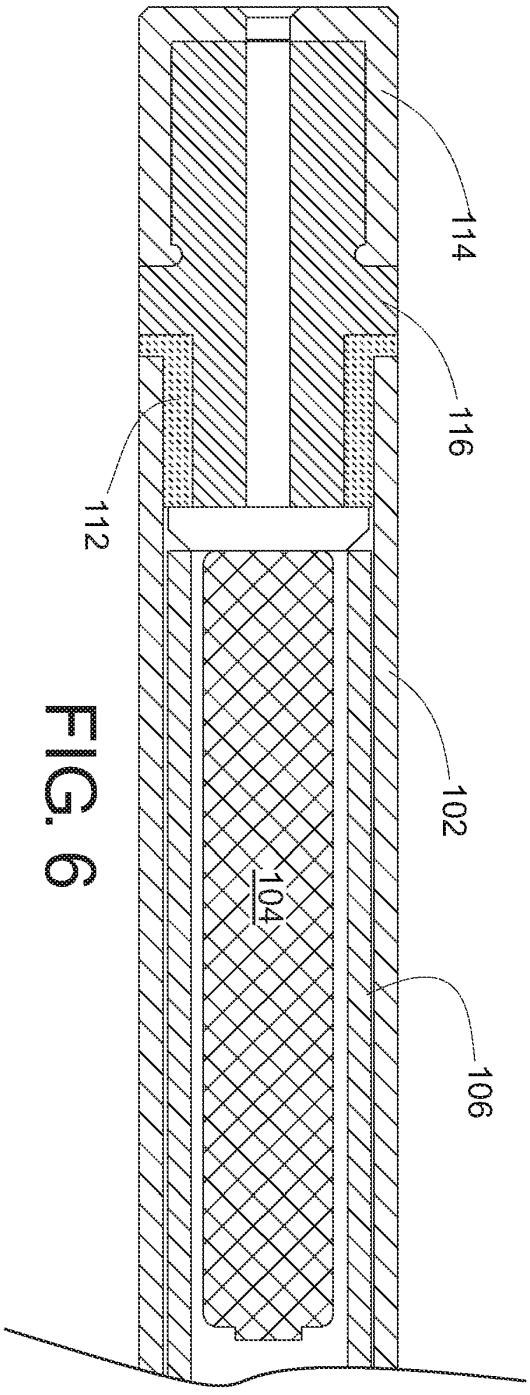


FIG. 6

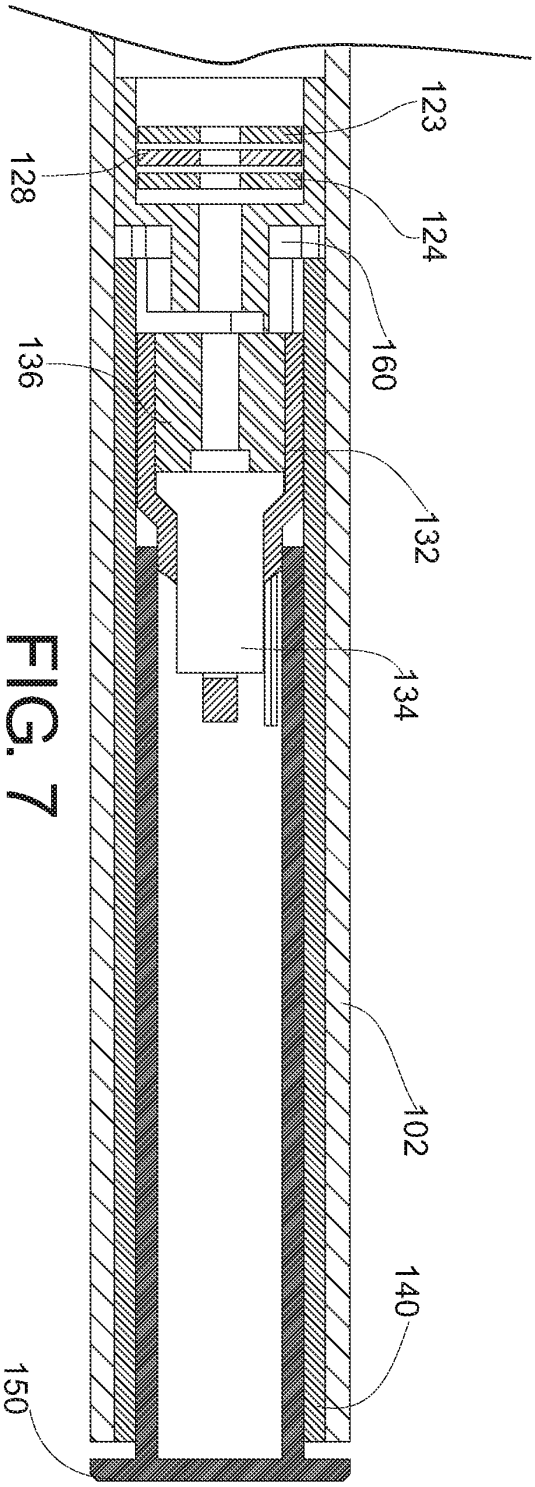


FIG. 7

NJOY Exhibit 1002.1962

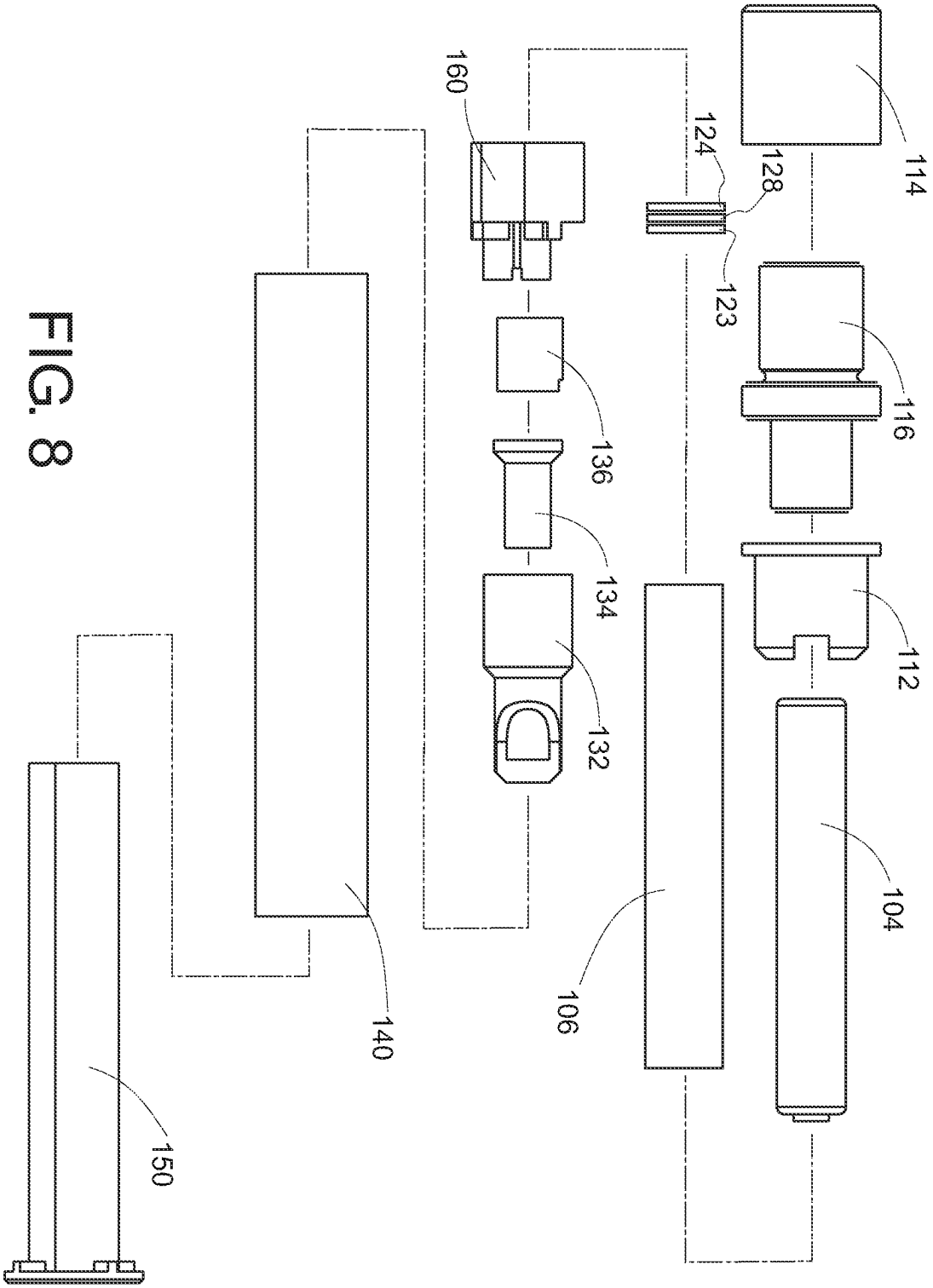


FIG. 8

NJOY Exhibit 1002.1963

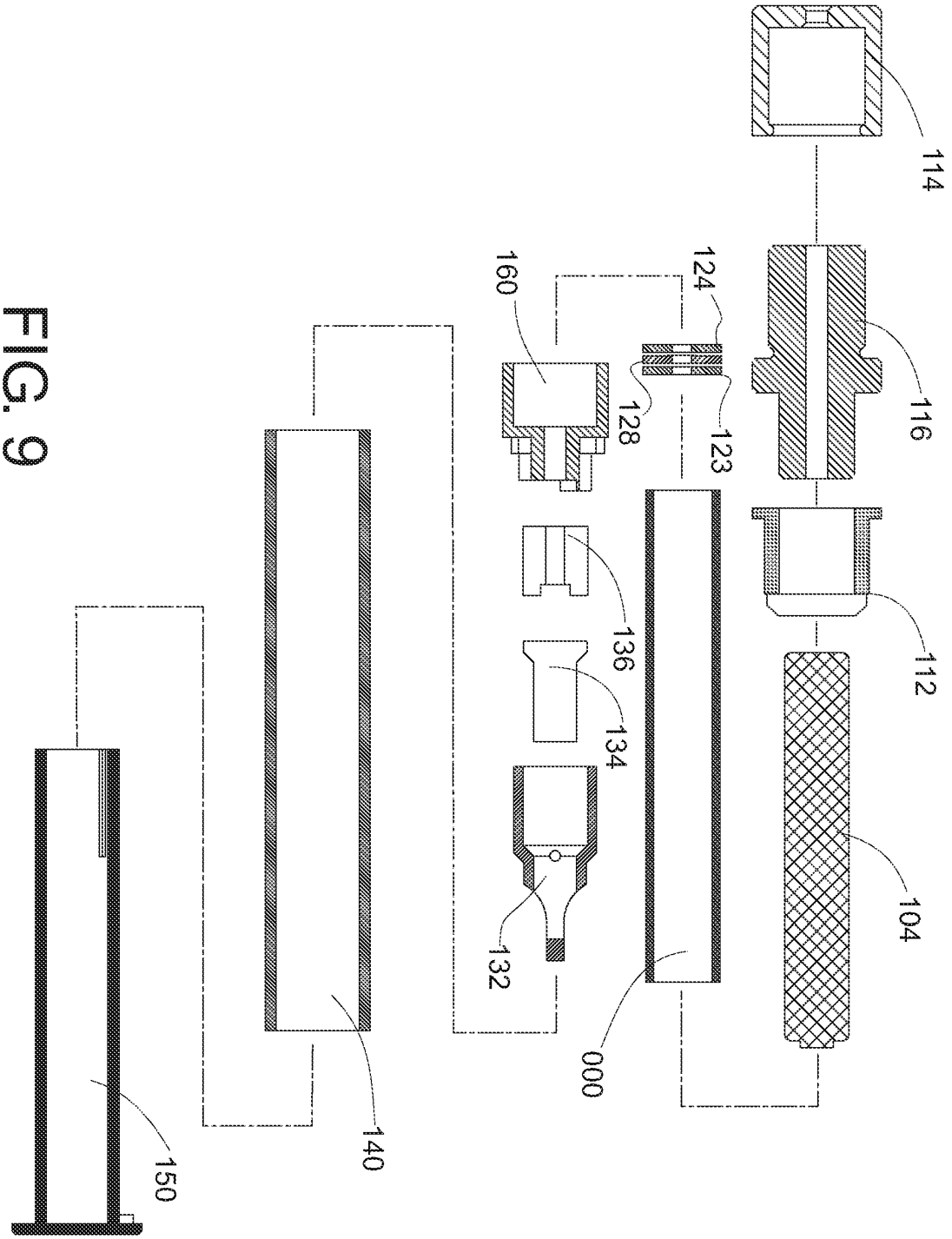


FIG. 9

NJOY Exhibit 1002.1964

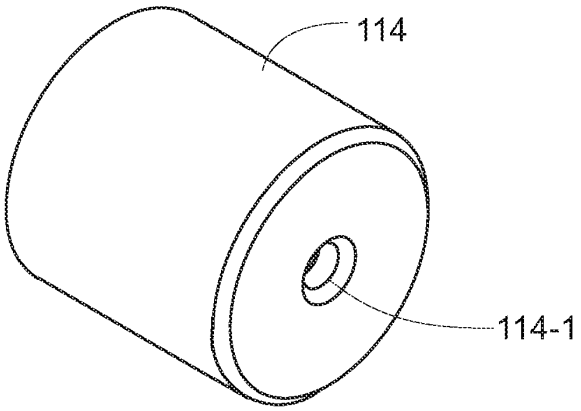


FIG. 10

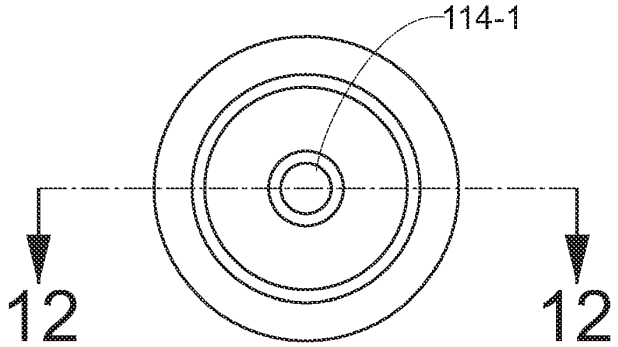


FIG. 11

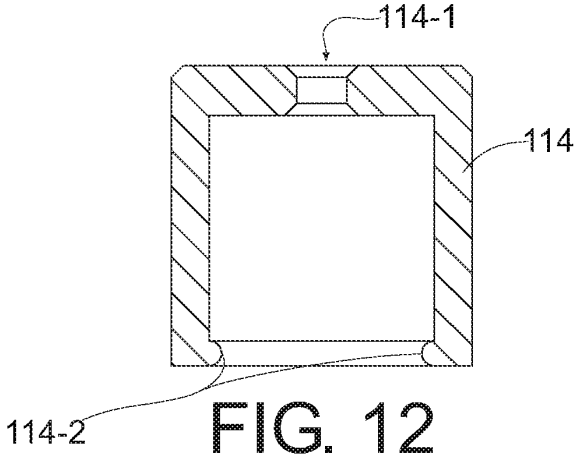


FIG. 12

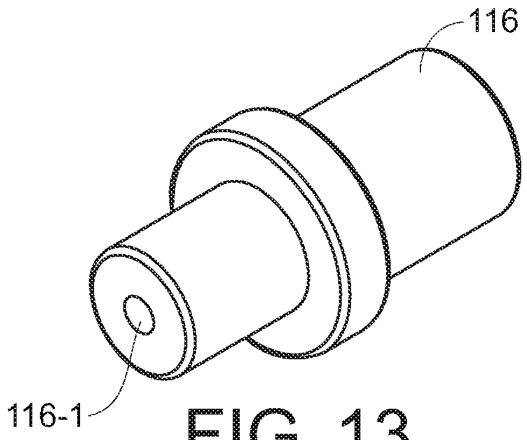


FIG. 13

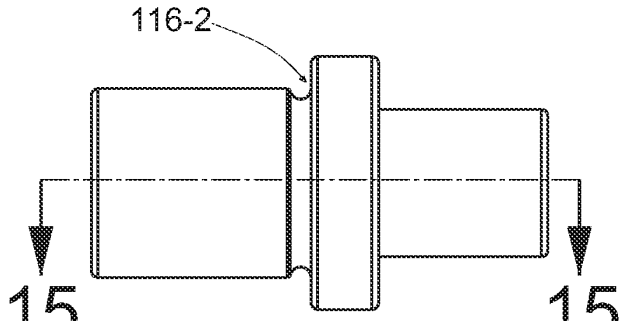


FIG. 14

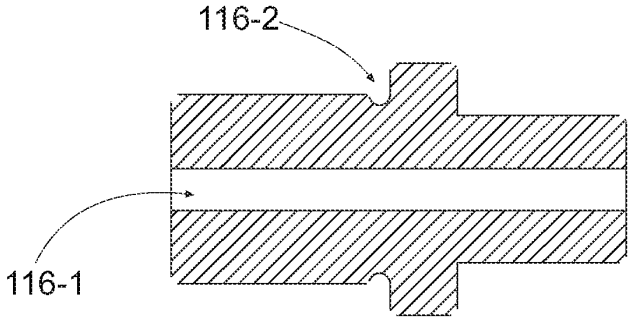


FIG. 15

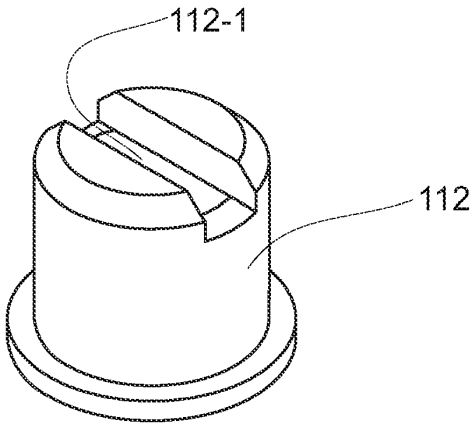


FIG. 16

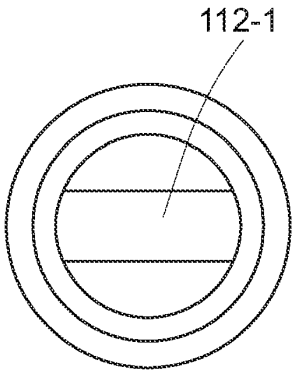


FIG. 17

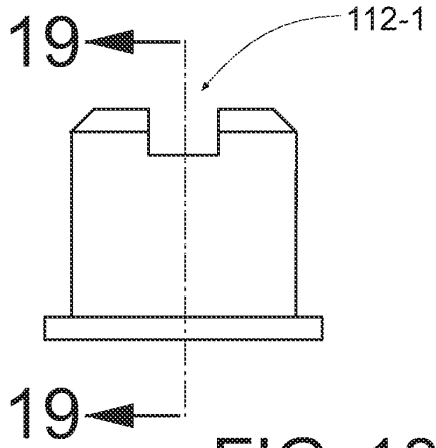


FIG. 18

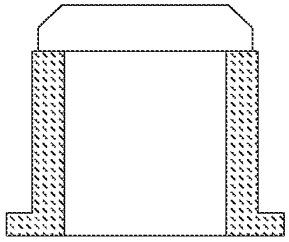


FIG. 19

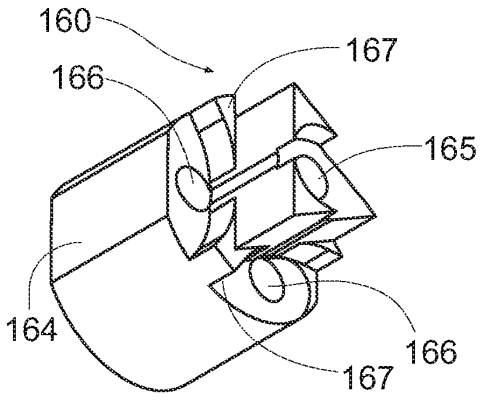


FIG. 20

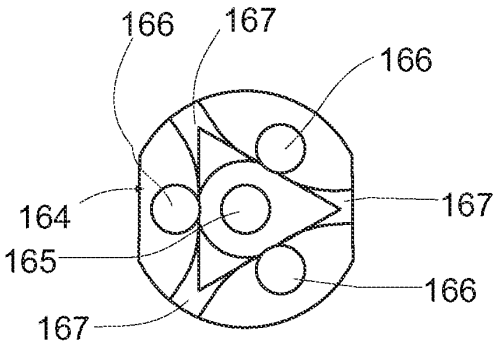


FIG. 21

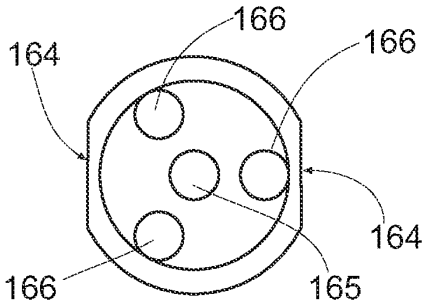


FIG. 22

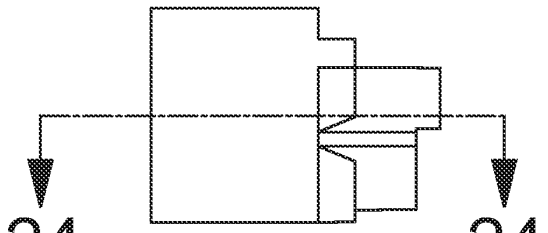


FIG. 23

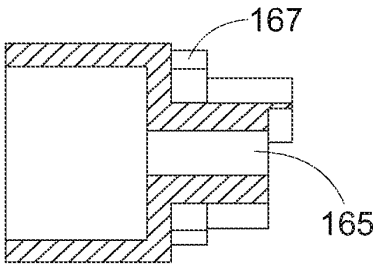


FIG. 24

NJOY Exhibit 1002.1968

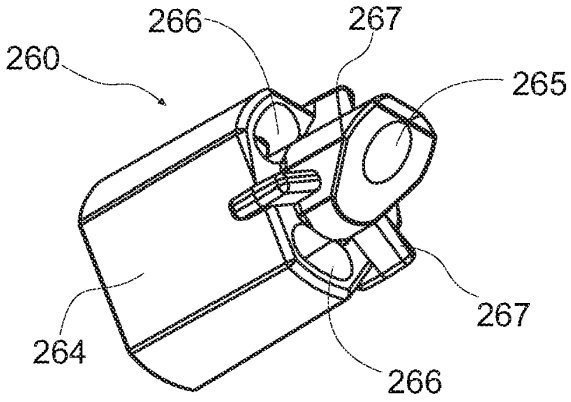


FIG. 25

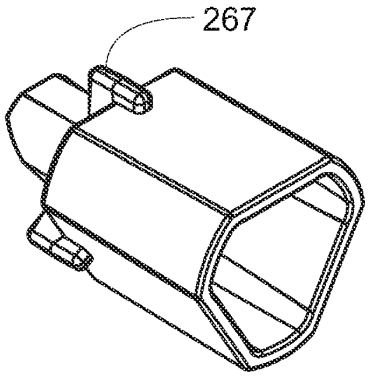


FIG. 26

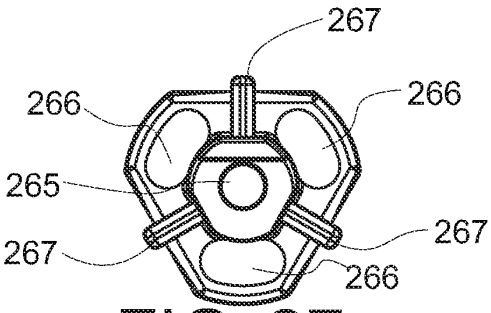


FIG. 27

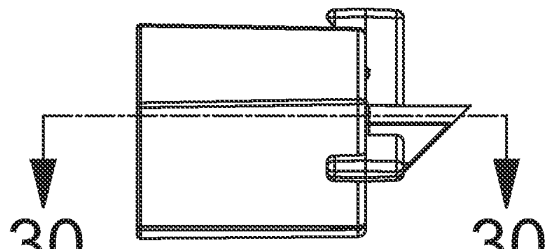


FIG. 29

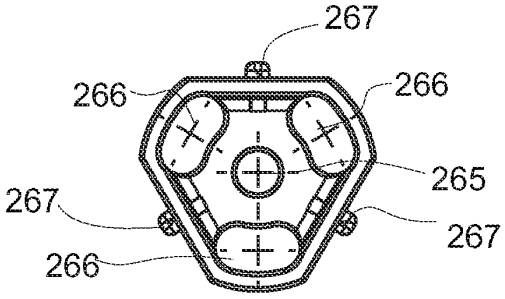


FIG. 28

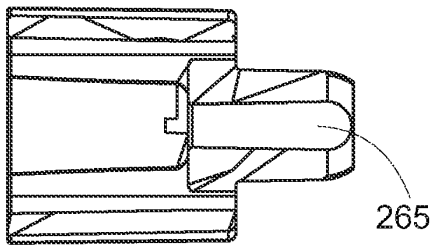


FIG. 30

NJOY Exhibit 1002.1969

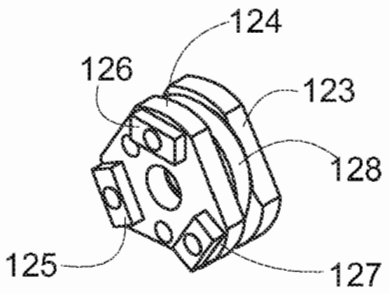


FIG. 31

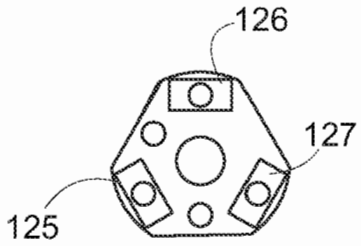


FIG. 32

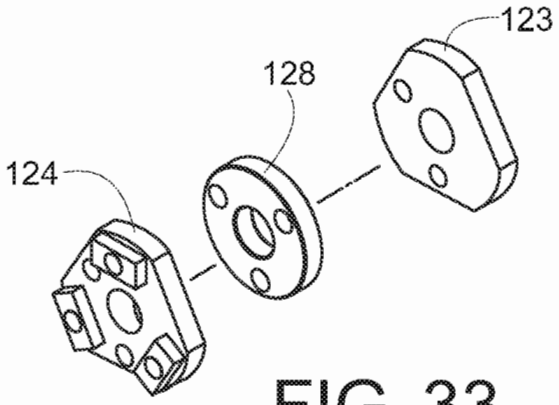


FIG. 33

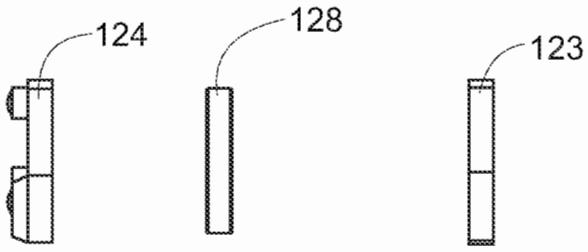


FIG. 34

NJOY Exhibit 1002.1970

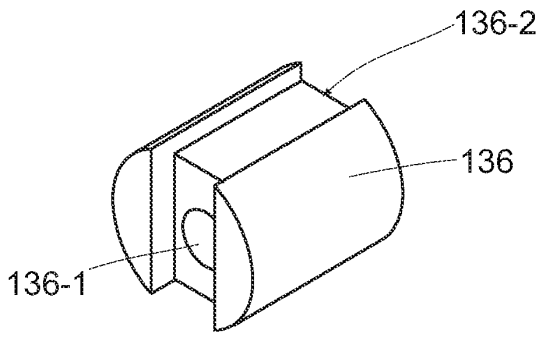


FIG. 35

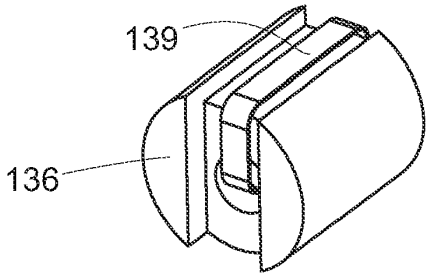


FIG. 35A

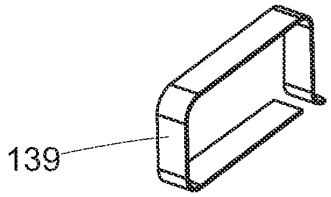


FIG. 35B

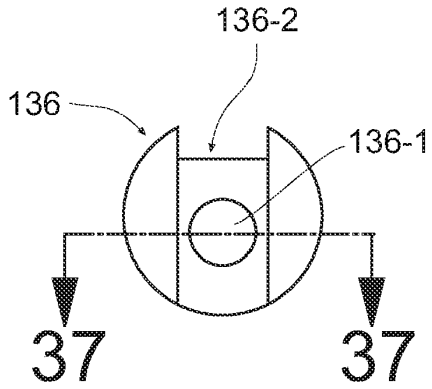


FIG. 36

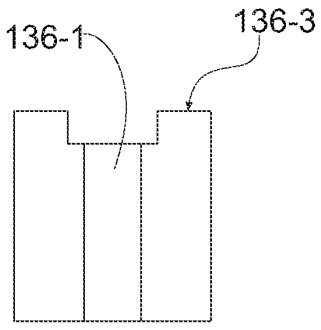


FIG. 37

NJOY Exhibit 1002.1971

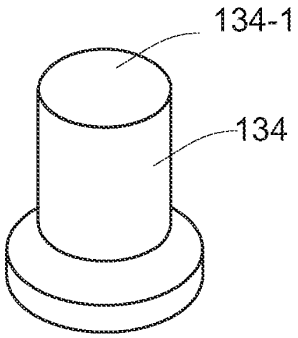


FIG. 38

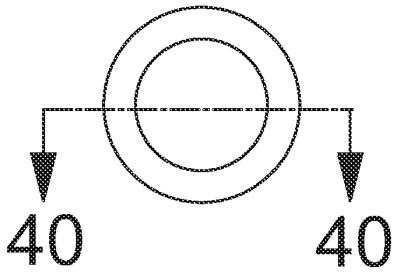


FIG. 39

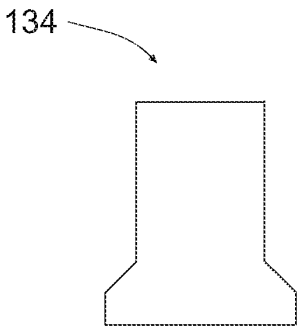


FIG. 40

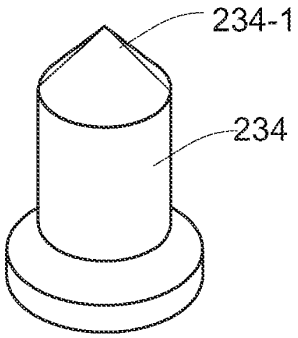


FIG. 41

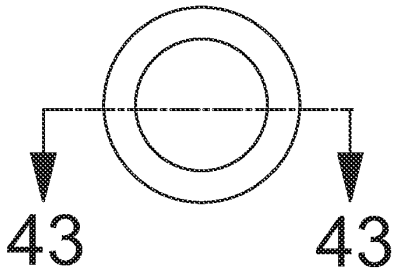


FIG. 42

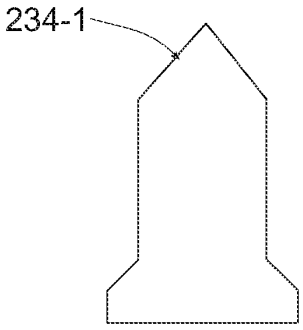


FIG. 43

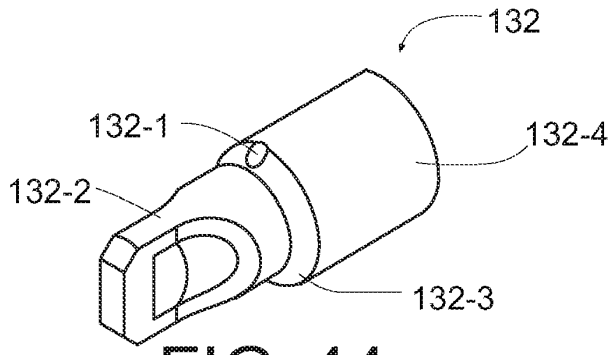


FIG. 44

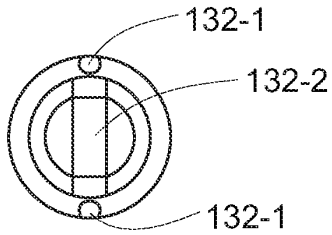


FIG. 45

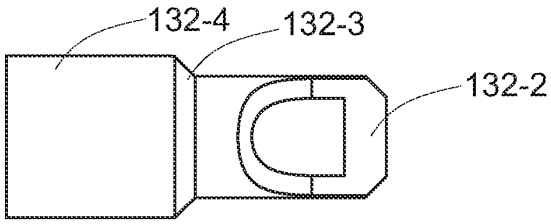


FIG. 46

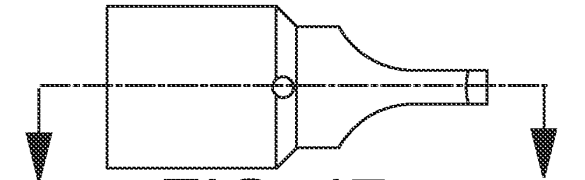


FIG. 47

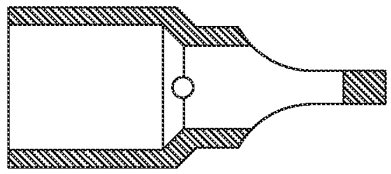


FIG. 48

NJOY Exhibit 1002.1974

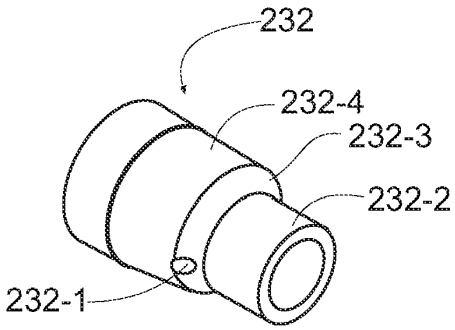


FIG. 49

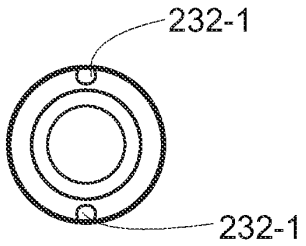


FIG. 50

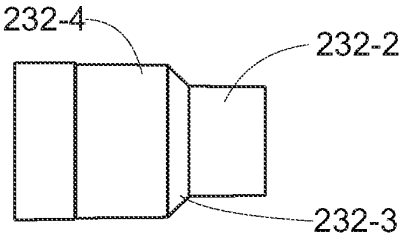


FIG. 51

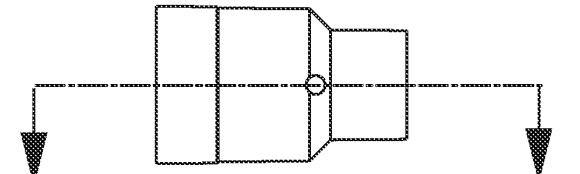


FIG. 52

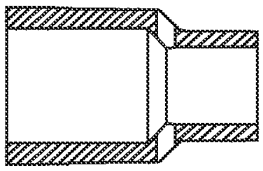


FIG. 53

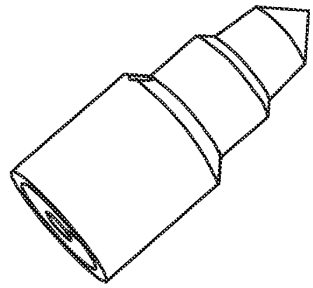


FIG. 54

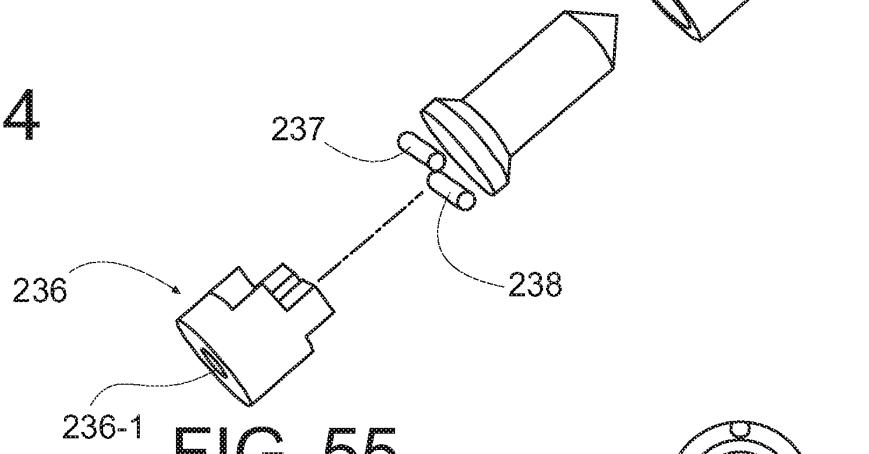


FIG. 55

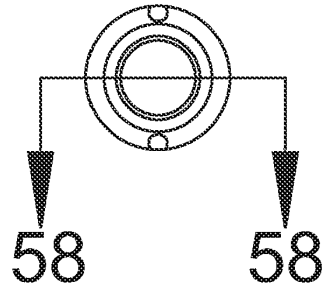


FIG. 57

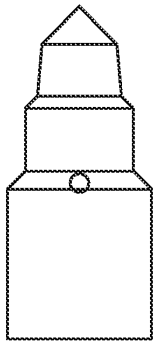


FIG. 56

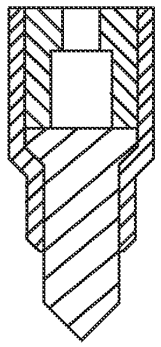


FIG. 58

NJOY Exhibit 1002.1976

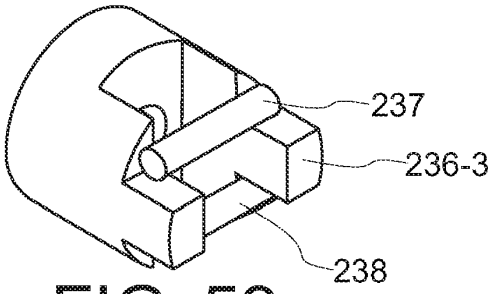


FIG. 59

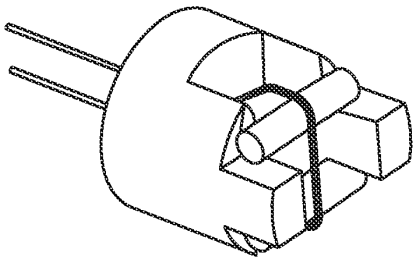


FIG. 59A

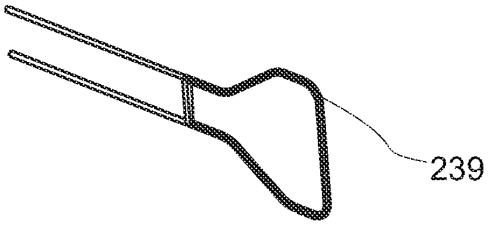


FIG. 59B

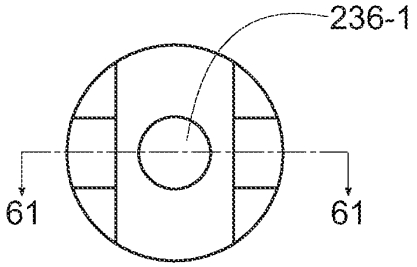


FIG. 60

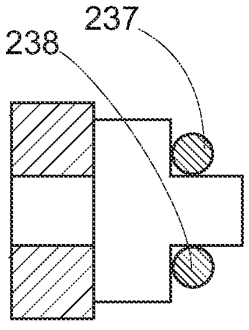


FIG. 61

NJOY Exhibit 1002.1977

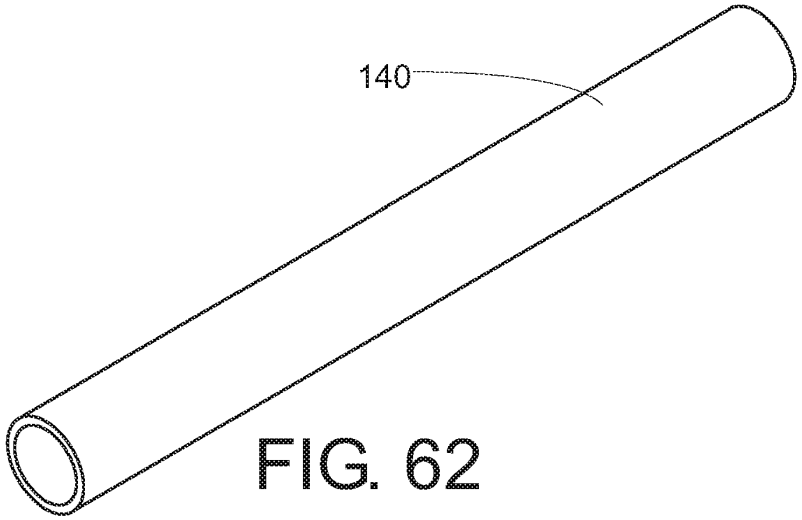


FIG. 62

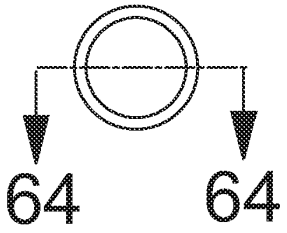


FIG. 63



FIG. 64

NJOY Exhibit 1002.1978

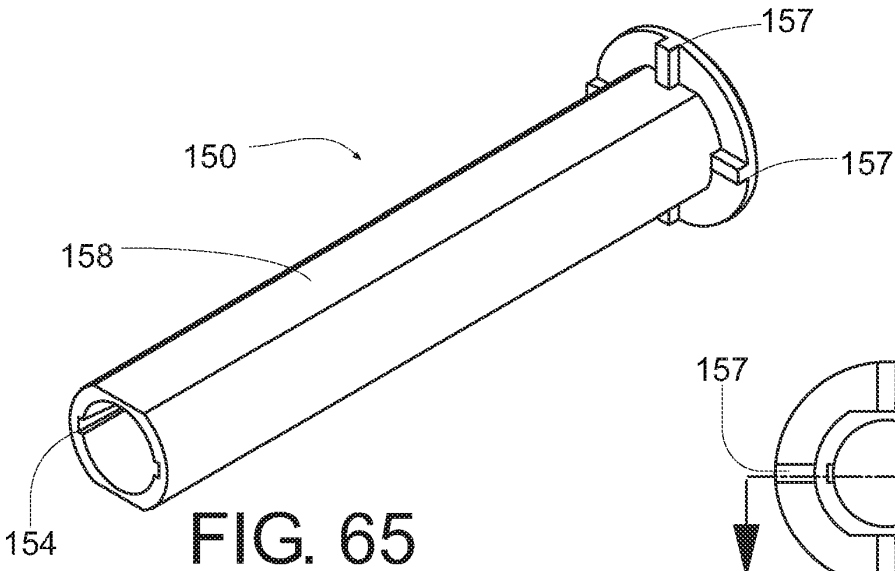


FIG. 65

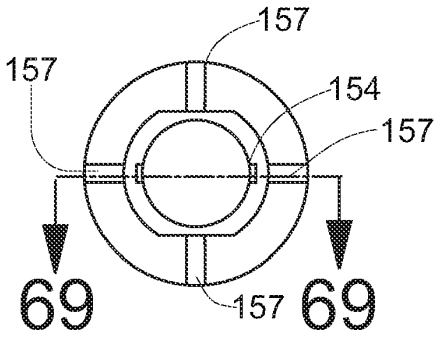


FIG. 66

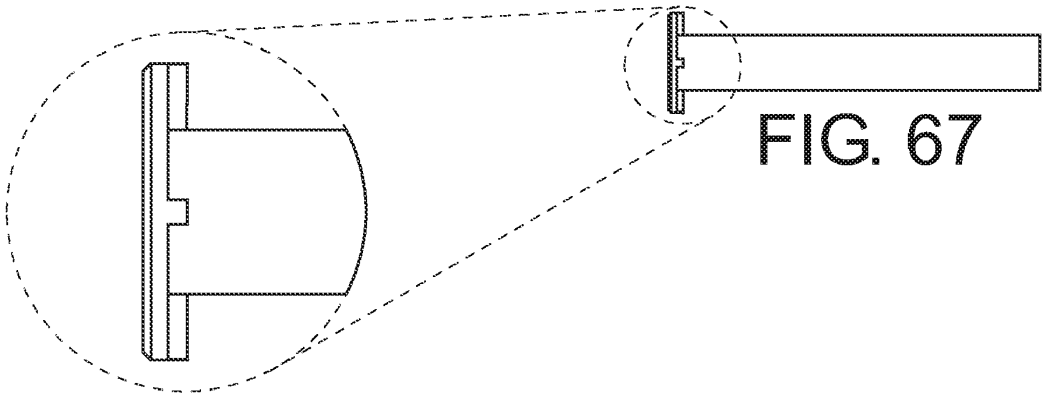


FIG. 67



FIG. 68

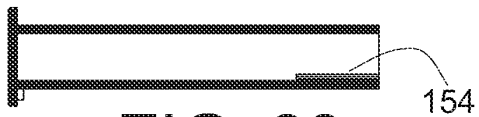


FIG. 69

NJOY Exhibit 1002.1979

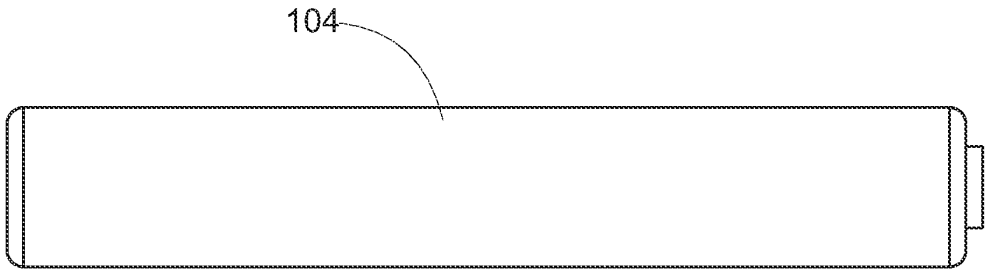


FIG. 70

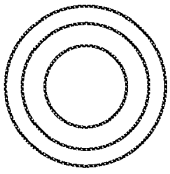


FIG. 71

NJOY Exhibit 1002.1980

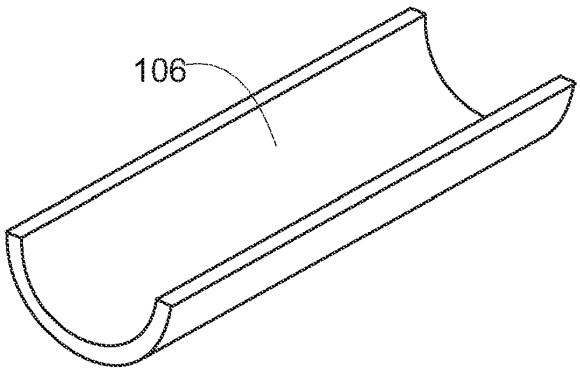


FIG. 72

NJOY Exhibit 1002.1981

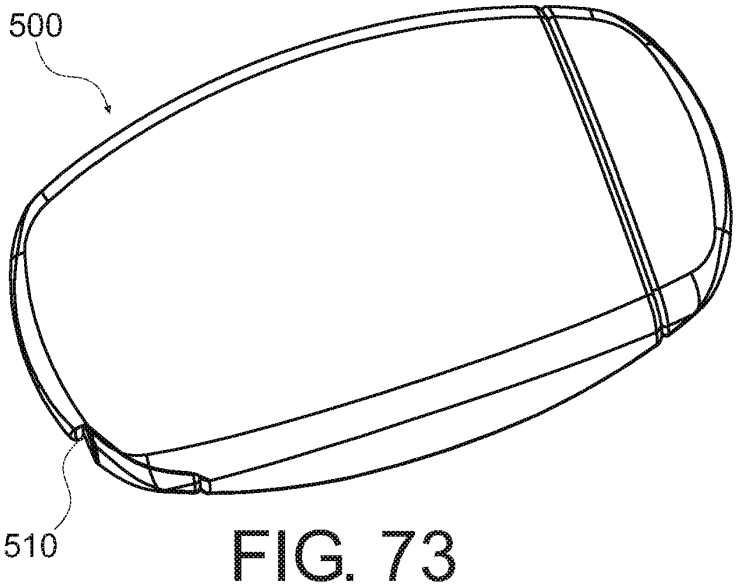


FIG. 73

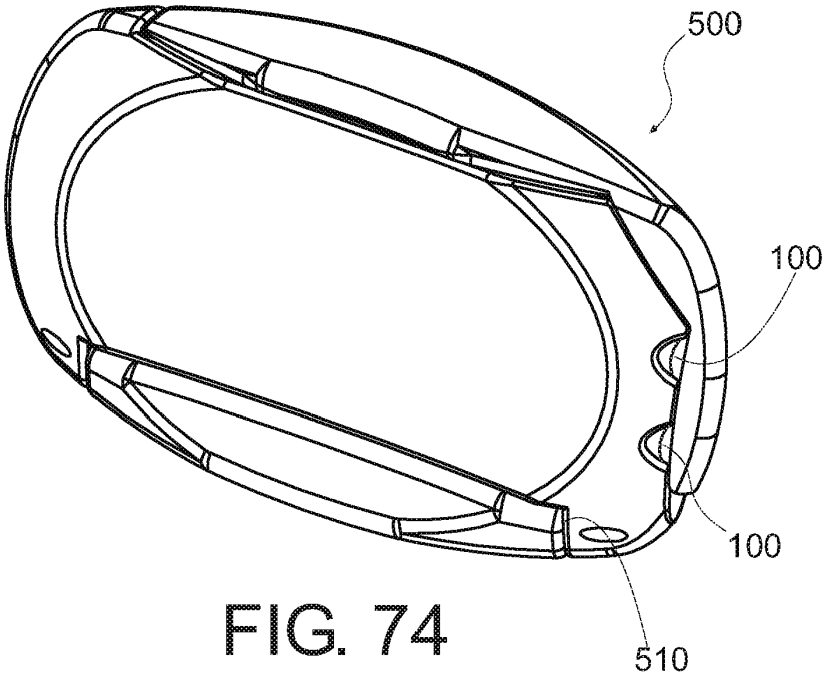


FIG. 74

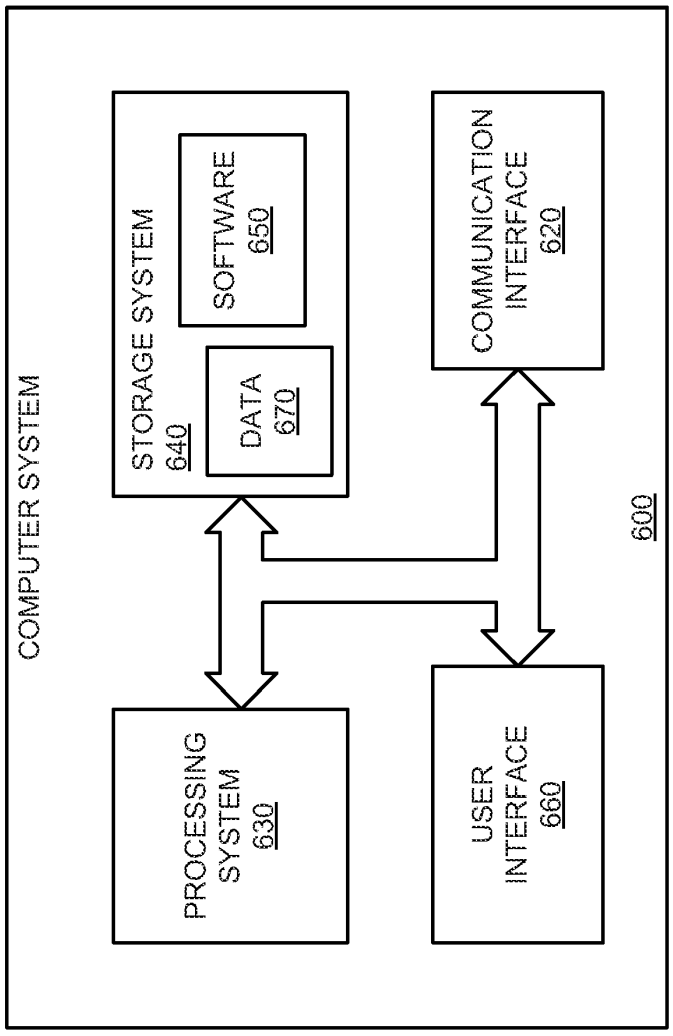

COMPUTER SYSTEM
600
STORAGE SYSTEM
640
SOFTWARE
650
DATA
670
COMMUNICATION INTERFACE
620
PROCESSING SYSTEM
630
USER INTERFACE
660

FIGURE 75

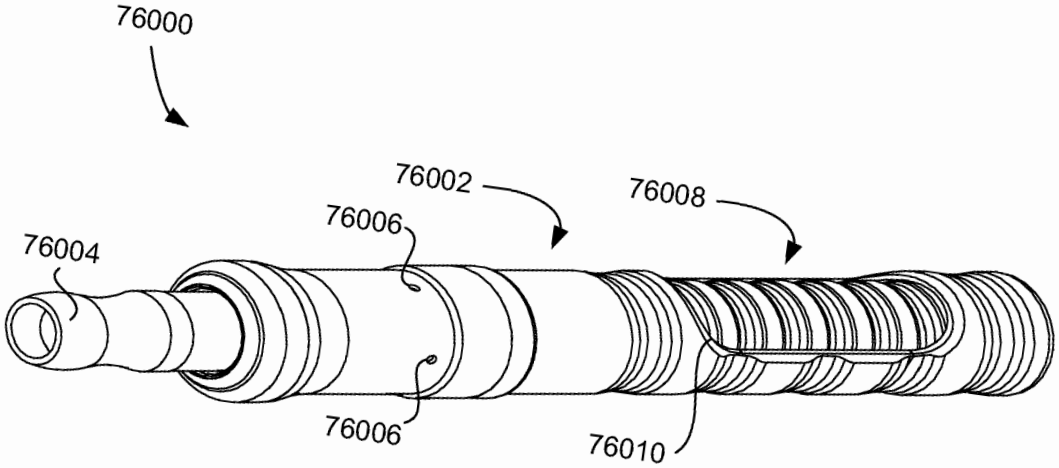


FIG. 76A

NJOY Exhibit 1002.1984

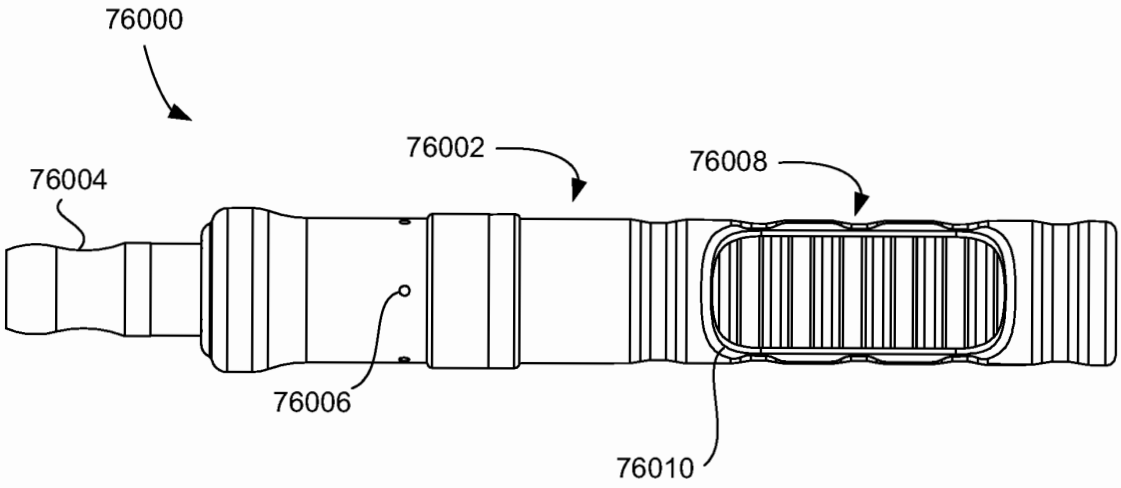


FIG. 76B

NJOY Exhibit 1002.1985

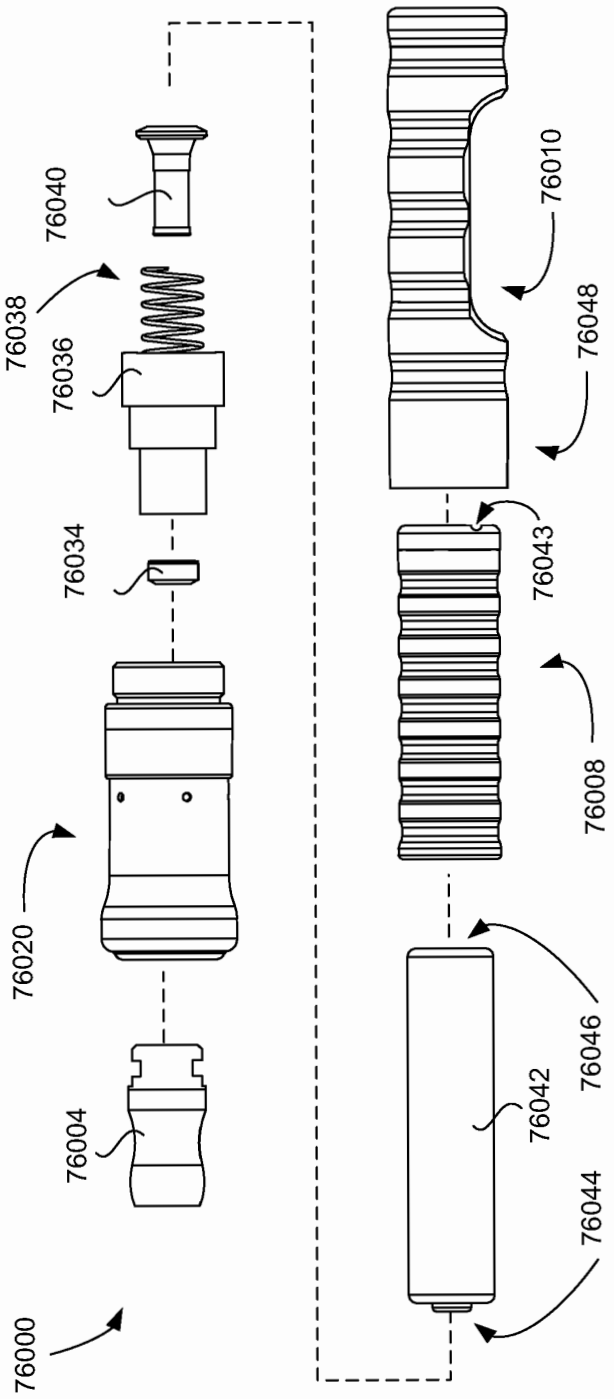

76000
76004
76020
76034
76036
76038
76040
76042
76044
76046
76008
76043
76048
76010

FIG. 76C

FIG. 76D

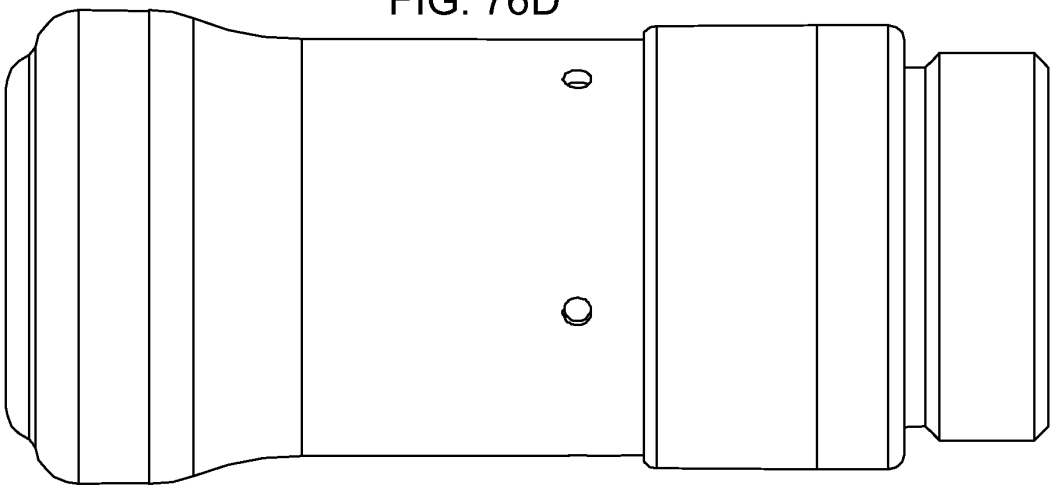


FIG. 76E

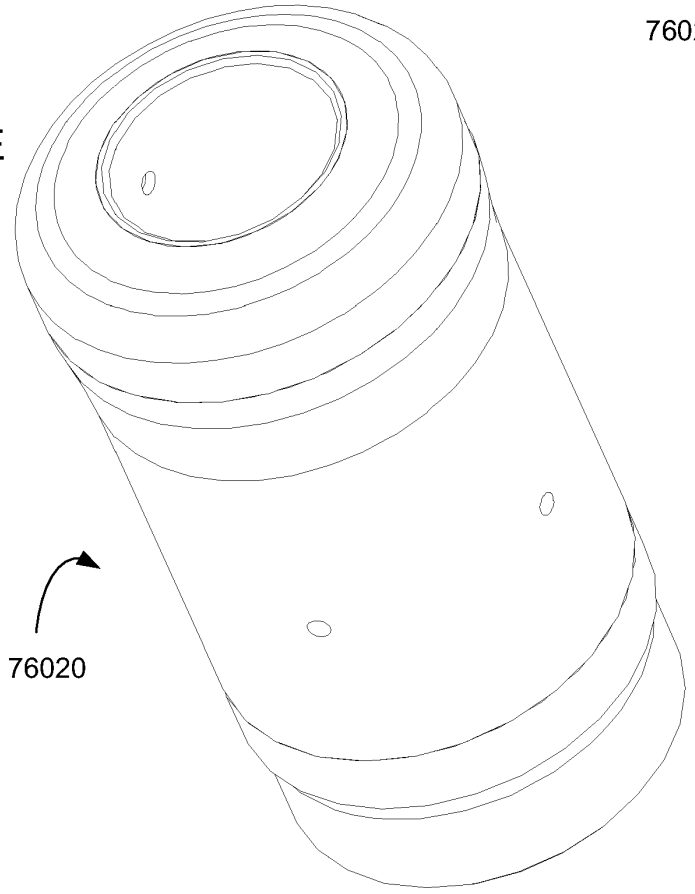
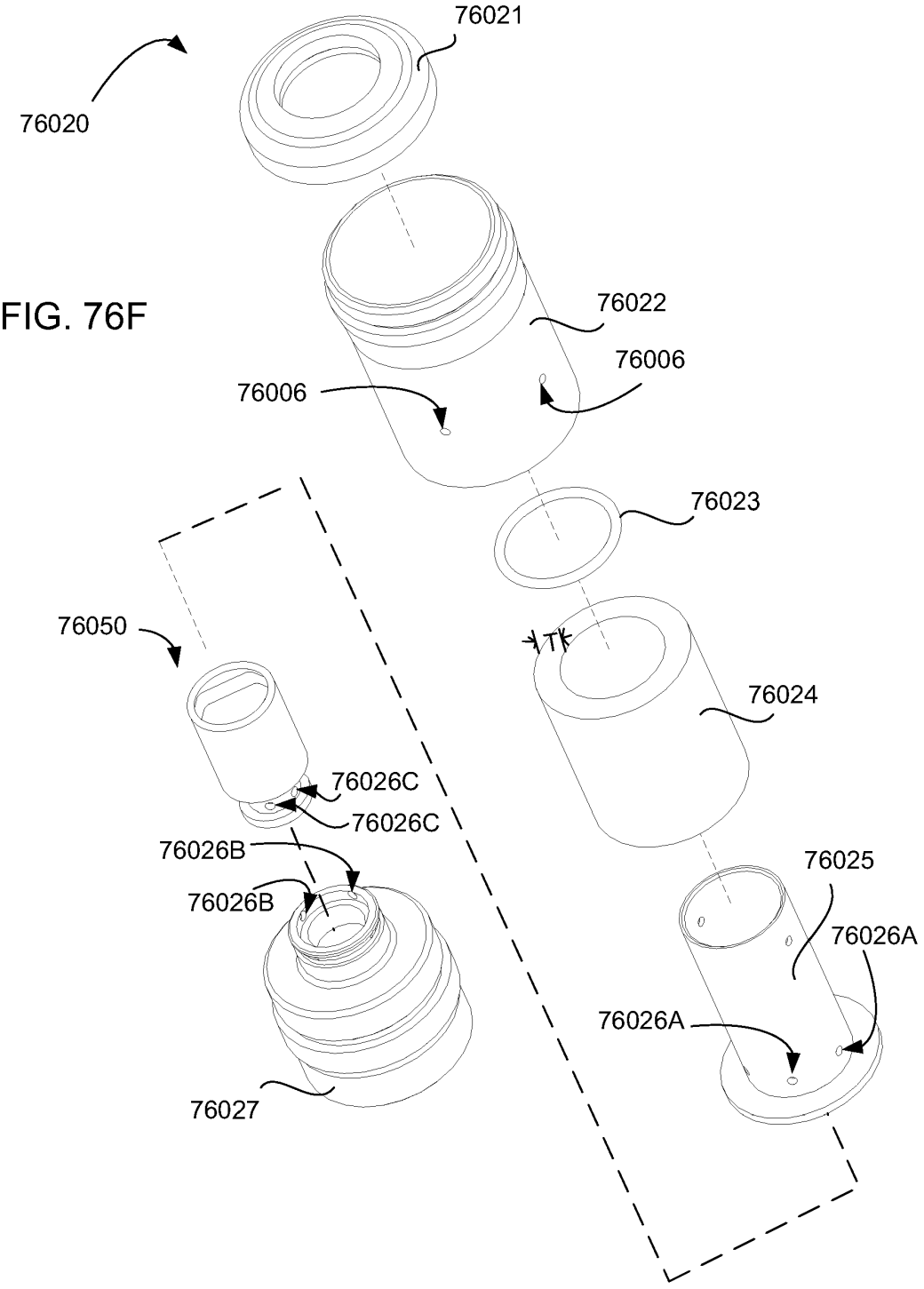


FIG. 76F



NJOY Exhibit 1002.1988

FIG. 76G

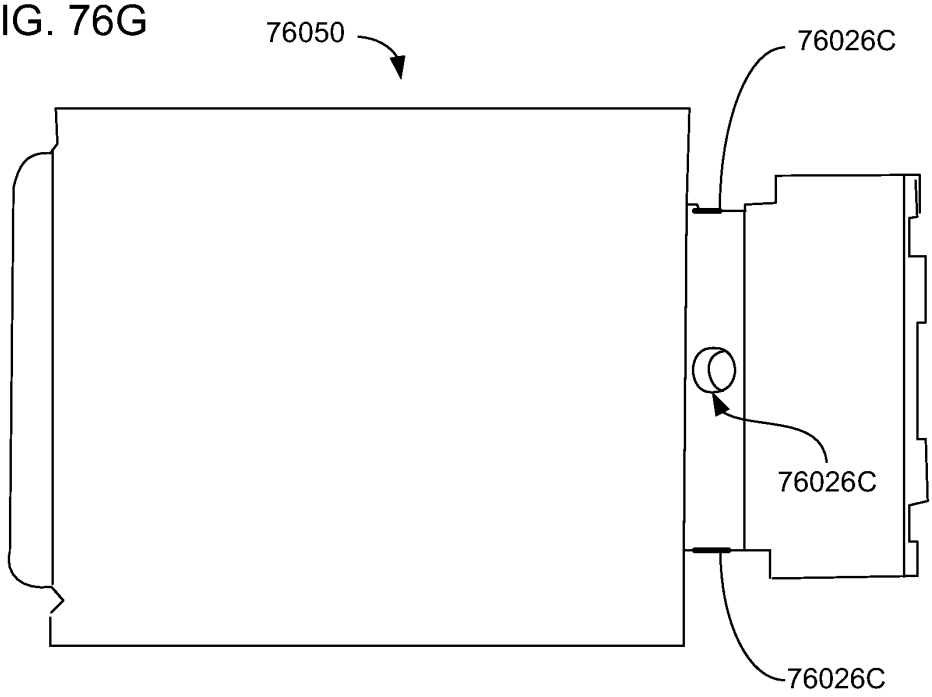
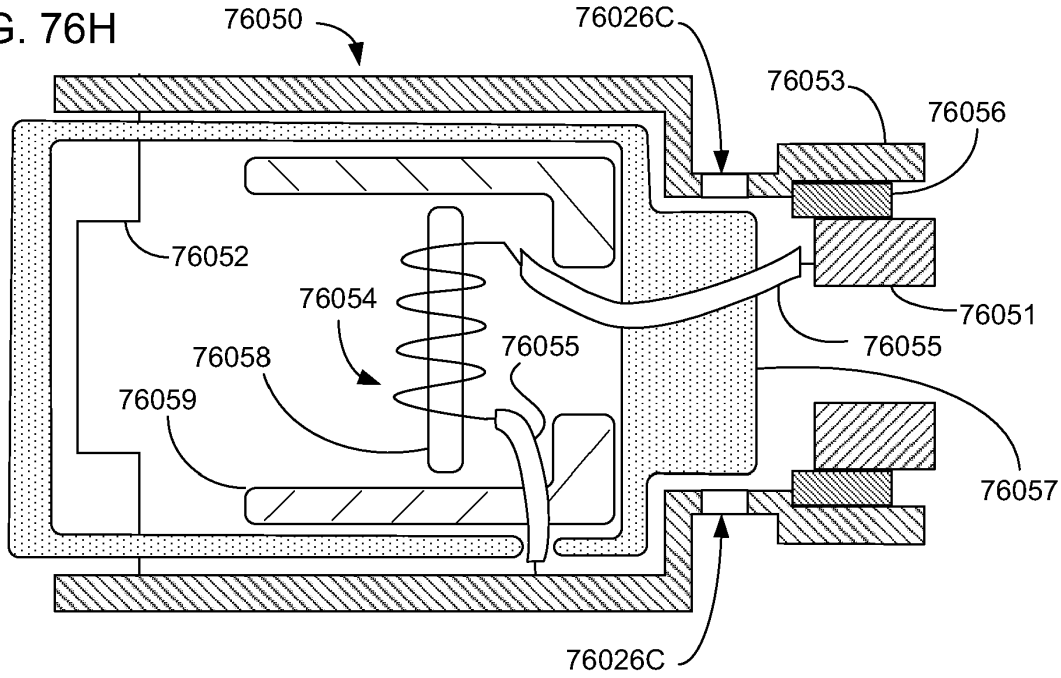


FIG. 76H



NJOY Exhibit 1002.1989

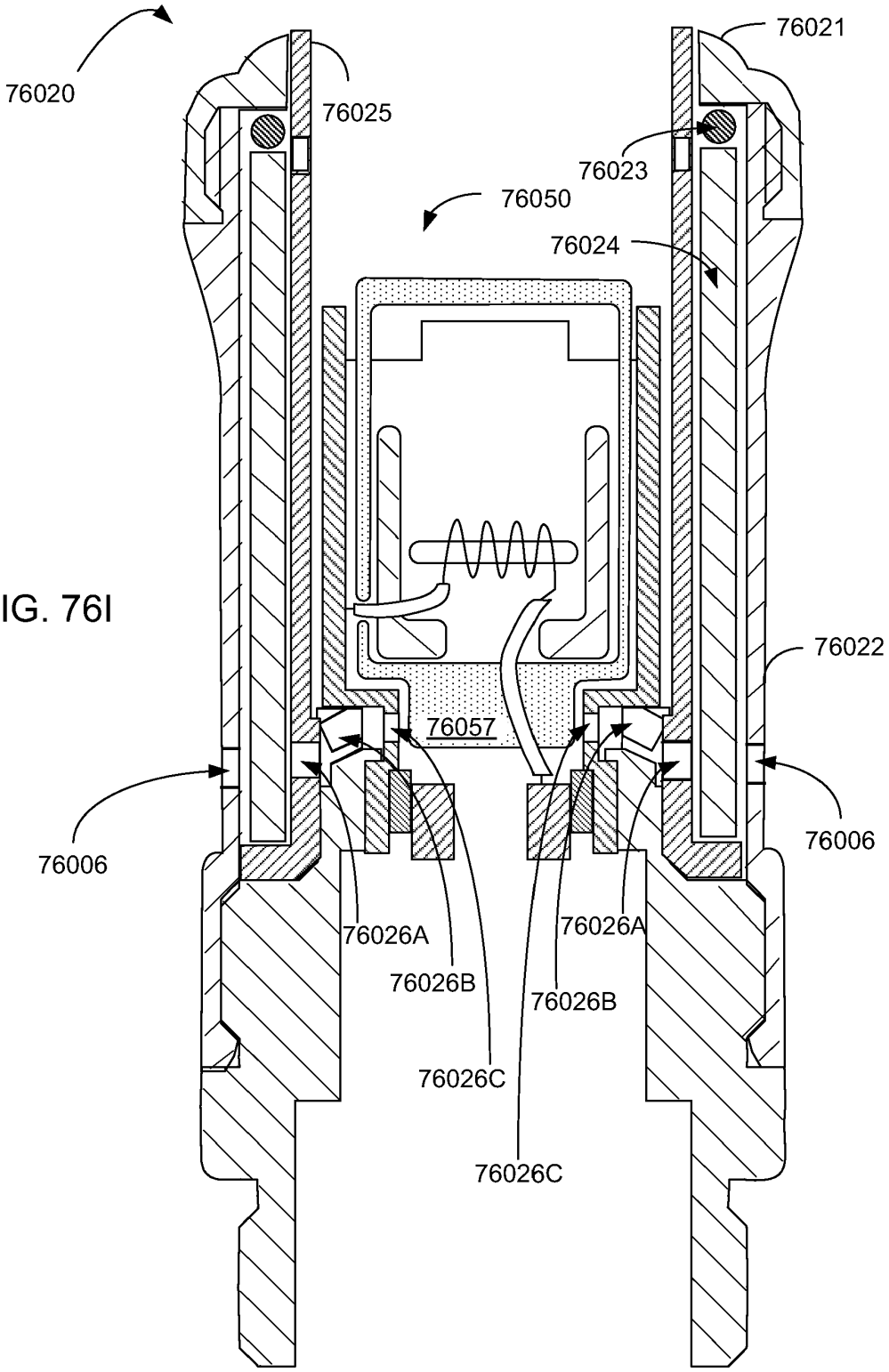


FIG. 76I

NJOY Exhibit 1002.1990

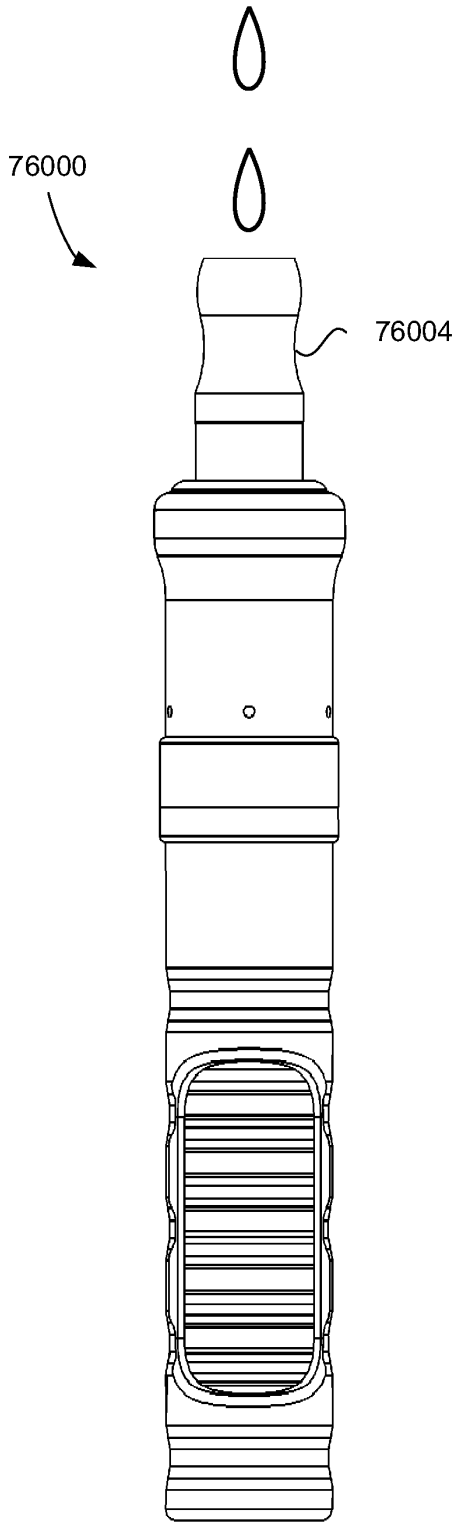
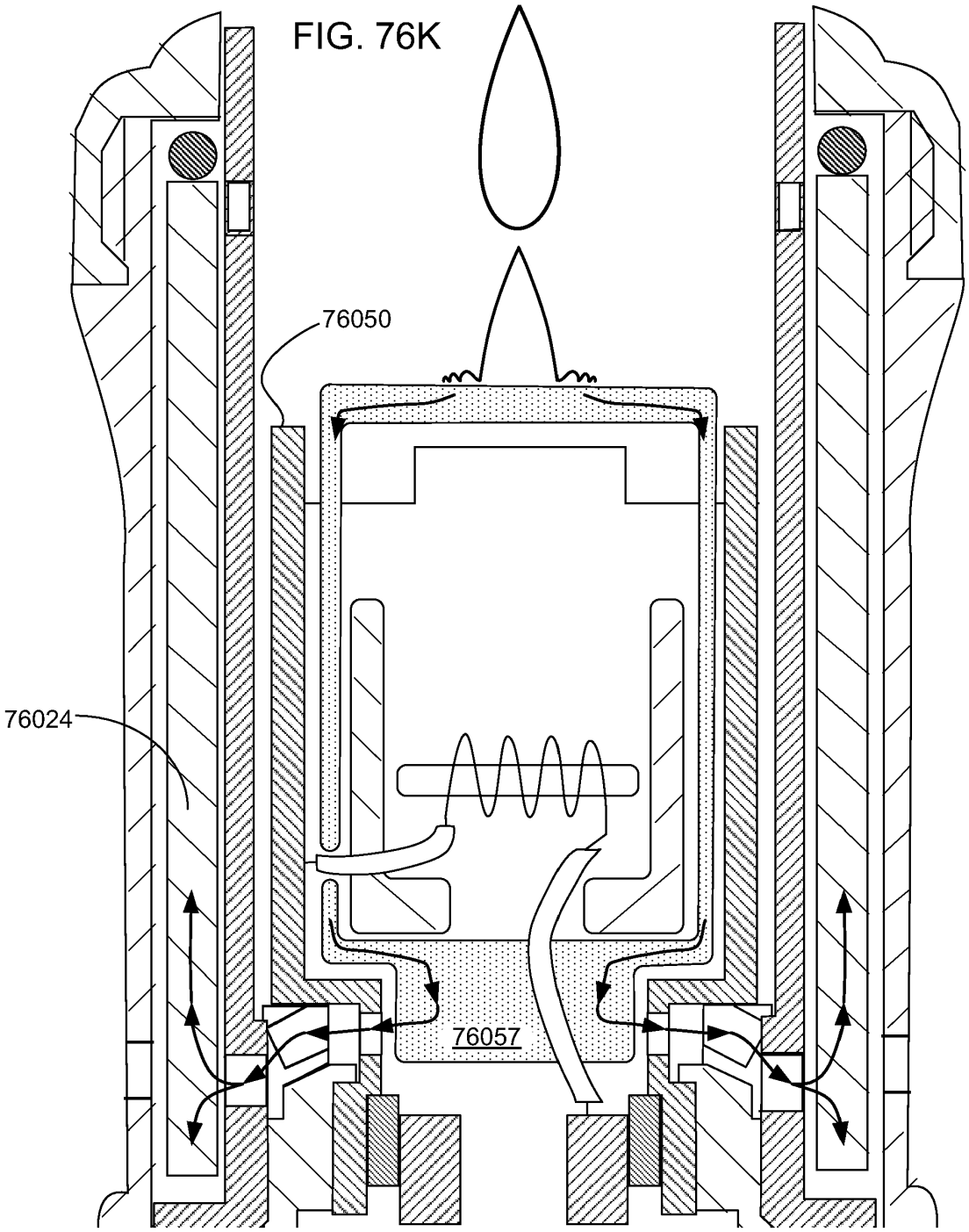


FIG. 76J

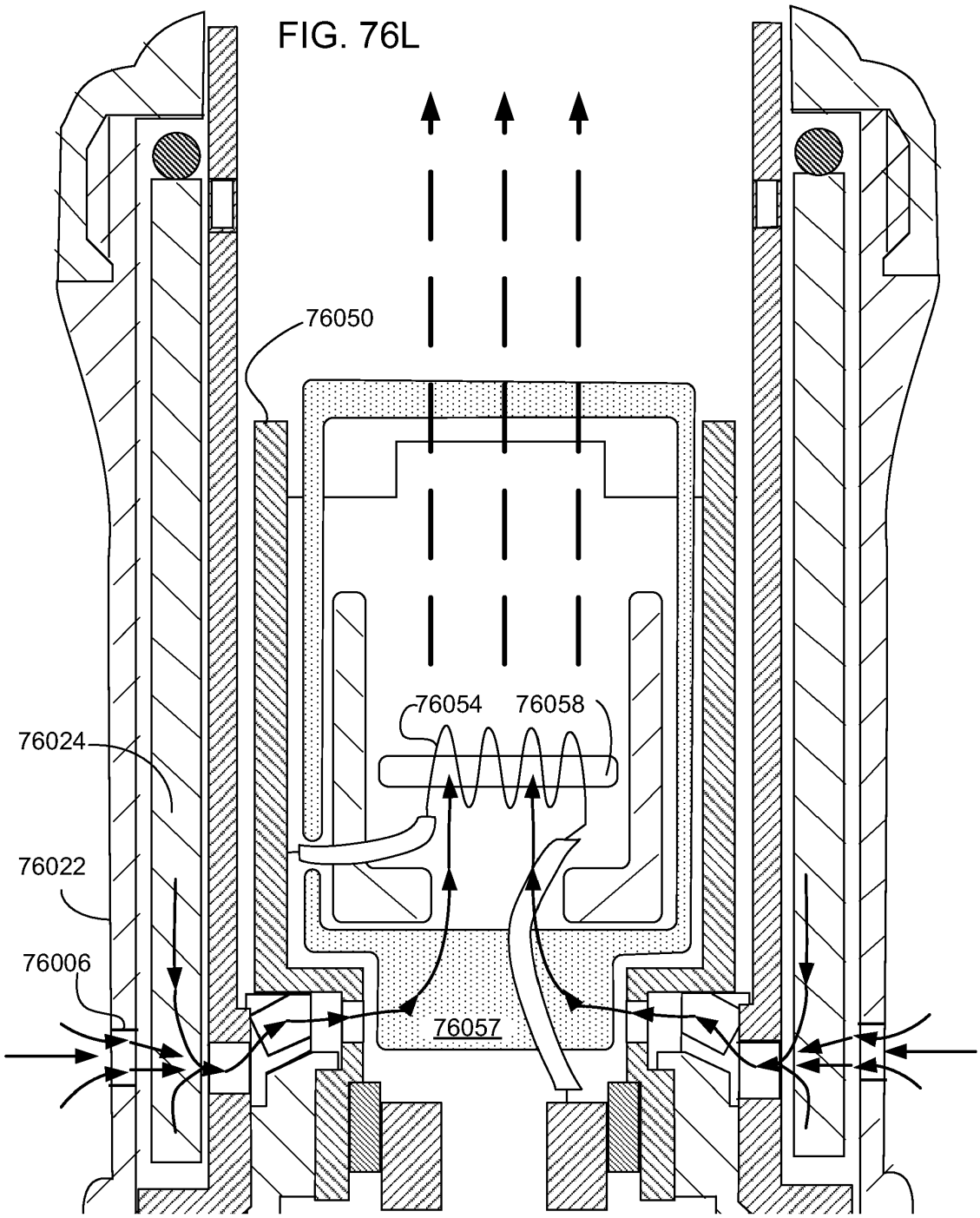
NJOY Exhibit 1002.1991

FIG. 76K



NJOY Exhibit 1002.1992

FIG. 76L



NJOY Exhibit 1002.1993

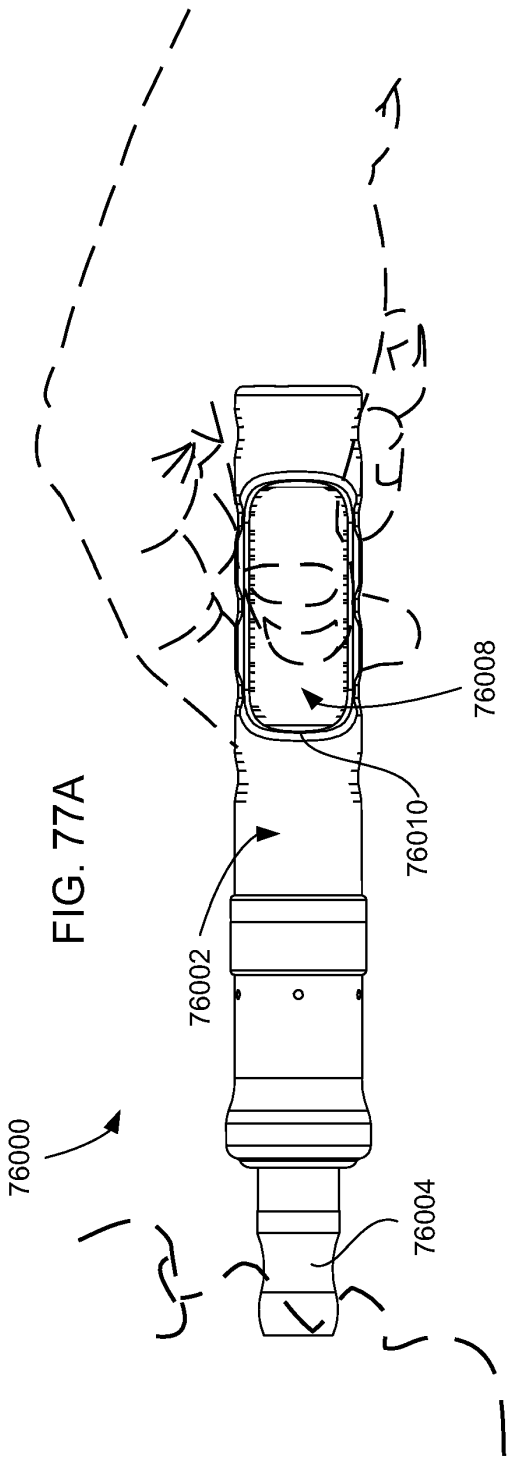


FIG. 77A

NJOY Exhibit 1002.1994

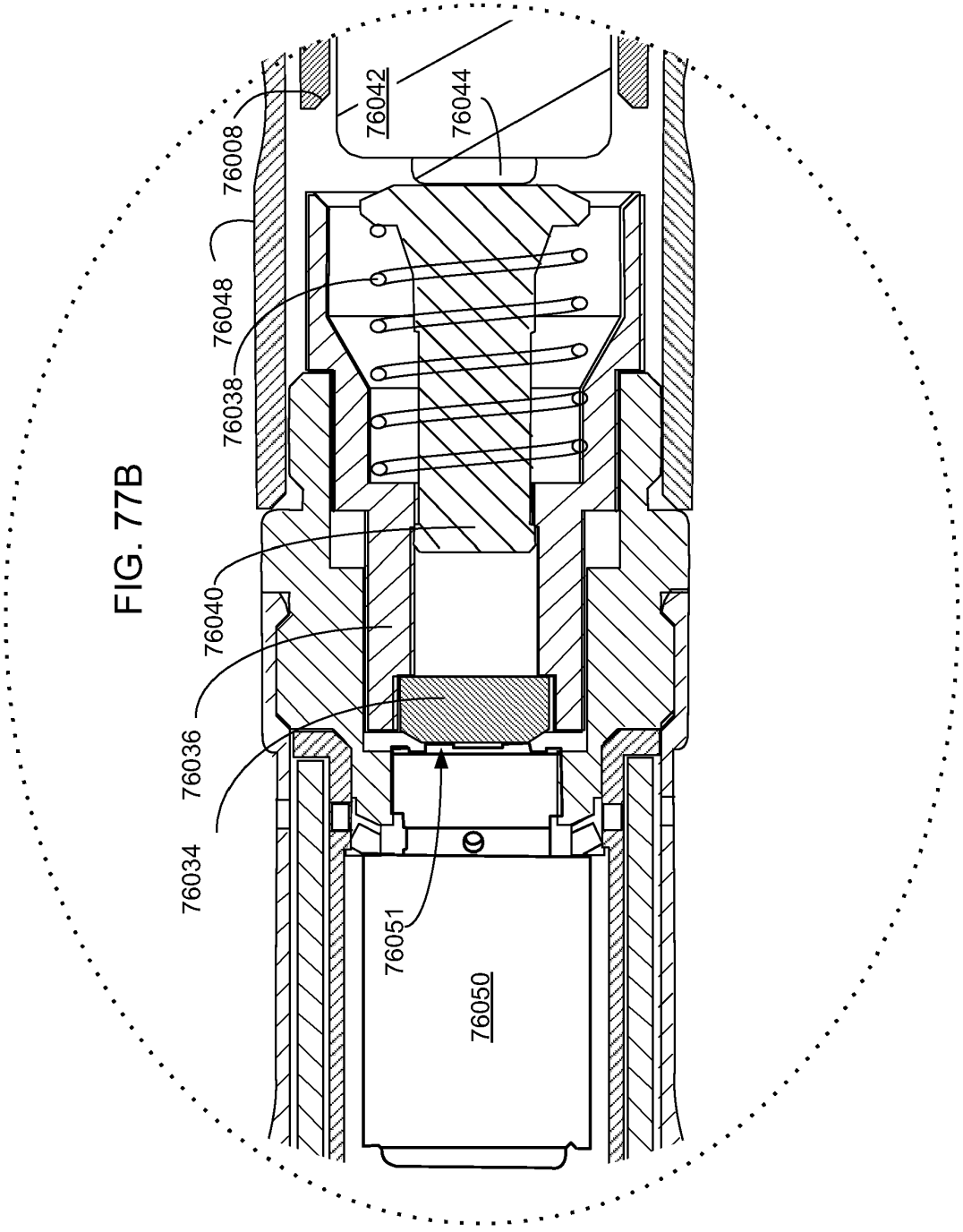


FIG. 77B

NJOY Exhibit 1002.1995

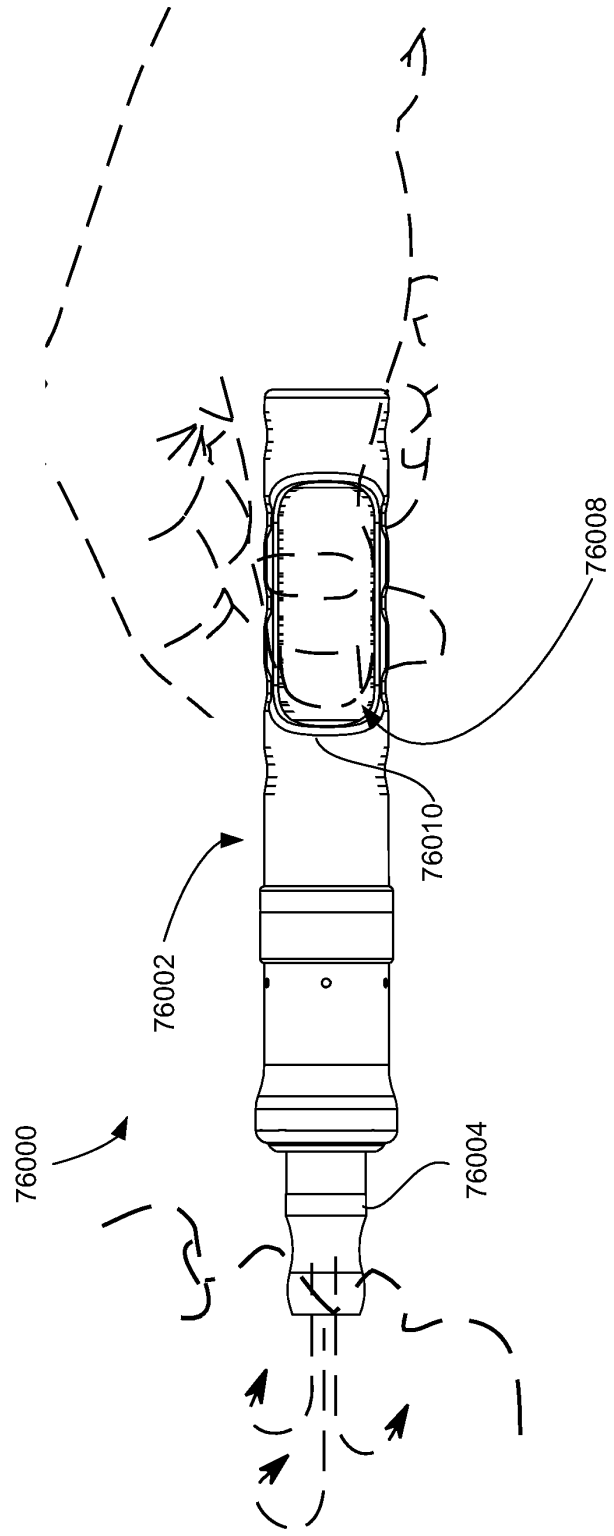


FIG. 77C

NJOY Exhibit 1002.1996

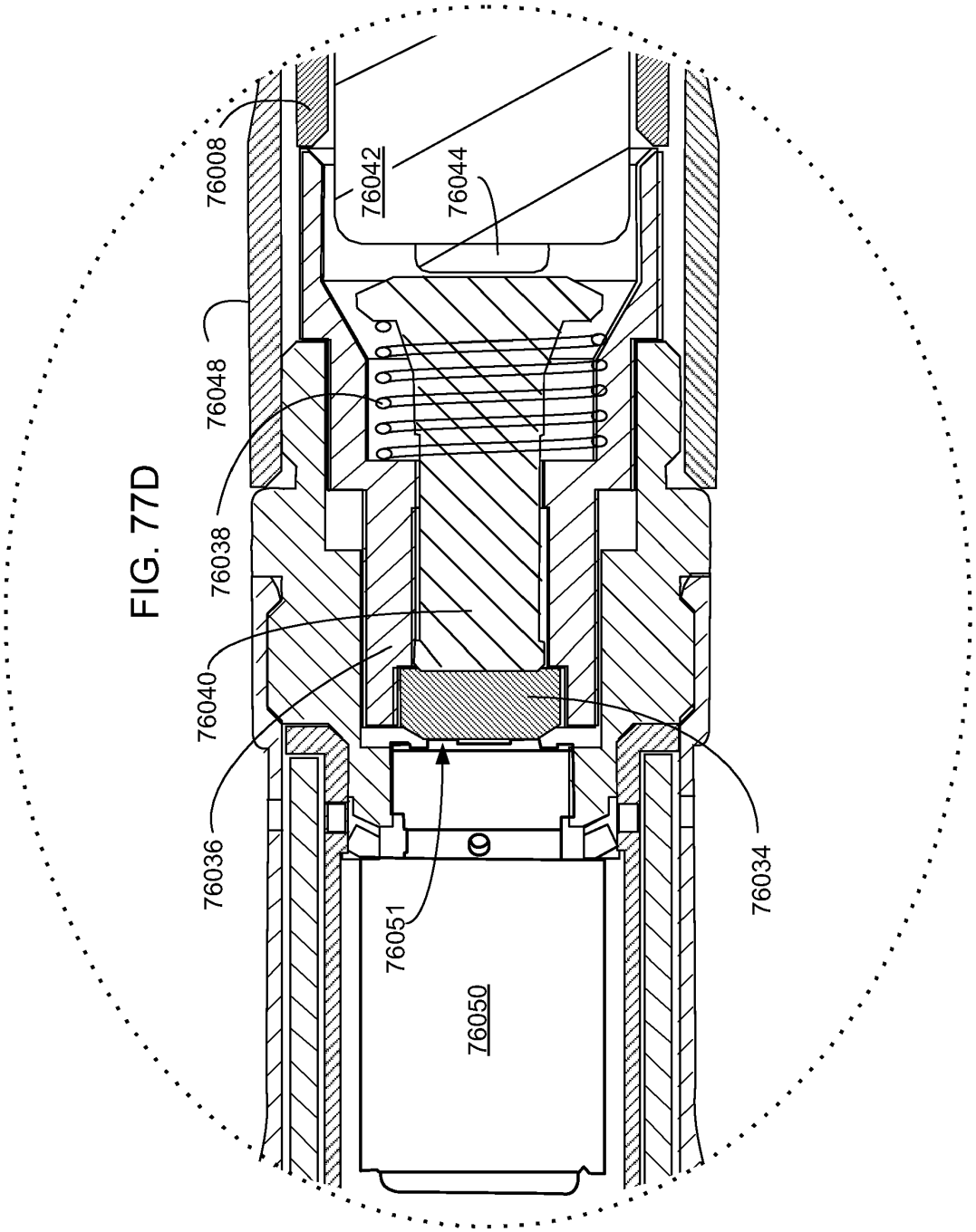


FIG. 77D

NJOY Exhibit 1002.1997

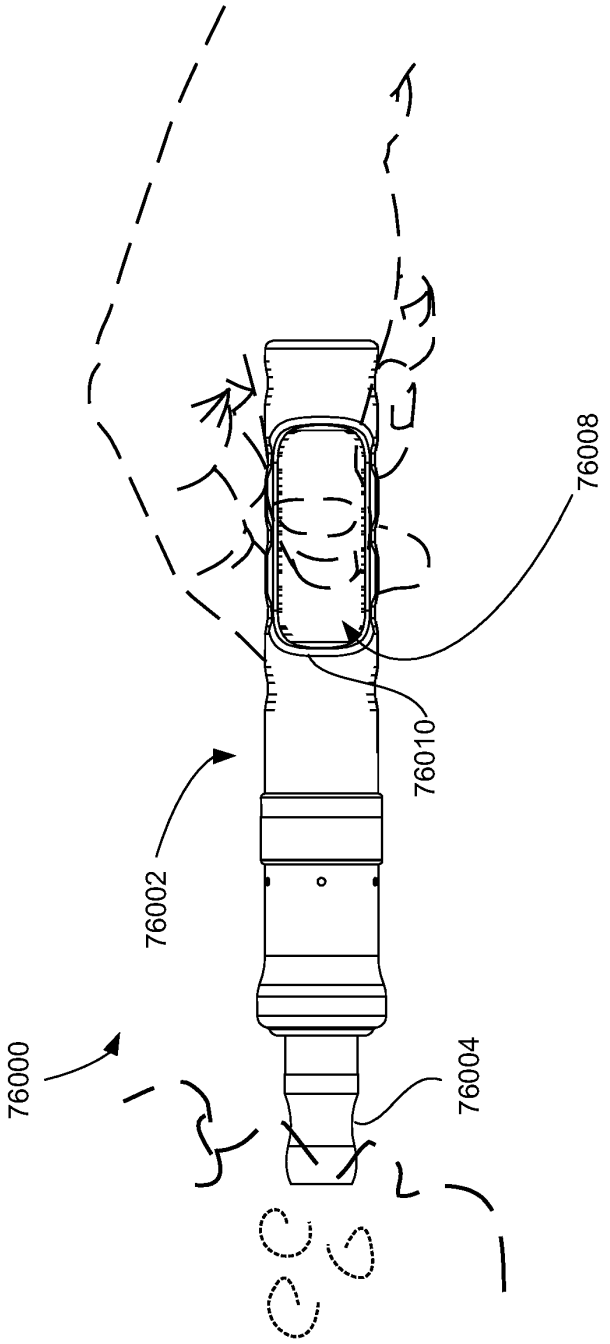


FIG. 77E

NJOY Exhibit 1002.1998

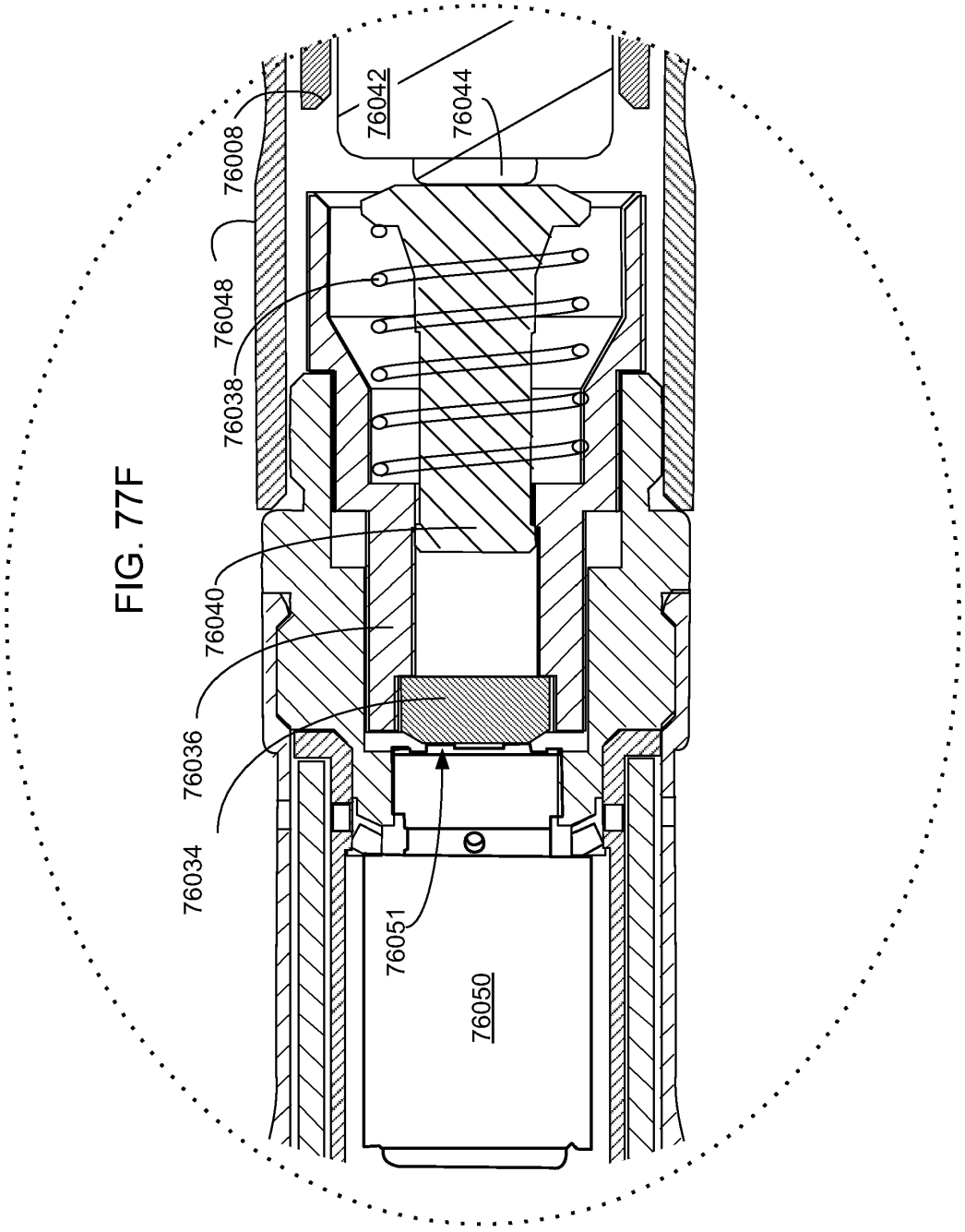

76042
76044
76008
76048
76038
76040
76036
76034
76051
76050

FIG. 77F

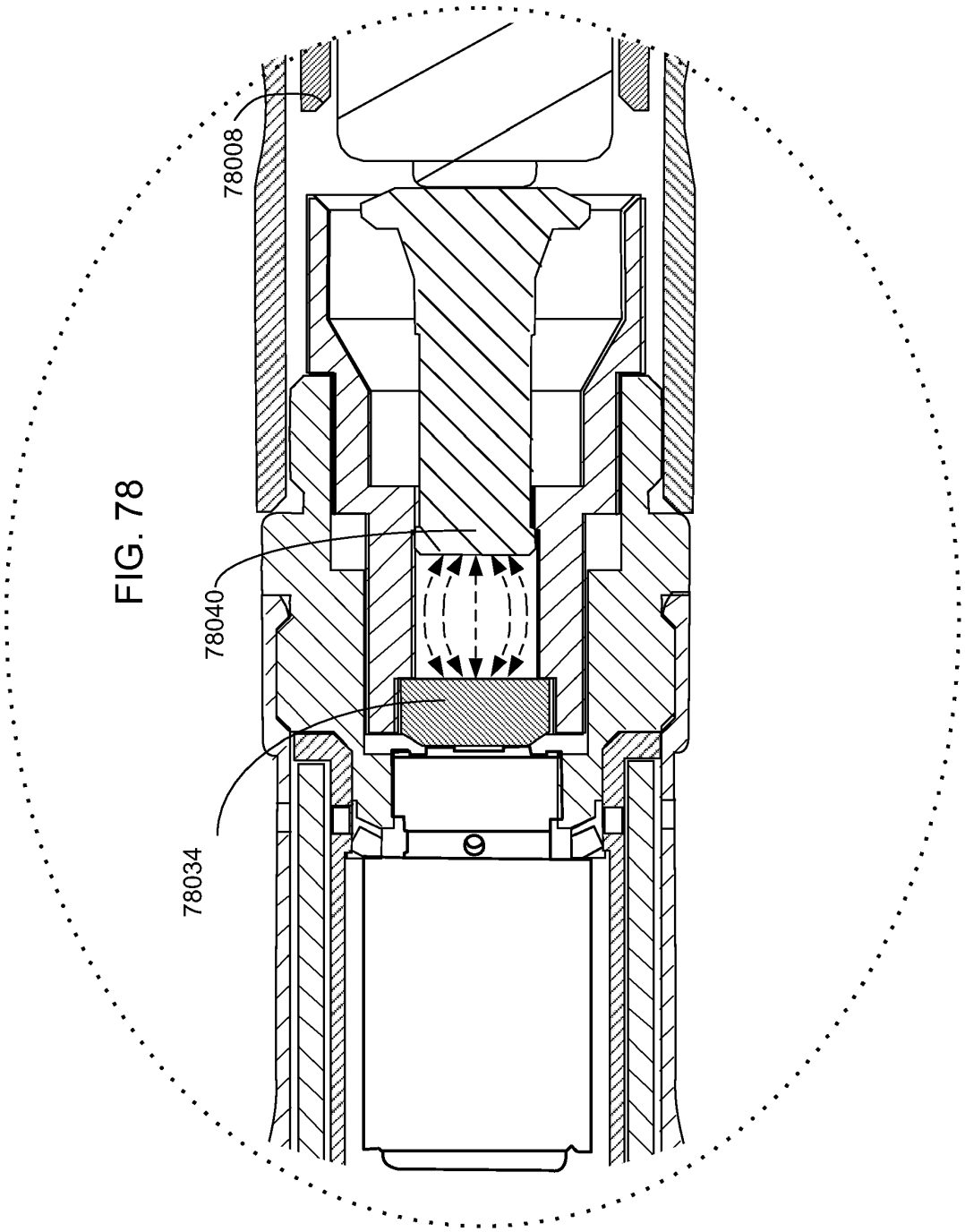


FIG. 78

NJOY Exhibit 1002.2000

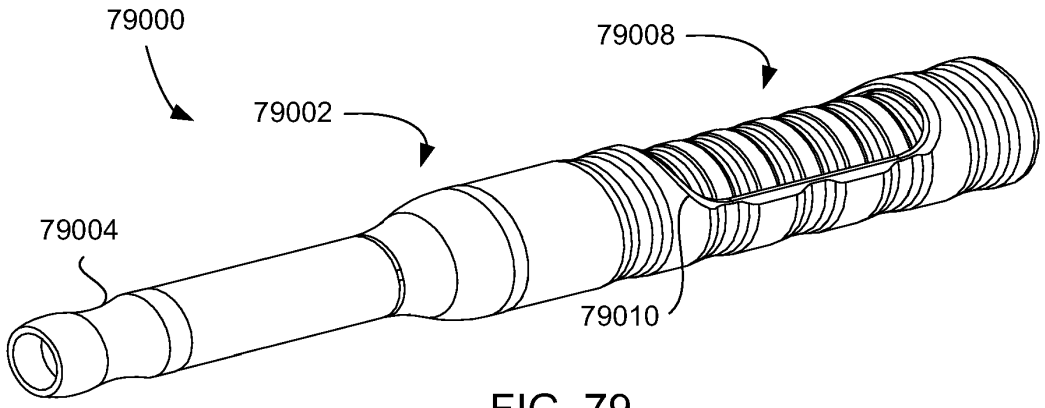


FIG. 79

NJOY Exhibit 1002.2001

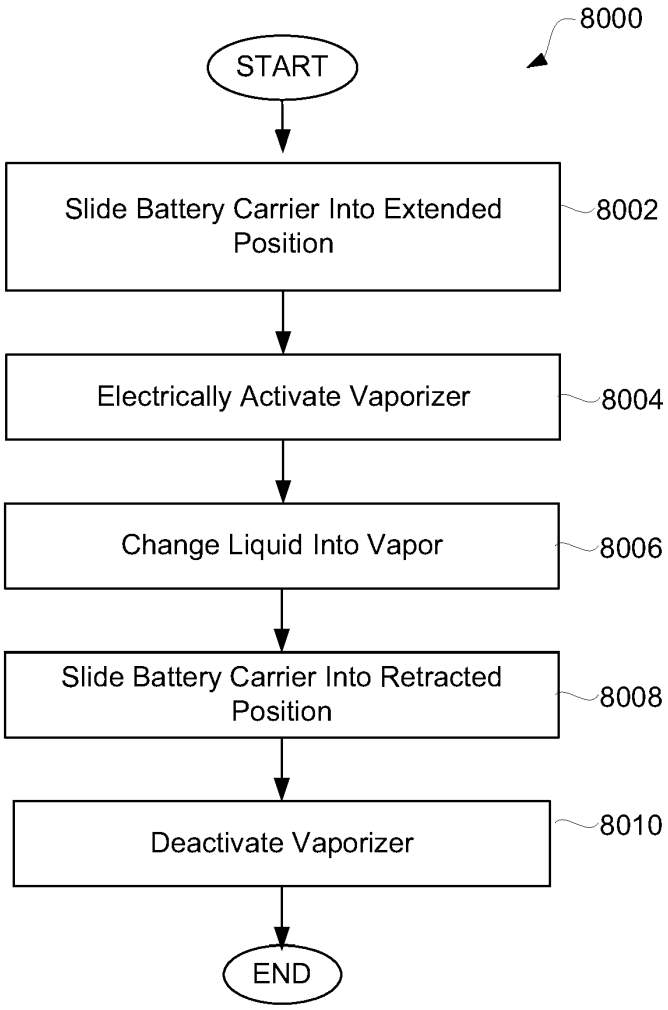

8000
START
Slide Battery Carrier Into Extended Position
8002
Electrically Activate Vaporizer
8004
Change Liquid Into Vapor
8006
Slide Battery Carrier Into Retracted Position
8008
Deactivate Vaporizer
8010
END

FIG. 80

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
10 May 2012 (10.05.2012)

PCT

(10) International Publication Number
WO 2012/059726 A2

(51) International Patent Classification:
A61L 9/015 (2006.01)

(21) International Application Number:
PCT/GB2011/001562

(22) International Filing Date:
4 November 2011 (04.11.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1018644.3 4 November 2010 (04.11.2010) GB
1020392.5 1 December 2010 (01.12.2010) GB

(71) Applicant *(for all designated States except US)*: **MOVING SUN LIMITED** [GB/GB]; Masters House, 107 Hammersmith Road, London W14 0QH (GB).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **SEGURA RIUS, Francisco, Javier** [GB/GB]; Masters House, 107 Hammersmith Road, London W14 0QH (GB). **HEWETT, Carl, Gordon** [GB/GB]; Masters House, 107 Hammersmith Road, London W14 0QH (GB). **EZBIRI, Abdelouahed** [GB/GB]; Masters House, 107 Hammersmith Road, London W14 0QH (GB).

(74) Agent: **PONDER, William, Anthony, John**; Reddie & Grose, 16 Theobalds Road, London WC1X 8PL (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

(54) **Title**: APPARATUS FOR GENERATING HYDROXYL RADICALS

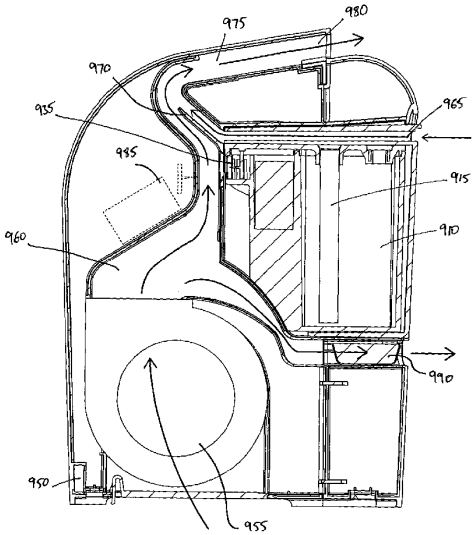


Figure 9

(57) **Abstract**: The invention provides a consumable cartridge for use in a hydroxyl radical generating apparatus, the consumable cartridge comprising: a reactant supply comprising a supply of a substance that reacts with ozone to form hydroxyl radicals; and an ozone supply comprising an ozone generator; wherein the ozone supply is fixed to the reactant supply. By supplying both a reactant supply and an ozone generator in the same consumable cartridge, maintenance operations on an associated base unit in a hydroxyl radical generating system can be minimised.

WO 2012/059726 A2

NJOY Exhibit 1002.2003

Apparatus for Generating Hydroxyl Radicals

Field of the Invention

The present invention relates to an apparatus for producing hydroxyl radicals for delivery to an indoor environment. In particular, the invention relates to an apparatus comprising a consumable cartridge for use with a base unit, wherein the consumable cartridge and base unit operate together to provide and deliver hydroxyl radicals.

Background to the Invention

The use of hydroxyl radicals as an airborne disinfectant in hospitals and other indoor environments is now becoming widespread. The disinfectant property of hydroxyl radicals has been known since the publication of research conducted in the 1960s at Porton Down in the UK and TNO in The Netherlands. Air based disinfection using hydroxyl radicals mimics a naturally occurring process in the outdoor environment, and so the concentration of hydroxyl radicals in the air is sometimes referred to as the "open air factor".

One example of an apparatus for generating hydroxyl radicals for airborne disinfectant is described in WO 2005/026044. A further apparatus is described in WO 2008/125879. The essential components of the apparatuses described in these documents are a supply of olefin, such as terpene, and a supply of ozone. An olefin vapour is produced from the supply of olefin and is mixed and reacts with the ozone to produce hydroxyl radicals.

While this basic chemistry for producing hydroxyl radicals is now well understood, there is a need to provide a convenient, safe and effective system for supplying hydroxyl radicals to an indoor environment. In particular, it would be desirable to provide a system that can be continuously and effectively operated by consumers with minimal interruption for maintenance and replenishment.

NJOY Exhibit 1002.2004

Summary of the Invention

The present invention is defined in the appended independent claims, to which reference should be made. Preferred features of the invention are set out in the dependent claims.

In a first aspect, the invention provides a consumable cartridge for use in a hydroxyl radical generating apparatus, the consumable cartridge comprising:

a reactant supply comprising a supply of a substance that reacts with ozone to produce hydroxyl radicals, and

an ozone supply comprising an ozone generator;

wherein the ozone supply is fixed to the reactant supply.

By supplying both a reactant supply and an ozone generator in the same consumable cartridge, maintenance operations on an associated base unit in a hydroxyl radical generating system can be minimised.

The reactant supply is consumed and will become exhausted during use. It therefore needs to be replenished. The rate at which the reactant supply is used up depends on the pattern of usage of the apparatus and the size of the supply, but in view of a number of factors, including the physical size of the device, a reactant refill is typically designed to last a few months. In the system as described in WO 2008/125879, for example, olefin cartridges are replaced approximately every three months.

In prior apparatuses employing a base unit and refill cartridges, such as described in WO 2008/125879, an electronic ozone generator has been provided within the base unit together with the other electronic elements of the system. The base unit typically includes electronics for controlling a pump or fan to drive air through the base unit and power control electronics for providing the correct voltage to the ozone supply.

NJOY Exhibit 1002.2005

However, the inventors have recognised that electronic ozone generators, although not consumable, also have a limited lifetime, particularly with continuous usage. The performance of an electric ozone generator, such as a corona discharge ozone generator, will degrade over time. An electric ozone generator might be expected to provide an acceptable level of performance for three or four months of continuous use. The other electronic elements of the system typically have a longer lifetime than the ozone generator, and accordingly it is the ozone generator that usually needs replacing first and most frequently from the electronic components.

Clearly, in environments such as hospitals and schools, it is vital to have disinfecting systems that are able to operate continuously and effectively, and any time in which the apparatus is out of service in order to replace faulty components is undesirable. By placing an ozone generator in the consumable cartridge, the ozone generator can be replaced at the same time as the reactant supply by an end user, and the need to call out technically trained service personnel to replace faulty or broken ozone generators can be avoided. The reactant supply and the ozone generator can be designed to have the same expected operating life.

Preferably, the ozone generator is an electrically powered ozone generator, such as corona discharge ozone generator or plasma ion generator. Other types of electrically powered ozone generator can be used, for example a cold plasma ozone generator, a UV type ozone generator, or a stainless steel filament in a dielectric tube. Preferably, the consumable cartridge includes at least one electrical contact configured to allow connection of an external power supply to the ozone generator.

Preferably, the consumable cartridge comprises an external housing, the reactant supply and the ozone supply being positioned within the external housing, wherein the electrical contact is accessible from an exterior of the external housing.

NJOY Exhibit 1002.2006

The consumable cartridge may include a transformer and other electronic components. The transformer is used to provide the required voltage to the ozone generator, which is typically between 10 and 20 kV. Alternatively, the consumable cartridge may be configured for use with a base unit which contains an appropriate high voltage power source or a transformer for converting an external or battery supply voltage. As an alternative, the consumable cartridge may include a battery together with a suitable transformer.

The reactant supply is preferably a reservoir containing the substance that reacts with ozone to produce hydroxyl radicals. The substance may be delivered from the reservoir by a capillary wick or membrane. The liquid may be vaporised by a flow of air past the wick or membrane. Additionally, a heater may be employed to aid vaporisation.

The cartridge may comprise a first air inlet and a first outlet, wherein the first outlet is in fluid communication with the reactant in the reactant supply and the first inlet, and

the cartridge may comprise a second air inlet and a second outlet, wherein the second outlet is in fluid communication with the ozone generator and the second air inlet.

Alternatively, the first air inlet and first air outlet may be defined by an associated base unit or by a combination of the consumable cartridge and the base unit, wherein the first outlet is in fluid communication with the reactant in the reactant supply and the first inlet. Similarly, the second air inlet and second air outlet may be defined by an associated base unit or by a combination of the consumable cartridge and the base unit, wherein the second outlet is in fluid communication with the ozone generator and the second air inlet.

The first outlet may be positioned adjacent the second outlet, and the cartridge (and/or base unit) may be configured so that air flow through one of the first outlet and the second outlet draws air through the other of the first outlet and

NJOY Exhibit 1002.2007

the second outlet. This suction of air exploits the Venturi effect, which is a well understood effect in fluid dynamics.

The suction due to the Venturi effect can be controlled by appropriate geometry of the air flow conduits. For example, the consumable cartridge may define a first air conduit between the first air inlet and the first outlet that narrows between the first air inlet and the first outlet. Narrowing the conduit in this way increases the magnitude of the Venturi effect and so provides greater suction through the second outlet. Alternatively, or in addition, the consumable cartridge may define a second air conduit between the second air inlet and the second outlet, the second air conduit narrowing between the second air inlet and the second outlet. However, in practical devices, the required air flow past the reactant supply has been found to be so small that narrowing of the ozone conduit is often not necessary, and parallel sided conduits can be used.

The consumable cartridge or base unit may include a mixing chamber having a dispensing opening, the mixing chamber in fluid communication with both the first outlet and the second outlet, and configured to ensure a substantially complete reaction of vapours from the reactant supply with ozone from the ozone supply before release to the user environment through the dispensing opening.

The reactant supply may comprise a supply of olefin, such as D-Limonene, or may be a supply of another substance such as hydrogen peroxide.

When the reactant is hydrogen peroxide the consumable cartridge or the base unit may advantageously further comprise an ion generator. The interaction of ions with ozone and hydrogen peroxide increases the yield of hydroxyl radicals and so reduces both the amount of ozone that needs to be generated and the amount of ozone that remains unreacted with the hydrogen peroxide.

The ion generator may be a separate device to the ozone generator and may be in the base unit or in the consumable cartridge, providing ions within the first or second air conduits. However, advantageously, the ion generator may be

NJOY Exhibit 1002.2008

the same device as the ozone generator. In this case, the ozone generator may be a plasma ion generator.

The ion generator is also preferably configured to ionize air at a relatively low voltage in order to avoid excessive ozone generation and nitric oxide generation. To achieve this, one of the electrodes in the ion generator may be configured with a plurality of fine spikes. This produces a high potential gradient around the spikes, increasing ionization for a given applied voltage when compared to electrode designs producing smaller potential gradients. The ion generator is preferably configured to generate negative ions, as this reduces ozone generation and nitric oxide generation compared with positive ions.

In a second aspect, the invention provides an apparatus for generating hydroxyl radicals comprising a base unit and a consumable cartridge, the consumable cartridge being in accordance with the first aspect of the invention, and the base unit comprising a means for providing electrical power to the consumable cartridge, and a means for driving air through the apparatus.

The base unit may comprise a transformer for transforming a mains voltage or other external supply voltage to a voltage suitable for the ozone generator in the consumable cartridge. The base unit may comprise a mixing chamber in fluid communication with an outlet in fluid communication with the reactant supply and an outlet in fluid communication with the ozone supply, the mixing chamber further comprising a dispensing outlet.

The base unit may comprise a base unit air inlet and base unit air conduit between the base unit air inlet and an air inlet on the consumable cartridge, or partially defined by the consumable cartridge, wherein the inlet conduit narrows between the base unit air inlet and the air inlet on, or partially defined by, the consumable cartridge. The narrowing of the inlet conduit accelerates the air flow towards the air inlet on, or partially defined by, the consumable cartridge. The speed of the air flow past the ozone generator affects the concentration of ozone in the air supplied to the mixing chamber. The narrowing of the inlet

NJOY Exhibit 1002.2009

conduit can therefore be designed to provide a predetermined ozone concentration. Other ways to control ozone and olefin concentration include controlling the speed of a pump or blower used as the means for driving air through the apparatus, and controlling the voltage supplied to the ozone generator.

The base unit may comprise an ion generator within or adjacent the base unit air conduit. The ion generator is also preferably configured to ionize air at a relatively low voltage in order to avoid excessive ozone generation and nitric oxide generation. To achieve this, electrodes in the ion generator may be configured as a plurality of fine spikes. This produces a high potential gradient around the spikes, increasing ionization for a given applied voltage when compared to electrode designs producing smaller potential gradients. The ion generator is preferably configured to generate negative ions, again to reduce ozone generation and nitric oxide generation.

In a third aspect, the invention provides a base unit for producing hydroxyl radicals, the base unit suitable for use with a consumable cartridge in accordance with the first aspect of the invention and a means for connection with a power supply, a base unit air inlet, a means for moving air through the consumable cartridge, and a socket configured to receive the consumable cartridge, the socket including electrical contacts suitable for supplying electrical power from the means for connection with a power supply to the consumable cartridge.

The base unit may comprise a base unit air conduit between the base unit air inlet and an air inlet on, or partially defined by, the consumable cartridge, wherein the base unit air inlet conduit narrows between the base unit air inlet and air inlet on, or partially defined by, the consumable cartridge. The narrowing of the air inlet conduit accelerates the air flow to the air inlet on the consumable cartridge.

The base unit may comprise an ion generator within or adjacent the base unit air conduit. The ion generator is also preferably configured to ionize air at a

NJOY Exhibit 1002.2010

relatively low voltage in order to avoid excessive ozone generation and nitric oxide generation. To achieve this, electrodes in the ion generator may be configured as a plurality of fine spikes. This produces a high potential gradient around the spikes, increasing ionization for a given applied voltage when compared to electrode designs producing smaller potential gradients. The ion generator is preferably configured to generate negative ions, again to reduce ozone generation and nitric oxide generation.

In a fourth aspect, the invention provides a hydroxyl radical generating apparatus, comprising:

at least one air inlet and a dispensing outlet, and an air flow path between the air inlet and the dispensing outlet;

a supply of hydrogen peroxide configured to supply hydrogen peroxide into the air flow path;

a supply of ozone configured to supply ozone into the air flow path; and

an ioniser configured to generate and supply ions into the air flow path.

The apparatus may comprise a first air inlet and a second air inlet. The apparatus may further comprise a mixing chamber, the mixing chamber in fluid communication with the first and second air inlets and the dispensing outlet. The supply of hydrogen peroxide may be positioned between the first air inlet and the mixing chamber. The supply of ozone may be positioned between the second air inlet and the dispensing outlet. The supply of hydrogen peroxide may be provided in one or more cartridges. The supply of ozone may also be provided in one or more cartridges, which may be the same as or different to cartridge(s) containing the supply of hydrogen peroxide.

The apparatus may comprise a first outlet, wherein the first outlet is in fluid communication with the hydrogen peroxide supply and the first inlet, and a second outlet, wherein the second outlet is in fluid communication with the ozone generator and the second air inlet. The first outlet may be positioned adjacent the second outlet, and the apparatus may be configured so that air flow through one of the first outlet and the second outlet draws air through the other of the first outlet and the second outlet. This suction of air exploits the

NJOY Exhibit 1002.2011

Venturi effect, which is a well understood effect in fluid dynamics. The first and second outlets may open into the mixing chamber.

The suction due to the Venturi effect can be controlled by appropriate geometry of the air flow conduits. For example, the apparatus may define a first air conduit between the first air inlet and the first outlet that narrows between the first air inlet and the first outlet. Narrowing the conduit in this way increases the magnitude of the Venturi effect and so provides greater suction through the second outlet. Alternatively, or in addition, the apparatus may define a second air conduit between the second air inlet and the second outlet, the second air conduit narrowing between the second air inlet and the second outlet.

A means to drive air through the air flow path may be provided, such as a fan, pump or blower. The means to drive air may be provided between the second air inlet and the mixing chamber, between the first air inlet and the mixing chamber or between the mixing chamber and the air outlet. More than one means to drive air through the apparatus may be provided, in different locations.

The ozone supply may be an ozone generator. Preferably, the ozone generator is an electrically powered ozone generator. Most preferably, the ozone generator also acts as the ioniser. An example of a suitable ozone generator is a corona discharge ozone generator or plasma ion generator. Other types of electrically powered ozone generator can be used, for example a cold plasma ozone generator, a UV type ozone generator, or a stainless steel filament in a dielectric tube.

If an ioniser is provided as a separate element to the ozone generator, any suitable ioniser may be used.

The apparatus may include a transformer and other electronic components. The transformer is used to provide the required voltage to the ozone generator, which is typically between 10 and 20 kV.

NJOY Exhibit 1002.2012

The hydrogen peroxide supply preferably comprises a liquid reservoir within a consumable cartridge. The hydrogen peroxide may be delivered from the reservoir by a capillary wick or membrane. The liquid may be vaporised by a flow of air past the wick or membrane. Additionally, a heater may be employed to aid vaporisation.

The apparatus may further comprise a scent supply, configured to supply a chemical having a scent into the air flow path.

In a fifth aspect, there is provided a method of producing hydroxyl radicals, comprising:

providing hydrogen peroxide into an air flow path;

providing ozone into the air flow path;

providing ions into the air flow path; and

mixing the hydrogen peroxide, ozone and ions to produce hydroxyl radicals.

The method may further comprise releasing the hydroxyl radicals from the air flow path into an external environment.

Brief description of the drawings

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

Figures 1a, 1b and 1c illustrate a consumable cartridge in accordance with a first embodiment of the invention;

Figures 2a, 2b and 2c illustrate the consumable cartridge of Figure 1 in combination with a base unit in accordance with the invention;

Figure 3 is a cross-sectional view of the consumable cartridge of Figure 1 installed in the base unit shown in Figure 2;

NJOY Exhibit 1002.2013

Figures 4a and 4b illustrate a consumable cartridge in accordance with the second embodiment of the present invention;

Figure 5 illustrates the ozone generator module of the cartridge shown in Figures 4a and 4b;

Figure 6 illustrates the consumable cartridge of the second embodiment installed in a base unit, with the casing in a removed position;

Figure 7 illustrates the flow path of air through the ozone generator shown in Figures 5 and 6;

Figure 8 is a perspective view of the dosing head shown in Figure 4;

Figure 9 is a cross-sectional view of an apparatus in accordance with a third embodiment of the invention; and

Figures 10a and 10b are a perspective view and a cross-sectional view of a cartridge for use in the apparatus of Figure 9.

Detailed description

Figures 1a, 1b and 1c illustrate a consumable cartridge in accordance with a first embodiment of the invention. Figure 1a is a side view of the cartridge, Figure 1b is an end view of the cartridge and Figure 1c is a cross-sectional view of the cartridge. The cartridge 100 comprises an olefin supply 110 and an ozone generator 120. The olefin supply comprises a container 112 in which an amount of liquid olefin, such as terpene, is stored. A wick 114 is inserted in the container and extends out of a top end of the container for delivery of olefin to an olefin outlet. This is illustrated most clearly in Figure 1c which shows the wick extending from within the container to a conduit extending between air inlet 116 and an outlet 118. Air entering the inlet 116 passes over the wick 114 and picks up an olefin vapour as it does so, before exiting through outlet 118.

NJOY Exhibit 1002.2014

The wick 114 may be formed from any suitable fibrous material, such as polypropylene fibre.

The reactant in this example is an olefin or mixture of olefins. However, other substances that react with ozone to produce hydroxyl radicals may be used, for example, hydrogen peroxide or cinnamaldehyde.

It should also be noted that the reactant supply need not be in liquid form and might be solid or gaseous instead. For example, solid beeswax may be used as an olefin source. Also, the wick illustrated in Figures 1a, 1b and 1c may be replaced by other means of conveying reactant vapour to an air flow. For example, a vapour permeable membrane may be used to separate the reactant supply from the associated air flow.

The ozone supply 120 comprises an electronic ozone generator 122 located adjacent an air passage having an inlet 124 and an outlet 126. Oxygen in the air entering through inlet passage 124 passes over the ozone generator, which in this example is a corona discharge device, and ozone is thereby formed. The ozone rich air exits through outlet 126. Suitable corona discharge ozone generators, such as plasma ion generators, are available from Trump Electronics of East Yongfu Road, Tianchang, China 201100 (www.trumpxp.com) and may be formed from aluminium oxide or calcium silicate for example. Alternative forms of ozone generator may also be used, such as UV type ozone generators, cold plasma ozone generators or a stainless steel filament in a dielectric tube.

In order to provide the necessary voltage to the ozone generator 122, electrical contacts 128a and 128b are provided on a back surface of the ozone generator. The outlets 118 and 126 are immediately adjacent one another within a unitary moulding which defines the conduits though which the air passes. The arrangement shown in Figure 1c, with the outlets immediately adjacent one another, is configured such that an air flow past the ozone generator and out of outlet 126, draws air through inlet 116 past the olefin wick and out of outlet 118. The flow of air past the olefin supply is a result of the

NJOY Exhibit 1002.2015

Venturi effect, which is a well-understood effect in fluid dynamics. The air flow exiting outlet 126 causes a reduction in pressure in the region of outlet 126, which pulls air through inlet 116. This is illustrated more clearly in Figure 3.

The moulding defining the air inlets and outlets of the ozone supply and the olefin supply can be connected to the container 112 using a screw fitting or push fitting.

The electrical contacts 128a and 128b are formed from any suitable conducting material, such as copper, and are spaced apart to avoid arcing. Corona discharge ozone generators operate at very high voltages so that arcing is possible problem if the electrical contacts are placed too close together.

Figures 2a, 2b and 2c illustrate the cartridge shown in Figures 1a, 1b and 1c, and its relationship with a base unit which is configured to connect directly to a mains power supply. Figure 2a is a side view, Figure 2b is a perspective view and Figure 2c is a cut-away view with an element of the base unit housing removed. The base unit 200 comprises a housing 210 and a hinged lid section 214, together with a standard bayonet-type plug for connection to a mains power supply. The hinged lid 214 is shown in an open position to allow for insertion or removal of the cartridge 100. As shown in Figure 2c, within the base unit there are electronic components 230 including a transformer which is used to transform the mains supply voltage to the high voltage required for the ozone generator in the cartridge. Electrical contacts 232 and 234 are provided for contact with corresponding contacts 128a and 128b on the cartridge. The electrical contacts 232,234 in the base unit are spring loaded to ensure good electrical contact.

Figure 3 is a cross-section of the base unit of Figures 2a to 2c together with the cartridge, with the cartridge installed within the base unit. The base unit includes a fan 220 which draws air in through air inlet 222 up into a narrowing air conduit 224 which connects to inlet 124 on the cartridge. Air drawn in by the fan is accelerated as the conduit narrows. The accelerated air flow then passes over the ozone generator 122 in the cartridge and out of outlet 126 into

NJOY Exhibit 1002.2016

mixing chamber 228 formed within the lid 214 of the base unit. The reduced pressure of the air flowing out through outlet 126 draws air in through inlet 226 in the lid 214 through inlet 116 in the cartridge and over the wick 114 containing the olefin, in this case terpene. The olefin rich air then exits through outlet 118 into mixing chamber 228 where it mixes with and reacts with the ozone to form hydroxyl radicals. The hydroxyl radicals then leave the mixing chamber through dispensing outlet 240.

The apparatus may be designed for different airflow. For example the fan may be provided in the conduit with the wick 114 and the internal geometry of the base unit and cartridge configured to use the Venturi effect to suck air through the ozone generator. Equally the narrowing of the air flow conduits may be provided in the cartridge instead of or as well as in the base unit. Furthermore, the Venturi effect may be exploited within the base unit rather than at the outlets of the cartridge. For example, the base unit may include output conduits that match the position of the outlets on the consumable cartridge and act as continuations of the air flow passages formed in the cartridge. These output conduits may debouche into a mixing chamber, and the Venturi effect at that point may cause air to be sucked through the conduit in contact with the olefin supply.

Alternatively, the ozone generator and olefin supply may be placed in the same conduit, one after the other in the direct of air flow, or substantially opposite each other within the same conduit. However, this is not the preferred option because residues resulting from olefin vapour and the products of reactions with ozone may build up on the ozone generator or on the olefin wick or membrane. This reduces the performance of the system, and so having separate conduits for the olefin supply and the ozone supply so that they mix and react in a downstream location is preferable.

Figure 3 also shows the position of the transformer and associated electronics 230 that supplies a high voltage to contacts 234 and 232, which are shown in contact with electrical contacts 128a and 128b on the consumable cartridge.

Electrical connection of the mains power supply to the electronics 230 is not shown, but is provided by suitable wiring components.

The mixing chamber 228 formed within the lid 214 includes a dispensing outlet 240 through which hydroxyl radicals pass to the user environment. The mixing chamber may have a complex geometry in order to ensure that the ozone rich air from outlet 126 and olefin rich air from outlet 118 have sufficient time, and are sufficiently turbulent to provide complete mixing. WO 2008/125879 describes a mixing chamber for this purpose, and the same or a similar geometry can be used in the embodiment shown in Figure 3.

The combination of base unit and cartridge shown in Figure 3 can be configured to operate continuously or may include control electronics that provide power to the fan and the ozone generator intermittently so that hydroxyl radicals are released into the atmosphere on an intermittent or periodic basis. A user interface may be included on the base unit to allow a user to program the mode of operation of the device so that hydroxyl radicals are only provided during times when users are in the immediate vicinity. This might be useful, for example in a school environment. An electronic timer or cycle counter may also be provided together with an audible or visible alarm to alert the user when a cartridge requires replacement.

The first embodiment can also be implemented using hydrogen peroxide as the reactant, instead of (or in addition to) olefin. When using hydrogen peroxide, there is a particular benefit to the generation of ions within the air flow through the device, as is explained with reference to Figure 9. An ion generator may be included in the base unit or in the consumable cartridge, but in the first embodiment the ozone generator also functions as an ion generator. The use of a plasma ion generator to produce ozone and to ionize air is both effective and economical.

It is desirable to produce ions at the lowest possible voltage level with the ozone generator in order to keep the production of ozone low and to minimize the production of any nitric oxide. In order to achieve this, the electrodes within

NJOY Exhibit 1002.2018

the plasma ion generator comprise a plurality of sharp spikes. The sharp spikes produce a large potential gradient within the ozone generator increasing the likelihood of ionization for a given applied voltage. The plasma ion generator is also configured to produce negative ions, again to keep ozone production within desirable levels. A suitable plasma ion generator to this design is available from Trump Electronics, referenced above.

Figures 4a and 4b show a second embodiment of a consumable cartridge in accordance with the invention. Figure 4a is a side view and Figure 4b is a perspective view from the underside. The cartridge shown in Figure 4a includes not only an ozone generator, but also the transformer required to convert an external supply voltage to the voltage required by the ozone generator.

Referring now to Figure 4a, the consumable cartridge 400 of the second embodiment comprises an ozone supply 410, an olefin supply 440 and a dosing head 450 in which olefin rich air and ozone rich air is mixed in order to generate hydroxyl radicals. Figure 4b shows an electrical contact pad 416 on the underside of cartridge 400 for connection to a power supply in the base unit.

As in the first embodiment, the reactant supply (again in this example an olefin supply) consists of a container 442 within which a wick 444 is placed. Olefins within the container are drawn into the wick and can be extracted from an open end of the wick as a vapour. As with the previous embodiment, it should be clear that a solid or gaseous reactant source may be used instead of a liquid source, and that a membrane may be used in place of a wick.

In this embodiment the ozone supply is provided underneath the olefin supply and is shaped so that the cartridge is substantially cylindrical. Alternative relative positioning of the olefin supply and the ozone generator is equally possible with alternative configurations of the air conduits used to supply olefin rich air and ozone rich air to the mixing chamber in the dosing head.

NJOY Exhibit 1002.2019

The configuration of the ozone supply is shown in more detail in Figure 5. The ozone generator 412 is provided as a downward facing component to which a suitable transformer 420 is connected. The transformer is connected to an external electric contact pad 416 formed on a dual sided printed circuit board by wiring 424 extending within the housing of the ozone supply. A component 430 is provided in order to separate the air conduit 418 in which ozone rich air is generated from the electrical contact pad 416 and the associated electronics 420. This is important to prevent oxidation of the electronic components. Component 430 may be integral with the housing of the consumable cartridge or may be provided as a separate component. Air enters the ozone supply through inlet 414 and exits through a similar outlet on the opposite side of the housing. This flow of air not only provides oxygen from which ozone is generated, but also provides some cooling for the electronics, and in particular for the transformer.

Figure 6 shows the consumable cartridge 400 installed within a base unit, with the casing 500 of the base unit shown removed above the cartridge. The cartridge 400 is inserted through an opening (not shown) formed in the top of the casing 500 and engages both with air flow hoses and with an electrical contact pad in the base unit.

The base unit includes an air inlet 505 through which air from the external environment can enter the base unit through the casing 500. The base unit air inlet 505 is in fluid communication with hoses 510 and 515 which are connected to the olefin supply and ozone generator respectively. A further hose 520 connects an output of the ozone generator to the dosing head 450. Within the dosing head the ozone rich air and olefin rich air streams are mixed before being exhausted to the external environment. A fan or pump 525 is provided in the base unit to move air from the base unit air inlet 505 through the hoses 510 and 515.

The dosing head 450 on the consumable cartridge includes sockets which mate with connectors provided on the end of hoses 510 and 520 when the cartridge is inserted in the base unit. The bottom of the cartridge, containing

NJOY Exhibit 1002.2020

the ozone generator engages with a sealing skirt 530 in the base unit, as shown in Figure 7.

Figure 7 shows the flow path of the air through the ozone generator in more detail, and in particular shows the sealing skirt 530 which engages with the bottom of the cartridge to provide both electrical power and a sealed air flow passage from hose 515 past the ozone generator to hose 520. The sealing skirt 530 is tapered to engage the tapered end of the cartridge 400, and includes an inlet opening 532 and an outlet opening 534, which are connected to hoses 515 and 520 respectively. The inlet and outlet openings provide a sealed connection to the inlet and outlet of the ozone generator. The skirt also includes an electrical contact 540 that engages with contact 416 formed on the cartridge when the cartridge is positioned within the sealing skirt 530, for providing power to electronics 420 within the cartridge.

Figure 6 does not show the further electrical components within the base unit, but the electronics can be placed anywhere with in the casing 500 and connect to contact 416 on the cartridge through the sealing skirt.

Figure 8 is a schematic perspective view of the dosing head 450, showing the flow paths through the dosing head 450 to the dispensing outlets 840. The ozone rich air from the ozone generator is shown as line 800. The air stream from hose 510 for the olefin supply is shown as line 810. The ozone rich air entering the dosing head is circulated along path 805 to mixing chamber 830. The air for the olefin supply is split in the dosing head, with some of the air passing over wick 444 along path 815 to extract olefin vapour and some of the air passing through an air bypass flow path 820 that bypasses the wick. Both flow paths 815 and 820 meet at mixing chamber 830 together with the ozone rich air. The ozone and olefins react in mixing chamber 830 to produce hydroxyl radicals, which are then released into the environment through dispensing outlets 840.

NJOY Exhibit 1002.2021

The dosing head 450 is formed from moulded plastic component. A more detailed description of the dosing head shown in Figure 8 can be found in WO2008/125879, the contents of which are incorporated by reference.

The dosing head provides a mixing chamber downstream of the olefin supply and the ozone generator and ensures that substantially all of the ozone from the ozone generator is reacted with olefin molecules. This ensures both safe levels of ozone in the environment and high levels of hydroxyl radicals.

The base unit can be designed to accommodate other configurations of consumable cartridge. For example, if the ozone generator and olefin supply are arranged side by side in the insertion direction of the cartridge into the base unit, the hoses and sealing skirt could be redesigned to provide the necessary fluid flow paths and electrical connection without changing the principle of operation.

Figures 9, 10 and 10a illustrate an alternative design of base unit and cartridge. Figure 9 is a cross-sectional view. The base unit 900 is configured to receive a cartridge 905. The cartridge is illustrated in more detail in Figures 10a and 10b.

The apparatus shown in Figure 9 uses hydrogen peroxide as the reactant. Liquid hydrogen peroxide is contained in a reservoir 910 in the cartridge 905. A wick 915 (not shown in Figure 9) is inserted in the reservoir and extends out of a top end of the cartridge for delivery of hydrogen peroxide to an outlet 920. This is illustrated most clearly in Figure 10b which shows the wick extending from within the reservoir to the exterior of the cartridge. The wick is covered by a removable cap 925, which is placed over the opening 920 and protects the wick and prevents spillage. The cap 925 is removed by the user before inserting the cartridge into the base unit. A filling aperture 930 is also shown, through which the reservoir is filled with hydrogen peroxide. It is covered with a breathable cap to prevent liquid spillage, but to allow for the escape of gas. The wick 915 may be formed from any suitable fibrous material, such as polypropylene fibre.

NJOY Exhibit 1002.2022

An ozone generator 935 is provided in the cartridge. The ozone generator is a corona discharge ozone generator that generates ions as well as ozone in operation. Suitable corona discharge ozone generators, such as plasma ion generators, are available from Trump Electronics of East Yongfu Road, Tianchang, China 201100 (www.trumpxp.com) and may be formed from aluminium oxide or calcium silicate for example. The ozone generator comprises a series of openings 940 that allow air to pass to and from between the plates of the ozone generator.

The generation of ions as well as ozone is beneficial when using hydrogen peroxide as a reactant. The ozone reacts with hydrogen peroxide, generating a number of radical species as illustrated in the equations below, and the ions accelerate the process and provide additional pathways for the generation of radicals.

$$H_2O_2 \rightarrow HO_2^- + H^+$$
$$O_3 + HO_2^- \rightarrow \bullet OH + O_2^-\bullet + O_2$$
$$O_3 + O_2^-\bullet \rightarrow O_3^-\bullet + O_2$$
$$O_3^-\bullet + H^+ \rightarrow HO_3\bullet$$
$$HO_3\bullet \rightarrow \bullet OH + O_2$$

The reaction of hydrogen peroxide with ozone is slow, but that of its anion, HO_2^- is fast, and produces hydroxyl radicals. Another product of the reaction is $O_2^-\bullet$ radical, which also reacts with ozone to produce $O_3^-\bullet$. $O_3^-\bullet$ reacts with H^+ to produce $HO_3\bullet$,which then dissociates into a hydroxyl radical and oxygen.

So a chain reaction is set up, and the yield of hydroxyl radicals is higher for a given amount of ozone than when using an olefin as the reactant.

As the amount of ozone required is very low, it is desirable to produce ions at the lowest possible voltage level with the ozone generator. This keeps the production of ozone low and minimizes the production of any undesirable nitric

NJOY Exhibit 1002.2023

oxide. In order to achieve this, one of the electrodes within the plasma ion generator comprises a plurality of sharp spikes. The sharp spikes produce a large potential gradient within the ozone generator increasing the likelihood of ionization for a given applied voltage. The plasma ion generator is also configured to produce negative ions, again to keep ozone production within desirable levels.

The cartridge 905 includes electrical contact 945 for connecting to power supply in the base unit 900. The cartridge 905 also includes a transformer (not shown) in order to convert a 12V DC supply from the base unit to the necessary voltage for the ozone generator 935. The base unit includes a power supply socket 950 for connection to a power supply, typically a 12V DC supply adapted from the mains. The power socket 950 is electrically connected to contacts on the base unit that interface with the contacts 945 on the cartridge.

The air flow paths with in the apparatus shown in Figure 9 are similar to that shown in Figure 3, and are illustrated by the arrows in Figure 9. The base unit includes a fan 955 which draws air in through an air inlet in the base of the base unit up into a narrowing air conduit 960. Air drawn in by the fan is accelerated as the conduit 960 narrows. The accelerated air flow then passes the ozone generator 935 in the cartridge, where ozone and ions are generated, and into mixing chamber 975 formed in the base unit. As in the embodiment of Figure 3, the flow of air through conduit 960, past partition 970, draws air in through inlet 965 and over the wick 915 containing the hydrogen peroxide. The hydrogen peroxide rich air then exits into mixing chamber 975 where it mixes with and reacts with the ozone and ions from conduit 960 to form hydroxyl radicals, as previously described. The hydroxyl radicals then leave the mixing chamber through dispensing outlet 980.

As with embodiment shown in Figure 3, the apparatus of Figure 9 may be designed for different airflow. For example, the fan may be provided in the conduit with the wick and the internal geometry of the base unit and cartridge configured to use the Venturi effect to suck air past the ozone generator.

NJOY Exhibit 1002.2024

Alternatively, the ozone generator and hydrogen peroxide supply may be placed in the same conduit, one after the other in the direction of air flow, or substantially opposite each other within the same conduit.

The apparatus shown in Figure 9 also allows for the use of an optional scent supply, provided in a cartridge 990. Some of the air passing through conduit 960 is passed through cartridge 990 (as illustrated by the arrow in Figure 9), introducing a scented chemical or chemicals into the environment.

The embodiment shown in Figures 9 and 10a and 10b, include an ozone generator that also ionises air. However, it is possible to include a further or separate ioniser within or adjacent the air flow path through the apparatus. This is particularly useful if the ozone supply does not act as an ioniser. A possible position for a separate ioniser 985 is shown in dotted outline in Figure 9. The ioniser may be any suitable type of negative ion generator. The ioniser may be placed anywhere along the air flow path in order to introduce ions into the air flow prior to dispensing outlet 980, and may be positioned within the base unit or within the cartridge.

NJOY Exhibit 1002.2025

Claims

1. A consumable cartridge for use in a hydroxyl radical generating apparatus, the consumable cartridge comprising:

a reactant supply comprising a supply of a substance that reacts with ozone to produce hydroxyl radicals, and

an ozone supply comprising an ozone generator;

wherein the ozone supply is fixed to the reactant supply.

2. A consumable cartridge according to claim 1, further comprising at least one electrical contact configured to allow connection of an external power supply to the ozone generator.

3. A consumable cartridge according to claim 1 or claim 2, further comprising an external housing, the reactant supply and the ozone supply being positioned within the external housing, wherein the electrical contact is accessible from an exterior of the housing.

4. A consumable cartridge according to any preceding claim, wherein the ozone generator is an electrically powered ozone generator.

5. A consumable cartridge according to any preceding claim, further comprising a transformer connected to the ozone generator.

6. A consumable cartridge according to any preceding claim, wherein the cartridge defines a first air inlet and a first outlet, wherein the first outlet is in fluid communication with the reactant supply and the first inlet; and

wherein the cartridge defines a second air inlet and a second outlet, wherein the second outlet is in fluid communication with the ozone generator and the second air inlet.

7. A consumable cartridge according to claim 6, wherein the first outlet is positioned adjacent the second outlet, and the cartridge is configured so that

NJOY Exhibit 1002.2026

air flow through one of the first outlet and the second outlet draws air through the other of the first outlet and the second outlet.

8. A consumable cartridge according to claims 6 or 7, further comprising a mixing chamber having a dispensing opening, the mixing chamber in fluid communication with both the first outlet and the second outlet, and configured to ensure a substantially complete reaction of vapours from the reactant supply with ozone from the ozone supply before release to the user environment through the dispensing opening.

9. A consumable cartridge according any preceding claim, wherein the reactant supply is a supply of olefin or hydrogen peroxide.

10. A consumable cartridge according any preceding claim, comprising an ion generator.

11. a consumable cartridge according to claim 10, wherein the ozone generator functions as the ion generator.

12. An apparatus for generating hydroxyl radicals comprising a base unit and a consumable cartridge in accordance with any preceding claim, the base unit comprising a means for providing electrical power to the consumable cartridge, and a means for driving air through the apparatus.

13. An apparatus for generating hydroxyl radicals according to claim 12, wherein the base unit comprises a transformer for transforming an external supply voltage to a voltage suitable for the ozone generator in the consumable cartridge.

14. An apparatus for generating hydroxyl radicals according to claim 12 or 13, the base unit comprising a mixing chamber in fluid communication with an outlet of the reactant supply and an outlet of the ozone supply, the mixing chamber further comprising a dispensing outlet.

NJOY Exhibit 1002.2027

15. An apparatus for generating hydroxyl radicals according to claim 12, 13 or 14, the base unit comprising a base unit air inlet and base unit air conduit between the base unit air inlet and an air inlet on the consumable cartridge, wherein the inlet conduit narrows between the base unit air inlet and the air inlet on the consumable cartridge.

16. An apparatus according to any one of claims 12 to 15, comprising a first air inlet and a first air outlet, wherein the first outlet is in fluid communication with the reactant in the reactant supply and the first inlet; and

a second air inlet and a second air outlet, wherein the second outlet is in fluid communication with the ozone generator and the second air inlet;

wherein the first outlet is positioned adjacent the second outlet, and the apparatus is configured so that air flow through one of the first outlet and the second outlet draws air through the other of the first outlet and the second outlet.

17. An apparatus according any one of claims 12 to 16, comprising an ion generator in the base unit.

18. A base unit for producing hydroxyl radicals, the base unit suitable for use with a consumable cartridge in accordance with any one of claims 1 to 11, comprising a means for connection with a power supply, a base unit air inlet, a means for moving air through the consumable cartridge, and a socket configured to receive the consumable cartridge, the socket including electrical contacts suitable for supplying electrical power from the means for connection with a power supply to the consumable cartridge.

19. A base unit according to claim 18, comprising a base unit air conduit between the base unit air inlet and either an air inlet on the consumable cartridge, wherein the base unit air inlet conduit narrows between the base unit air inlet and an air inlet on the consumable cartridge.

20. A base unit according to claim 18 or 19, further comprising an ion generator.

NJOY Exhibit 1002.2028

21. A hydroxyl radical generating apparatus, comprising:

at least one air inlet and a dispensing outlet, and an air flow path between the air inlet and the dispensing outlet;

a supply of hydrogen peroxide configured to supply hydrogen peroxide into the air flow path;

a supply of ozone configured to supply ozone into the air flow path; and

an ioniser configured to generate and supply ions into the air flow path.

22. An apparatus according to claim 21, comprising a first air inlet and a second air inlet wherein the supply of hydrogen peroxide is positioned between the first air inlet and the dispensing outlet and the supply of ozone is positioned between the second air inlet and the dispensing outlet.

23. An apparatus according to claim 22, further comprising a mixing chamber, the mixing chamber in fluid communication with the first and second air inlets and the dispensing outlet.

24. An apparatus according to claim 22 or 23, comprising a first outlet, wherein the first outlet is in fluid communication with the hydrogen peroxide supply and the first inlet, and a second outlet, wherein the second outlet is in fluid communication with the ozone generator and the second air inlet;

wherein the first outlet is positioned adjacent the second outlet, such that air flow through one of the first outlet and the second outlet draws air through the other of the first outlet and the second outlet.

25. An apparatus according to any one of claims 21 to 24, further comprising means to drive air through the air flow path.

26. An apparatus according to any one of claims 21 to 25, wherein the ozone supply is an ozone generator.

27. An apparatus according to claim 26, wherein the ozone generator also acts as the ioniser.

NJOY Exhibit 1002.2029

28. An apparatus according to any one of claims 21 to 27, further comprising a scent supply configured to supply a chemical having a scent into the air flow path.

29. A method of producing hydroxyl radicals, comprising:
providing hydrogen peroxide into an air flow path;
providing ozone into the air flow path;
providing ions into the air flow path; and
mixing the hydrogen peroxide, ozone and ions to produce hydroxyl radicals.

30. A method according to claim 29, further comprising: releasing the hydroxyl radicals from the air flow path into an external environment.

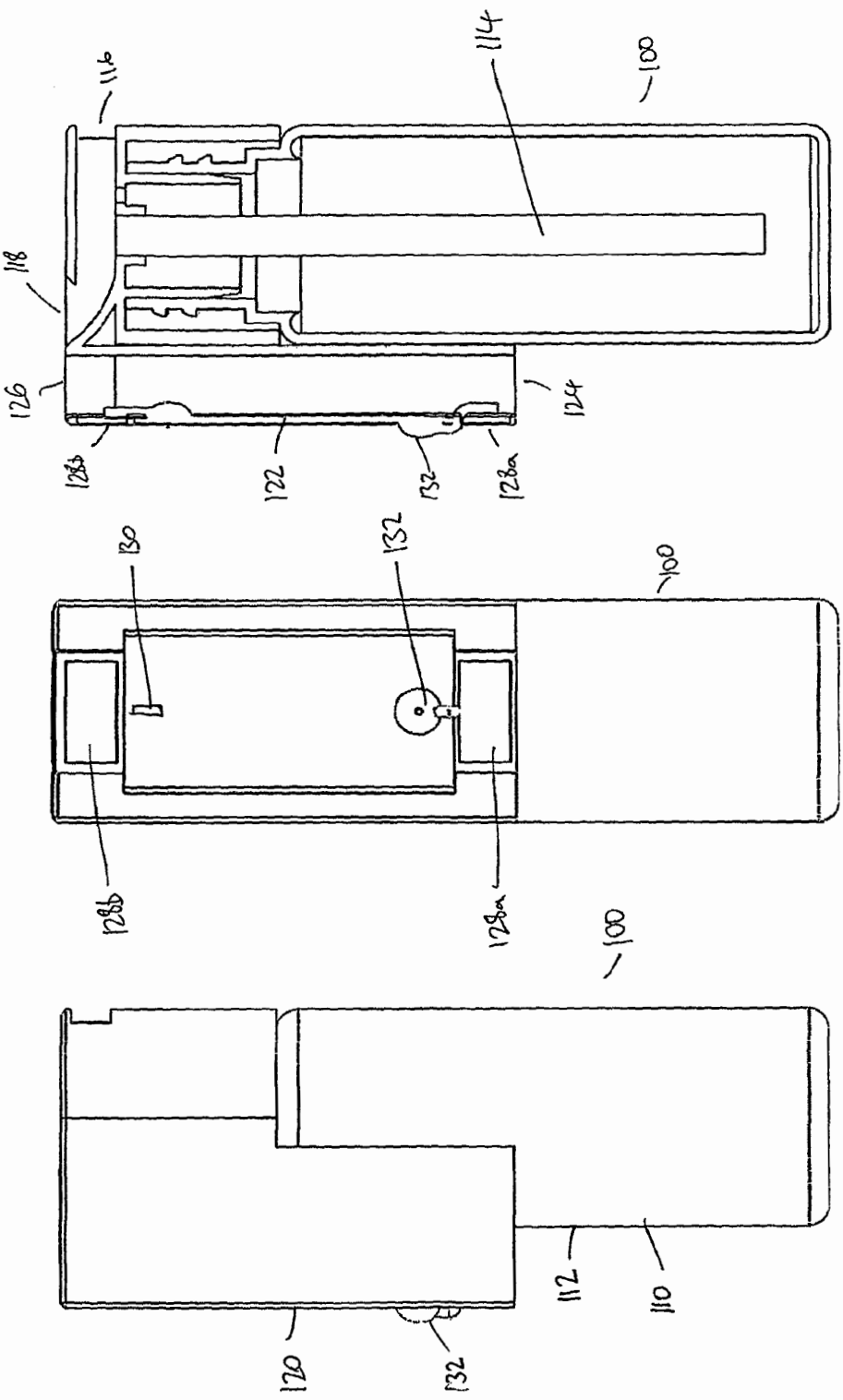


Fig 1c

Fig 1b

Fig 1a

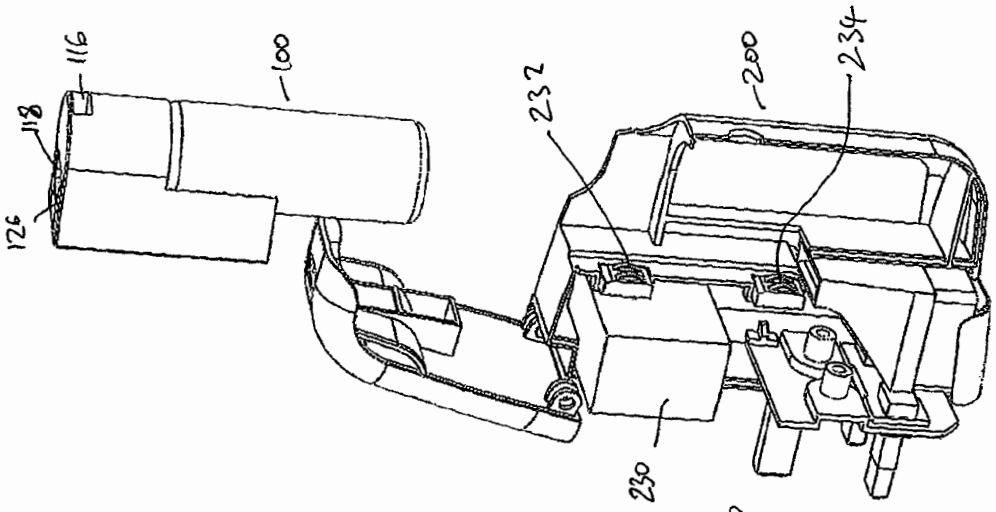


Fig2c

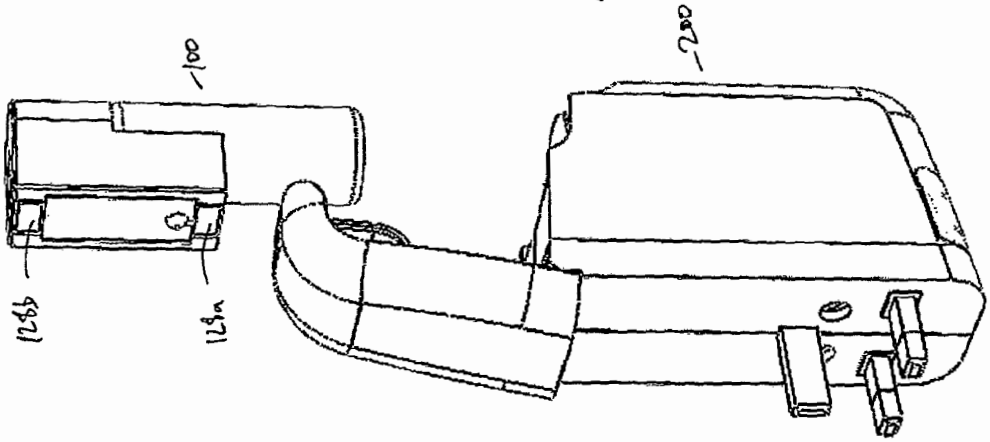


Fig2b

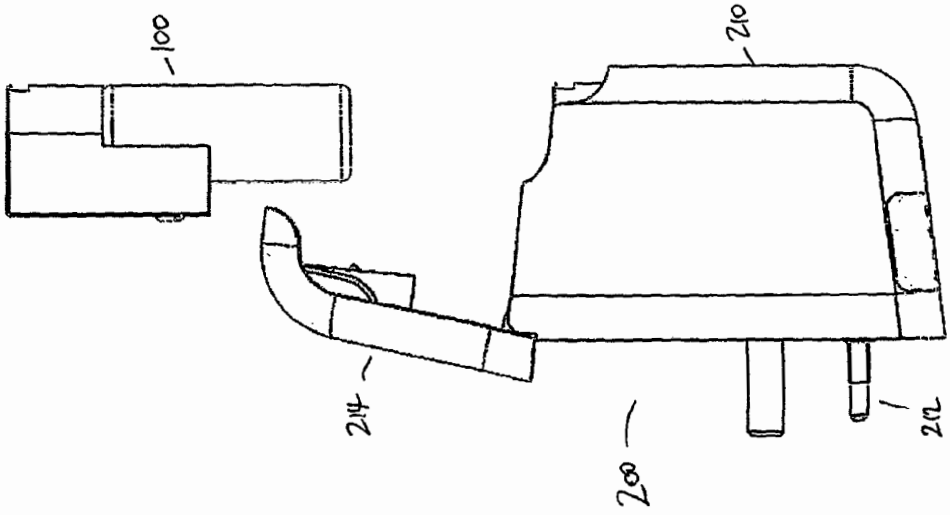


Fig2a

NJOY Exhibit 1002.2032

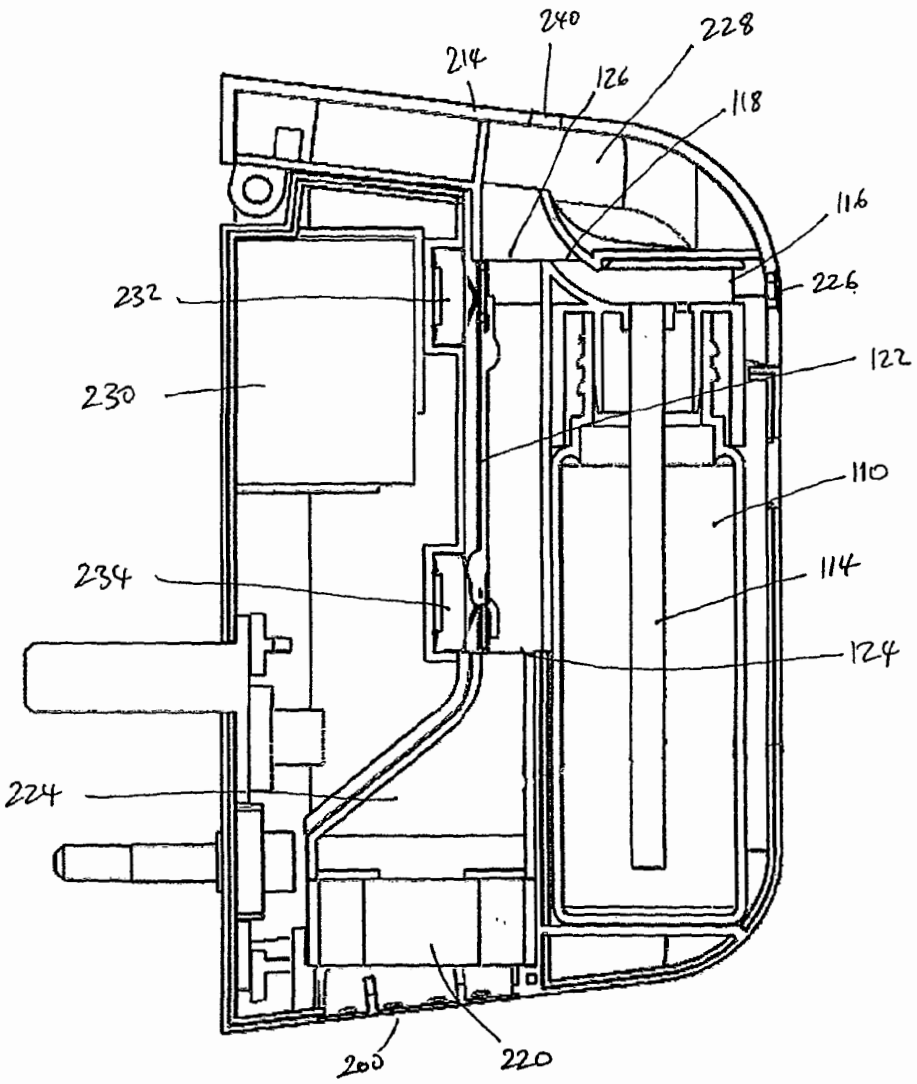


Fig 3

NJOY Exhibit 1002.2033

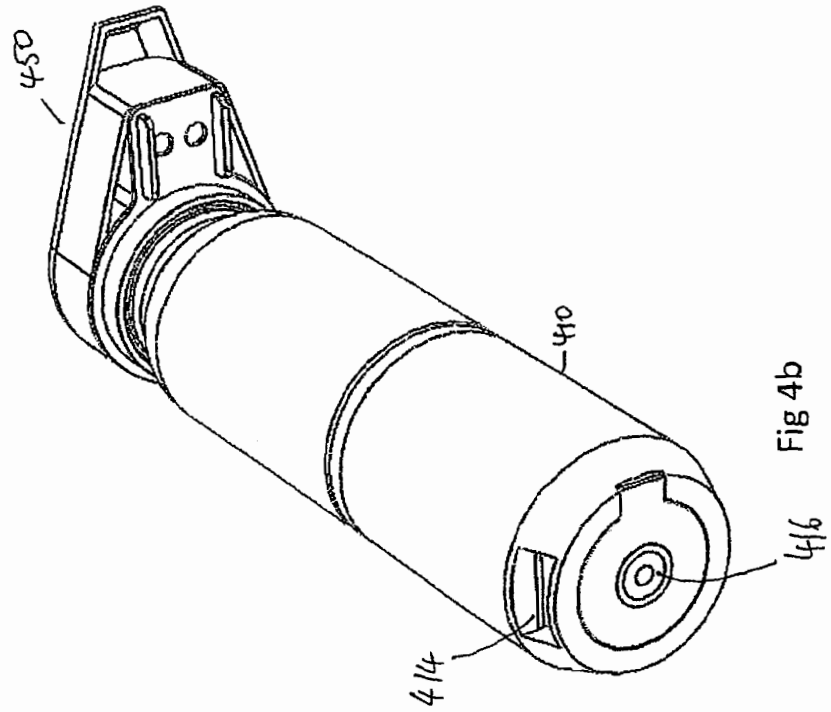


Fig 4b

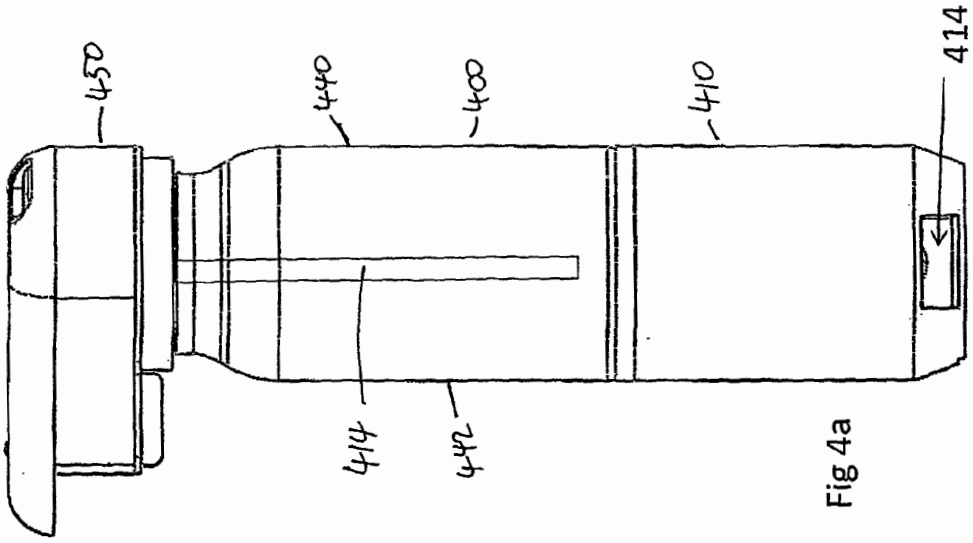


Fig 4a

NJOY Exhibit 1002.2034

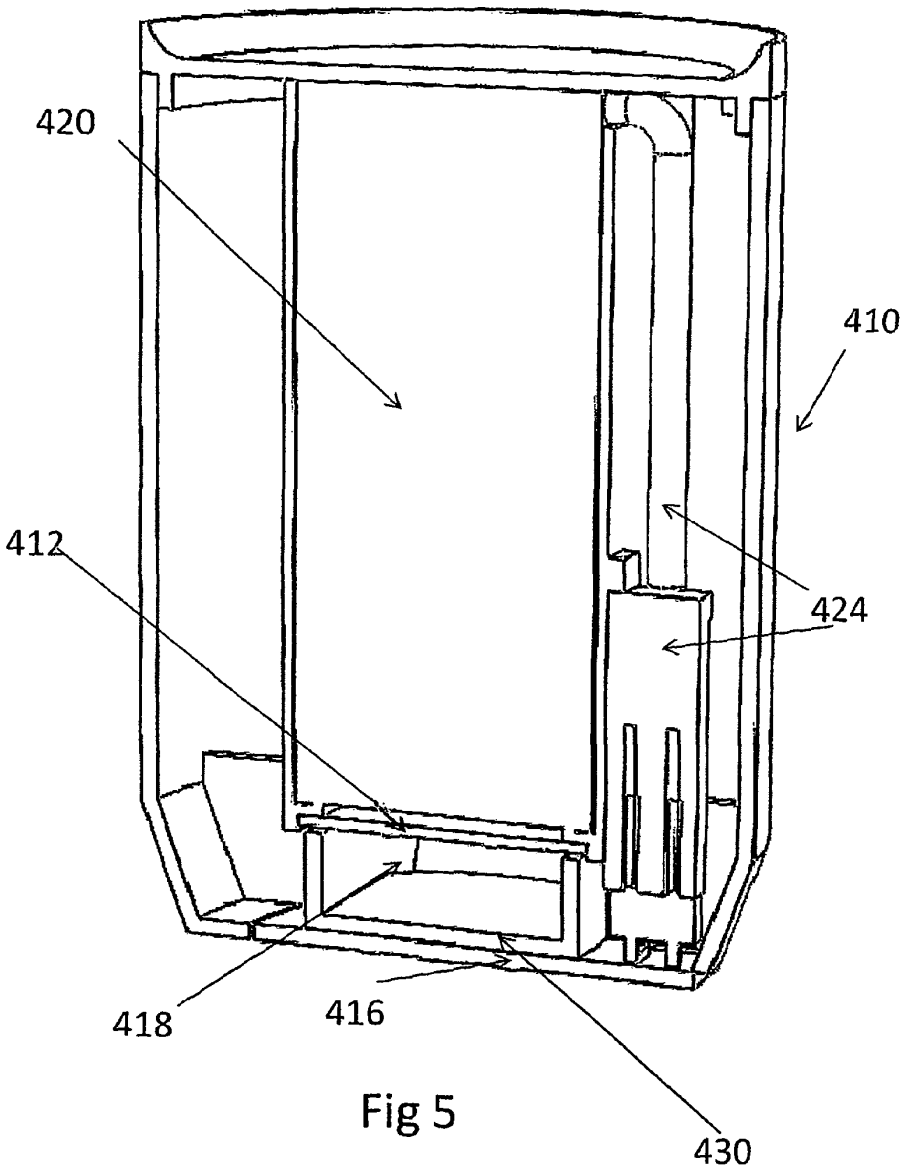


Fig 5

NJOY Exhibit 1002.2035

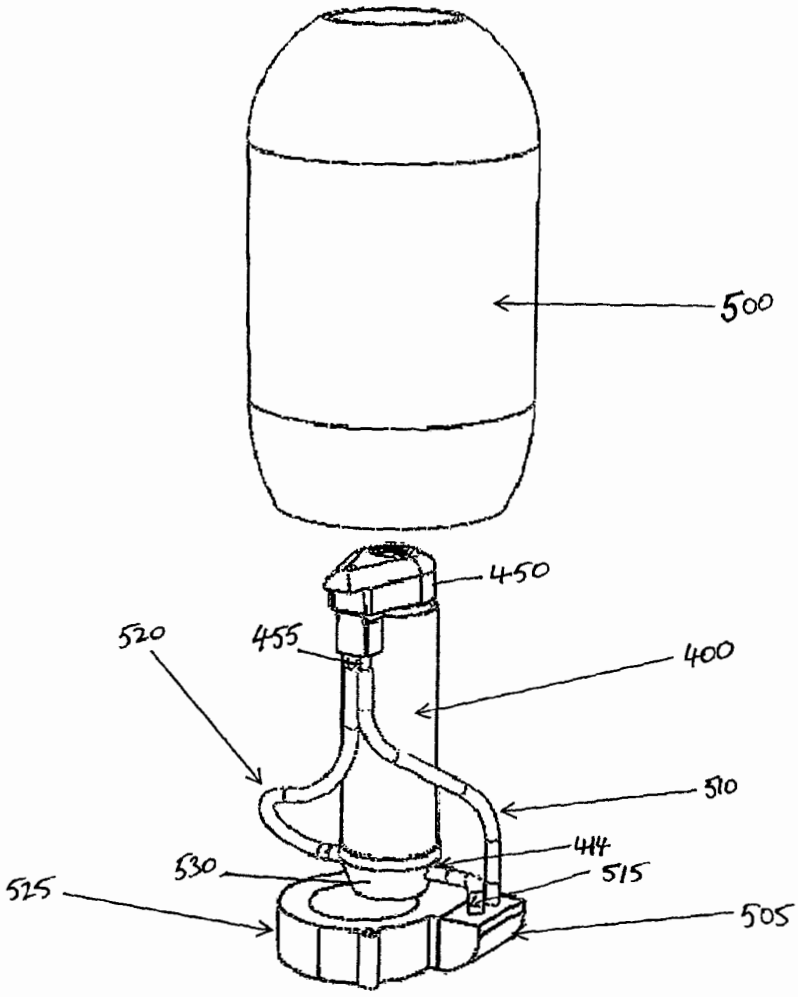


Fig 6

NJOY Exhibit 1002.2036

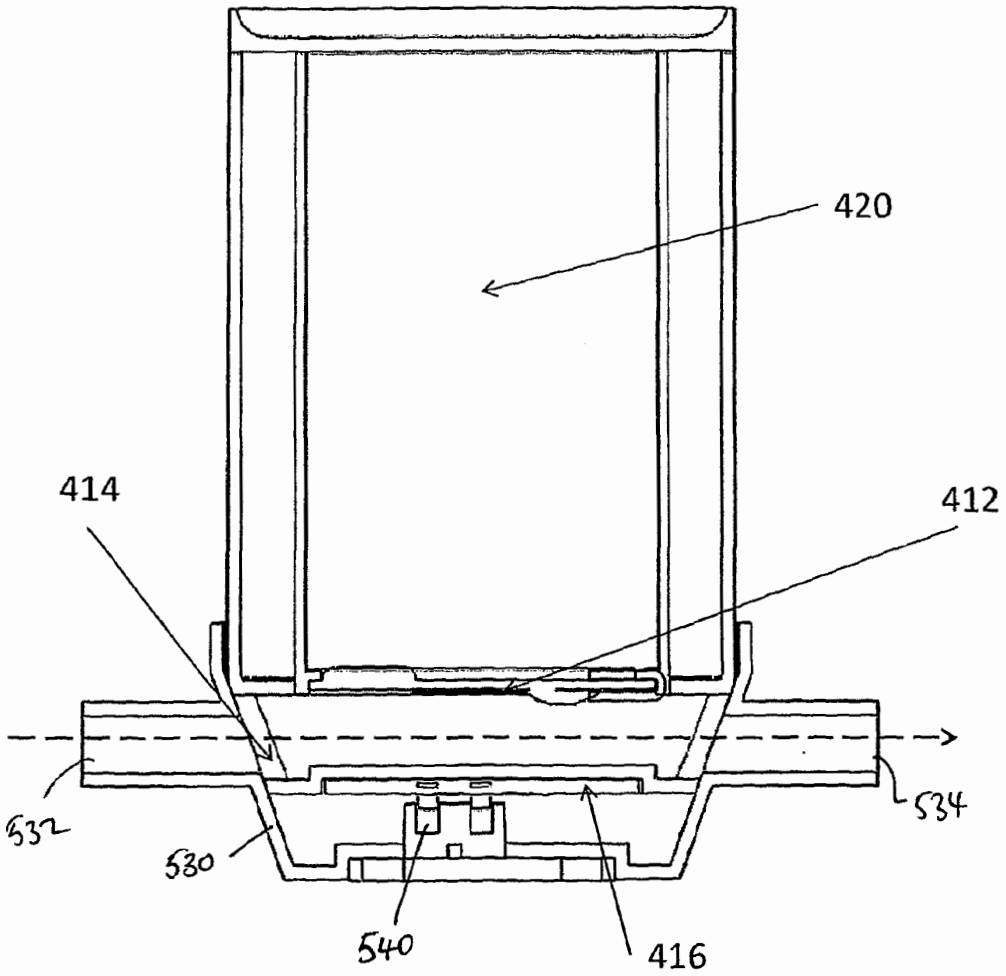


Fig 7

NJOY Exhibit 1002.2037

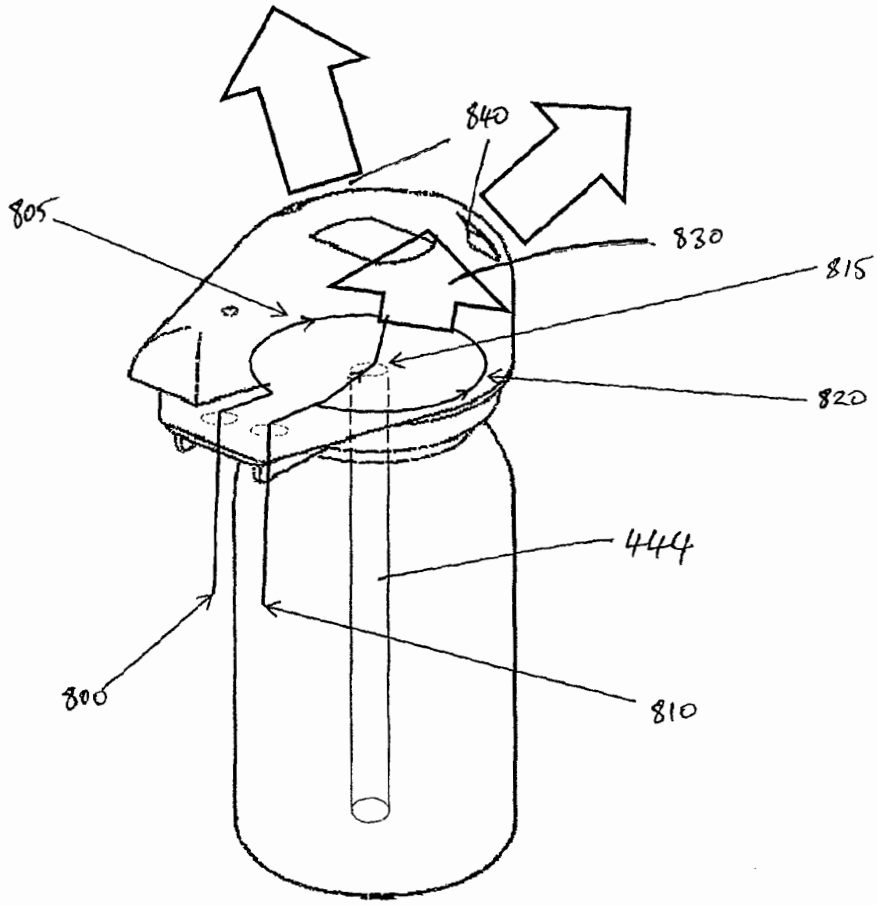


Fig 8

NJOY Exhibit 1002.2038

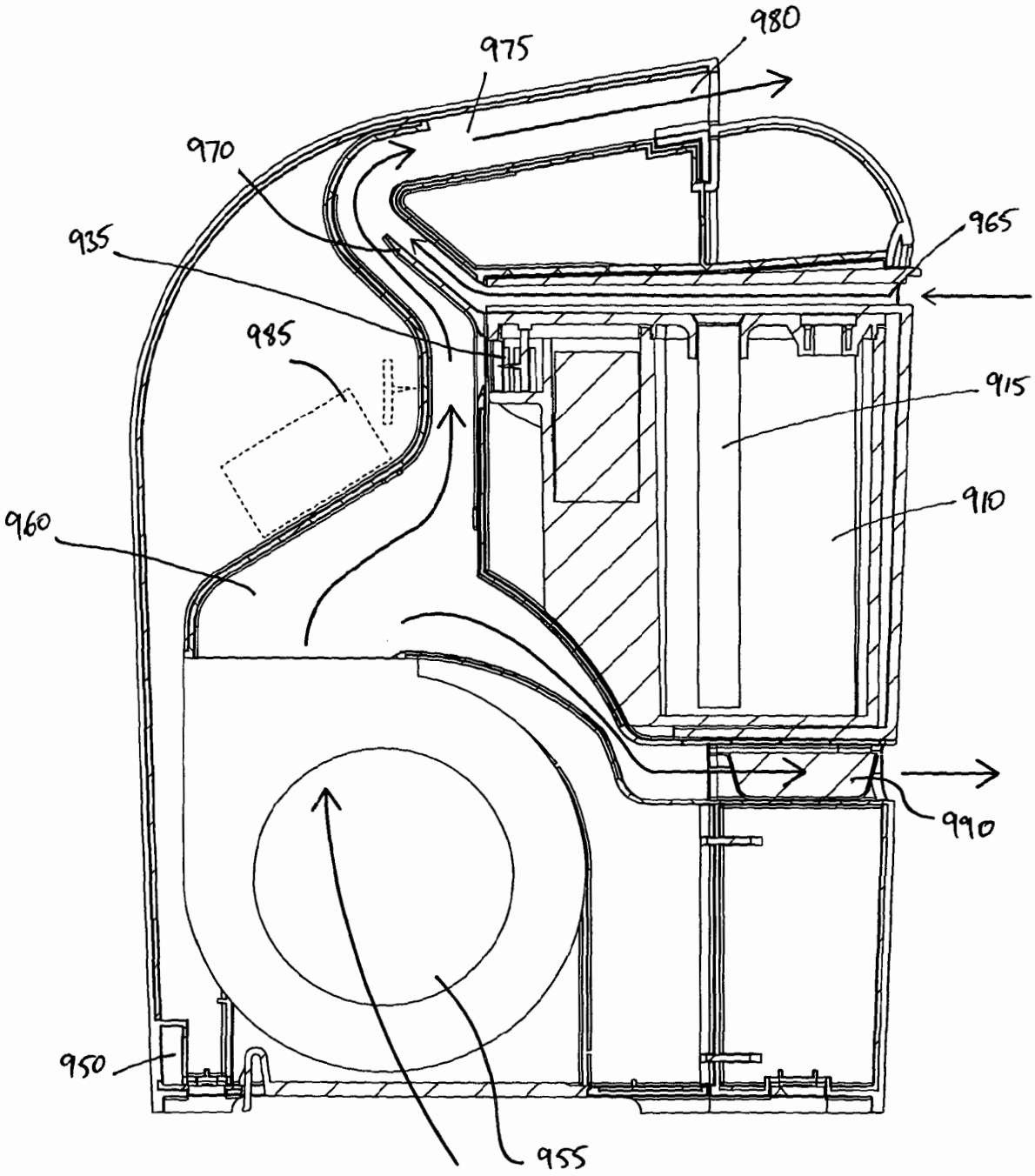


Figure 9

NJOY Exhibit 1002.2039

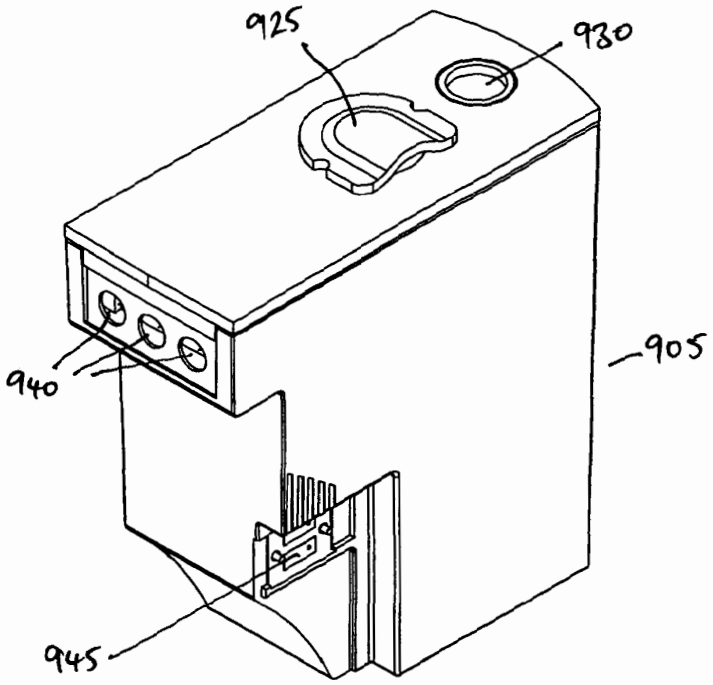


Figure 10a

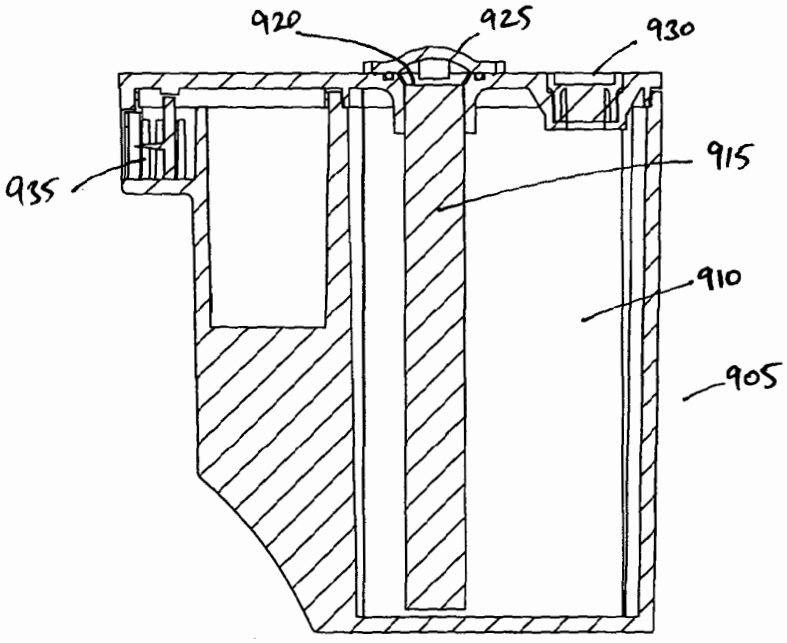


Figure 10b

NJOY Exhibit 1002.2040

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 May 2012 (18.05.2012)

PCT

(10) International Publication Number
WO 2012/062600 A1

(51) International Patent Classification:
B05B 17/06 (2006.01) *A61M 15/06* (2006.01)
A24F 47/00 (2006.01)

(21) International Application Number:
PCT/EP2011/068908

(22) International Filing Date:
27 October 2011 (27.10.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1018796.1 8 November 2010 (08.11.2010) GB

(71) Applicant *(for all designated States except US)*: **BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED** [GB/GB]; Globe House, 1 Water Street, London WC2R 3LA (GB).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **ANDERSSON, Fredrik** [CH/CH]; c/o Forteq Nidau AG, Ipsachstrasse 14, CH-2560 Nidau (CH). **TACHE, Christian** [CH/CH]; c/o EP Systems SA, Microflow Division, Rue du Plan 30, CH-2002 Neuchatel (CH). **FERIANI, Amir** [CH/CH]; c/o EP Systems SA, Microflow Division, Rue du Plan 30, CH-2002 Neuchatel (CH).

(74) Agents: **READ, Matthew** et al.; 20 Little Britain, London EC1A 7DH (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: AEROSOL GENERATOR

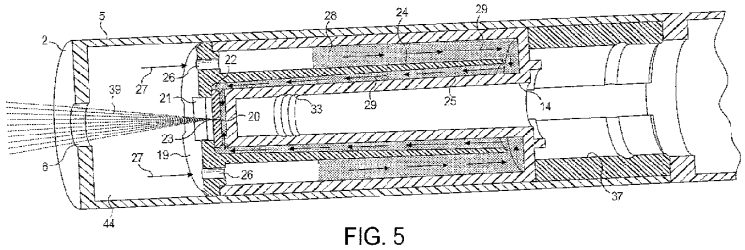


FIG. 5

(57) **Abstract**: A generally cylindrical aerosol generator which can be used as a substitute for a conventional cigarette has a longitudinal extending horn member (8) that carries a piezoelectric actuator (9) mounted within a main housing (4) and a mouthpiece housing (5). A cartridge (7) contains an aerosolizable liquid (28) in a chamber having an inner chamber wall (13) extending longitudinally between the proximal and distal ends (15, 16) of the cartridge, defining a receptacle to receive the horn member (8) from the distal end, a longitudinally extending outer chamber wall (17) surrounding the inner wall, a proximal inner end wall (18) bridging the inner chamber wall at the proximal end, and a proximal outer end wall (19) longitudinally spaced from the inner wall to define a discharge region (20). A nozzle (23) discharges liquid from the discharge region through the outer end wall as an aerosol (39). A capillary driver wall (24) is disposed between the inner and outer chamber walls, spaced from the inner wall to define a longitudinally extending capillary passageway (25) sufficiently narrow to drive liquid within the chamber by capillary action along the gap to the discharge region, where it is aerosolised by the vibratory action of the piezo device that is transmitted along the horn (8) to the discharge region (20).

WO 2012/062600 A1

NJOY Exhibit 1002.2041

Aerosol generator

Field

This invention relates to an aerosol generator which uses a vibratory source such as a piezoelectric device to atomise liquid to produce an aerosol and a cartridge for use in such a generator, and has particular but not exclusive application to providing an aerosol of a liquid containing a nicotine based substance or a flavourant, which may be used as a substitute for a conventional cigarette.

Background

Piezoelectric generators have been proposed hitherto for creating an atomised spray. For example WO 2002/241777 discloses the use of a piezo device both to create vibrations in a fluid flow and also to monitor the flow by using the device as a pressure transducer. FR 2929861 illustrates that it is known to use capillary action to feed liquid to a piezo electric actuator to create an aerosol. Also, JP 2004313871 discloses an atomiser using piezo device which feeds vibrations through a horn to focus them when creating the aerosol spray.

The present invention provides an improved aerosol generator that utilises a cartridge of liquid to be aerosolised, which may be used as a cigarette substitute device.

Summary

The invention provides a cartridge for an aerosol generator, comprising a chamber to receive an aerosolisable liquid, the chamber having proximal and distal ends, a generally tubular inner chamber wall extending longitudinally between the proximal and distal ends, a longitudinally extending outer chamber wall surrounding the inner wall, a proximal inner end wall bridging the inner wall at the proximal end, a proximal outer end wall longitudinally spaced from the inner wall to define a discharge region between the proximal end walls, a nozzle to discharge liquid from the discharge region through the outer end wall as an aerosol, and a capillary driver wall between the inner and outer chamber walls, the capillary driver wall being spaced from the inner chamber wall to provide a longitudinally extending capillary passageway sufficiently narrow to drive liquid within the chamber by capillary action along the capillary passageway to the discharge region.

NJOY Exhibit 1002.2042

The capillary passageway may narrow from the distal end towards the proximal end so that the force due to capillary action on the liquid increases towards the proximal end.

The invention also includes an aerosol generator configured to receive the cartridge, comprising a generally tubular housing, an elongate horn member configured longitudinally within the housing to extend into the distal end of the cartridge chamber to engage the interior surface the inner chamber wall, and a vibratory actuator on the horn member to create vibrations therein to be transmitted to the proximal inner end wall of the chamber to act on liquid in the discharge region to cause discharge thereof through the nozzle.

Brief description of the drawings

In order that the invention may be more fully understood an embodiment will now be described by way of illustrative example with reference to the accompanying drawings in which:

Figure 1 is the schematic perspective view of an aerosol generator,
Figure 2 is a longitudinal sectional view of the generator shown in Figure 1,
Figure 3 is a perspective view of a cartridge for use in the aerosol generator,
Figure 4 is an exploded view of the cartridge illustrated in Figure 3,
Figure 5 is an enlarged sectional view of the cartridge when installed in the mouth piece of the aerosol generator, with the horn removed,
Figure 6 is a sectional view of the cartridge installed in the mouthpiece of the generator, also illustrating the horn in section,
Figure 7 is a schematic circuit diagram of a driver circuit board used in the device to actuate the piezoelectric generator, and
Figure 8 is a schematic circuit diagram of a detection circuit to detect when the user sucks on the mouthpiece, to actuate the device and produce an aerosol with the circuitry shown in Figure 6.

Detailed description

Referring to Figure 1, an aerosol generator 1 has a generally cylindrical outer surface extending from a generally circular proximal end 2 to circular distal end 3. The device 1

NJOY Exhibit 1002.2043

has a main housing 4 and a mouthpiece housing 5 with a proximal end aperture 6 through which aerosol is delivered to a user.

The mouthpiece 5 is removably mounted on the housing 4, for example as a push-fit or bayonet mounting (not shown).

A cartridge 7 containing an aerosolisable liquid is received within the mouthpiece housing 5 and can be interchanged when empty by removal of the housing 5 from the main body housing 4. As illustrated in Figure 2, main housing 4 contains a horn 8 on which is mounted a piezoelectric transducer 9. The housing 4 also contains electrical circuitry 10 coupled to the piezoelectric transducer 9 both to cause it to oscillate and also to detect pressure variations when the user draws on the mouthpiece housing 5. The circuitry 10 is driven by batteries 11 in the housing 4. Also, a LED 12 is mounted at the distal end 3 of the device, to be driven by the circuitry 10 to indicate when the device is in use.

The cartridge 7 is illustrated in more detail in Figures 3 and 4. The cartridge 7 has generally toroidal configuration with a generally tubular inner chamber wall 13 having a distal end opening 14 (shown in Figure 5) and extending from proximal end 15 to distal end 16. A tubular outer chamber wall 17 surrounds the inner chamber wall 13 and also extends between the proximal and distal ends 15, 16. A proximal inner end wall 18 closes the proximal end of the inner chamber wall so that the interior of the inner chamber wall 13 together with the proximal inner end wall 18 define a receptacle open at the distal end 16, that receives the horn 8 as will be described in more detail hereinafter. Also, the outer chamber wall 17 is closed at its proximal end by an outer proximal end wall 19 that is longitudinally spaced from the proximal inner end wall 18 to define a discharge region 20 shown clearly in Figure 5. The proximal outer end wall 19 includes an opening 21 that receives a nozzle plate 22 formed with at least one aperture 23 for forming an aerosol from liquid in the cartridge, to be supplied into the mouthpiece housing 5. A generally frustoconical capillary driver wall 24 is mounted on the interior surface of the proximal outer end wall 19 so as to provide a capillary passageway 25, illustrated in Figures 4 and 5, between the inner chamber wall 13 and the capillary driver wall 24. As illustrated in Figures 4 and 5, the passageway 25 narrows from the distal end 16 towards the proximal end 15.

As shown in Figures 5 and 6, the space between the inner and the outer chamber walls 13, 17, contains liquid from which aerosol is formed. The capillary driver wall 24 cooperates with the inner chamber wall 13 to drive the liquid by capillary action into the discharge region 20. Apertures 26 in the proximal outer wall 19 allow air to enter into the cartridge 7 in order to prevent an air lock, as illustrated by arrows 27. The liquid is illustrated by reference 28 in Figures 5 and 6. The passage of the liquid 28 towards the discharge region 20 is illustrated by arrows 29. As illustrated in Figure 6, the horn 8 has a frustoconical or cylindrical tongue 30 that fits through the opening 14 closely within the interior of recess 31 formed by the inner chamber wall 13. The tongue 30 has a proximal end 32 that is spaced from the interior surface of the proximal inner end wall 18. The inner surface of the inner chamber wall 13 and the outer surface of the tongue 30 may include cooperating grooves and recesses 33, 34 to releasably hold the tongue within the chamber wall when the cartridge is inserted into the generator. The horn 8 also includes a generally cylindrical base member 35 from which the tongue 30 extends, the base number being mounted in a resilient mounting that comprises an O ring 36, within the main housing 4. The piezoelectric device 9 is mounted on the distal end 38 of the horn 8, on the base number 35 so that on actuation the horn can vibrate back and forth longitudinally within interior cylindrical region 37 of the main housing 4.

In use, the piezoelectric device 9 is actuated and produces ultrasonic vibrations in the base member 35, which are transmitted along and are focussed by the tongue 30 onto the inner chamber wall 13. The spacing between the end 32 of the tongue and the proximal inner chamber wall 18, ensures that the wall 18 is free to vibrate in the manner of a drum which causes liquid in the discharge region 20 to be urged through the aperture 23 to form an aerosol 39 that is illustrated in Figure 5, which is directed through the outlet 6 of the mouthpiece housing 5.

When the user draws on the mouthpiece housing 5, air is drawn into the aerosol 39 as illustrated in Figure 6 by arrows 40. Referring to Figure 1, main housing 4 includes an air inlet aperture 41 which, referring to Figure 6, allows air to enter in the direction of arrows 42 and pass through longitudinal passageways defined by diametrically opposed exterior grooves 43 in the outer chamber wall 17, illustrated in Figures 3 and 4. Referring to

Figures 5 and 6, the mouthpiece housing 5 defines a plenum 44 between the outlet 6 and the proximal outer end wall 19 of the cartridge 7. In use, the air flow 40 shown in Figure 6 mixes with the aerosol 39 shown in Figure 5 and passes to the user through outlet 6.

When the user draws on the mouthpiece housing 5, the resulting pressure reduction in plenum 44 is detected by the piezoelectric device 9 which is coupled to electrical circuitry that switches an electrical drive to the device 9 in order to cause it to produce the aerosol 39.

The electrical circuitry is shown in Figures 7 and 8 and includes a breath detector circuit 45 together with a driver circuit 46. The driver circuit 46 is shown in detail in Figure 7 and includes a micro controller 47 responsive to an output from the breath detector circuit 45 indicative that the user is drawing on the mouthpiece housing 5. As explained later, the breath detector circuit 45 provides a step voltage change in response to the user drawing on the mouthpiece housing 5, and in response, the micro controller 47 generates a pulsed rectangular waveform as illustrated in graph G1, which is applied to a driver circuit 48, that acts as a modulator to modulate the output of an oscillator 49 typically operating a frequency in a range of 420 -450 KHz illustrated in graph G2, although other suitable frequencies could be used. The resulting modulated output is shown in graph G3 and supplied to a voltage converter circuit 50 and then to a switching circuit 51 that supplies the modulated waveform to the piezoelectric device 9 at a frequency to cause it to produce ultrasonic vibrations which, as previously explained are transmitted through the horn 8 to the discharge region 20 to cause ejection of liquid 28 through nozzle 23 as the aerosol 39 shown in Figure 5. The components of the driver circuit 46 receive a regulated drive voltage from regulator 52 that is powered by batteries 53 which, as previously explained, are mounted in the battery compartment 11 shown in Figure 2. The batteries may also illuminate the LED 12 shown in Figure 2 either continuously or when the driver circuit 46 is actuated. The batteries 53 may be rechargeable batteries in which case an external battery charger 54 may be provided, for example as a cradle or some other convenient configuration to allow the batteries 53 to be recharged by the user.

Referring to Figure 8, the breath detector circuit 45 comprises a preamplifier 55 which amplifies a signal received via the switching circuit 51 from the piezoelectric element 9, and

the amplified signal is illustrated schematically in graph G4. A signal processor 56 detects the envelope of the signal shown in graph G4 and a threshold detector 57 detects step changes in the signal from the processor 56. As illustrated in graphs G5, G6 and G7, when the user draws on the mouthpiece housing 5, when the flow rate of draw increases above a threshold, in this case around 1.6 litres/minutes as shown in graph G6, a step change occurs in the output of the signal processor 56, due to the air turbulence in the mouthpiece, which can be detected by threshold detector 57 to switch on the driver circuit 46. The voltage output from the threshold detector 57 is illustrated schematically in graph G8. Thus, the piezoelectric element 9 switches from being a pressure sensor to a ultrasonic driver so as to produce the aerosol 39 in response to the user drawing on the mouthpiece housing 5. It will be noted that the piezo detects the air turbulence resulting from drawing on the mouthpiece without actually being directly exposed directly to the airflow itself.

The components of the breath detector circuit 45 are driven by the batteries 53.

Thus, the aerosol generator device can produce an aerosol from the liquid 28 in the cartridge 7. The liquid may contain a suitable active ingredient such as nicotine, which case the device may be used as a substitute for a conventional cigarette. The liquid may contain a flavourant in addition to or instead of nicotine or may contain other active ingredients.

Once the contents of the cartridge have been consumed, the mouthpiece housing 5 may be removed and the cartridge 7 pulled away from the horn 8 and replaced with another.

It has been found that the piezoelectric arrangement provides an efficient aerosol generation technique. In particular, the shape of the tongue 30 of horn 8 amplifies the ultrasonic vibrations from the piezoelectric element 9 onto the inner proximal end wall 18 which because of its spacing from the proximal end 32 of the tongue, is free to vibrate like a drum and hence pressurise liquid in the discharge region 20 to drive the liquid through the aperture 23 to form the aerosol.

Furthermore, the progressively tapering of the capillary passageway 25 assists in transporting liquid from the interior of the cassette to the discharge region, producing a progressively increasing capillary force along the cartridge towards the proximal end 15 for

NJOY Exhibit 1002.2047

driving the liquid 28 into the discharge region 20. Also, when the generator is held in a vertical configuration, gravity assists with driving the liquid 28 from the space between the outer chamber wall 17 and the capillary driver wall 24, into the capillary passageway 25, to assist in delivery of the liquid to the discharge region 20.

It will be understood that because the cartridge is replaced periodically, quality of the successively used cartridges 7 should have generally similar spray characteristics. The cartridge 7 can be checked *in situ* in terms of its spray characteristics, which has been found to be highly dependent on the frictional force between the tongue 30 of the horn 8 and the inner chamber wall 13, which in turn results in a different electrical load on the piezo device 9. Referring to Figure 7, the driver 48 or the voltage converter 50 may be configured to adaptively adjust its voltage to compensate the load variations of the piezo device from cartridge to cartridge so as to maintain a uniformity of the aerosol spray 39 produced when cartridges are changed in the device.

It will be understood that many modifications and variations may be made to the described example of aerosol generator and cartridge, within the scope of the claims hereinafter. For example the nozzle(s) 23 my be formed directly in the cartridge outer wall rather than in a separate nozzle plate. Also, breath detection may be performed by other means than the piezo device to allow simultaneous aerosol generation and breath detection.

Claims

1. A cartridge for an aerosol generator, comprising a chamber to receive an aerosolizable liquid, the chamber having proximal and distal ends, a generally tubular inner chamber wall extending longitudinally between the proximal and distal ends, a longitudinally extending outer chamber wall surrounding the inner wall, a proximal inner end wall bridging the inner wall at the proximal end, a proximal outer end wall longitudinally spaced from the inner wall to define a discharge region between the proximal end walls, a nozzle to discharge liquid from the discharge region through the outer end wall as an aerosol, and a capillary driver wall between the inner and outer chamber walls, the capillary driver wall being spaced from the inner chamber wall to provide a longitudinally extending capillary passageway sufficiently narrow to drive liquid within the chamber by capillary action along the capillary passageway to the discharge region.

2. A cartridge according to claim 1 wherein the capillary passageway narrows from the distal end towards the proximal end so that the force due to capillary action on the liquid increases towards the proximal end.

3. A cartridge according to claim 1 or 2 wherein the nozzle comprises at least one hole in a nozzle plate received in an aperture in the proximal outer end wall.

4. A cartridge according to any preceding claim including an air inlet aperture in the proximal outer end wall to allow ingress of air into the chamber.

5. A cartridge according to any preceding claim wherein the chamber comprises a first cartridge element including the inner and outer chamber walls the inner proximal end wall and a distal end wall extending between the inner and outer chamber walls at the distal end, and a second cartridge element comprising the capillary driver wall and the outer proximal end wall.

6. An aerosol generator configured to receive a cartridge according to any preceding claim, comprising a generally tubular housing, an elongate horn member configured longitudinally within the housing to extend into the distal end of the cartridge chamber to

engage the interior surface the inner chamber wall, and a vibratory actuator on the horn member to create vibrations therein to be transmitted to the proximal inner end wall of chamber to act on liquid in the discharge region to cause discharge thereof through the nozzle.

7. A generator according to claim 6 including a mouthpiece at one end of the housing and a detector to detect air turbulence in the mouthpiece to actuate the vibratory actuator and generate the aerosol.

8. A generator according to claim 7 wherein the mouthpiece is removable from the housing to allow insertion and removal of the cartridge.

9. A generator as claimed in claim 7 or 8 wherein the vibratory actuator comprises a piezoelectric element and the detector includes said piezoelectric element to detect the air turbulence.

10. A generator according to claim 9 including electrical circuitry in the housing to drive the piezoelectric element to produce ultrasonic vibrations and also to be responsive to electrical signals from the actuator to detect pressure changes detected by the piezoelectric element.

11. A generator according to claim 10 wherein the housing includes a battery compartment to receive a battery to power the circuitry.

12. A generator according to any one of claims 8 to 11 wherein the horn comprises an elongate tongue having a proximal end to be inserted into the tubular inner chamber wall from the distal end thereof, and a base member at the distal end of the tongue, resiliently mounted in the housing, the piezoelectric element being mounted on the base member.

13. A generator according to claim 12 wherein the base member is generally cylindrical and mounted in a resilient O-ring in the housing.

14. A generator according to any one of claims 6 to 13 and including said cartridge within the housing, with the horn received within and in engagement with the tubular inner chamber wall.

15. A generator according to claim 14 wherein the outer chamber wall includes a longitudinal groove to provide a passageway for air to enter the mouthpiece to be mixed with liquid discharged from the nozzle.

16. A generator according to claim 14 or wherein the inner chamber wall of the cartridge is frustoconical and the horn is tapered to engage the interior surface of the inner chamber wall.

17. A generator according to claim 14, 15 or 16 wherein horn and the interior surface of the inner chamber wall are formed with cooperating rings and grooves to releasably engage them together.

18. A generator according to any one of claims 14 to 17 wherein the proximal end of the horn when fitted in the inner wall of the chamber is spaced from the inner proximal end wall permitting vibration thereof to discharge liquid from the discharge region through the nozzle.

19. An aerosol generator comprising:

an elongate horn member;

a vibratory actuator on the horn member

a chamber to receive an aerosolizable liquid, the chamber having proximal and distal ends, an inner chamber wall extending longitudinally between the proximal and distal ends and defining a receptacle to receive the horn member from the distal end, a longitudinally extending outer chamber wall surrounding the inner wall, a proximal inner end wall bridging the inner wall at the proximal end, a proximal outer end wall longitudinally spaced from the inner wall to define a discharge region, a nozzle to discharge liquid from the discharge region through the outer end wall as an aerosol, and a capillary driver wall between the inner and outer walls, the capillary driver wall being spaced from

the inner wall by a longitudinally extending capillary passageway sufficiently narrow to drive liquid within the chamber by capillary action along the gap to the discharge region.

20. An electronic device comprising

(a) a cartridge having a space for containing humectants and having nozzle outlet for ejecting liquid,

(b) a vibrating membrane arranged proximate the nozzle outlet,

(c) a housing comprising a support for holding said cartridge,

(d) a vibrating element arranged to actuate said vibrating membrane and said vibrating membrane being arranged to transmit the vibration to the humectants to said space, and

(e) battery powered electronics for transmitting electrical energy to said vibrating element.

21. An electronic device according to claim 20, wherein said vibrating membrane is shaped to allow an efficient ultrasonic energy transmission from said vibrating element to the liquid.

22. An electronic device according to claim 20 or and 2, wherein said cartridge is prefilled with humectants to be expelled through said nozzle outlets and an air chamber arranged to have a pressure drop between 10mbar to 20mbar for a air flow rate between 1 and 1.6 l/min.

23. An electronic device according to claim 20, 21 or 22, wherein said vibrating element arranged to vibrate and to detected air turbulence in said air chamber without contact with the piezo.

24. An electronic device according to any of claims 20 to 23 wherein said battery powered electronics comprise a bridge driver and a puff sensing circuit.

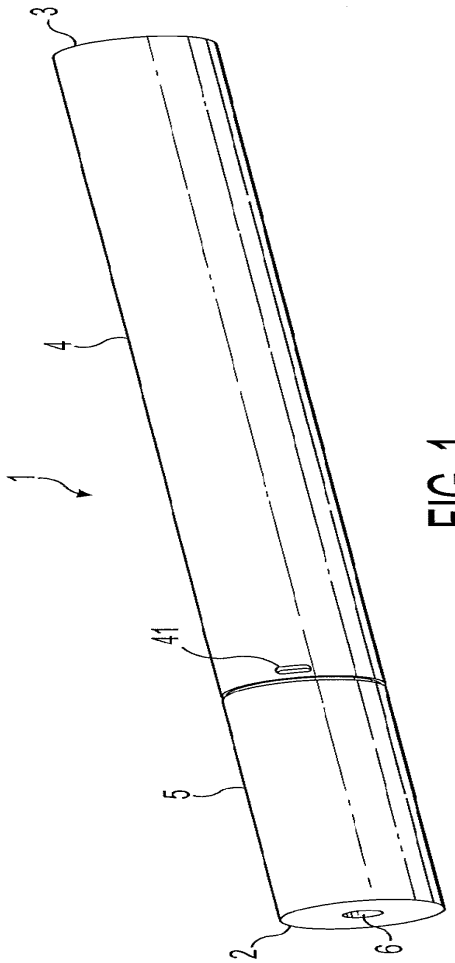


FIG. 1

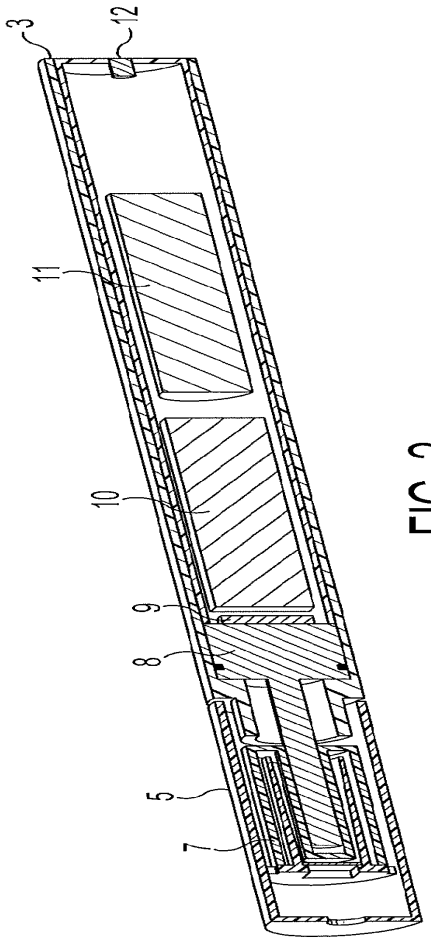


FIG. 2

NJOY Exhibit 1002.2053

FIG. 3

FIG. 4

NJOY Exhibit 1002.2054

FIG. 5

NJOY Exhibit 1002.2055

FIG. 6

NJOY Exhibit 1002.2056

FIG. 7

NJOY Exhibit 1002.2057

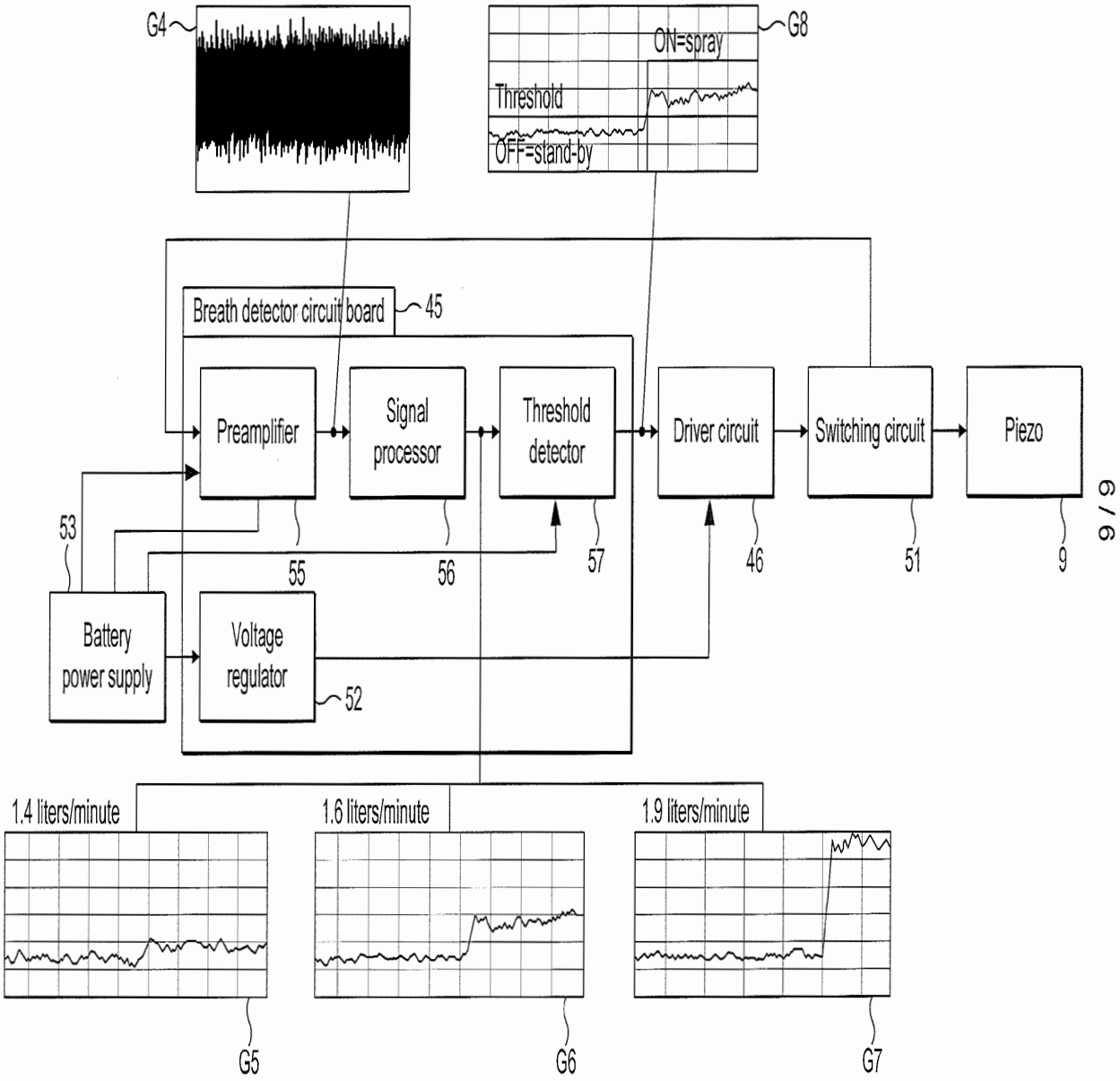


FIG. 8

PCT/EP2011/068908

NJOY Exhibit 1002.2058

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/068908

A. CLASSIFICATION OF SUBJECT MATTER
INV. B05B17/06 A24F47/00 A61M15/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B05B A24F A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/221212 A1 (HUANG YI-HSIN [TW]) 27 September 2007 (2007-09-27)	1,3-6,19
A	paragraphs [0037] - [0040]; figure 2	2
X	US 2002/074426 A1 (TANAKA SHINYA [JP] ET AL) 20 June 2002 (2002-06-20)	1,3-6,19
A	paragraph [0019] figure 1	2
X	US 2008/230052 A1 (MONTASER AKBAR [US]) 25 September 2008 (2008-09-25)	6-8
A	paragraph [0069] - paragraph [0070]	9-18
X	CN 100 443 036 C (MATSUSHITA ELECTRIC WORKS LTD [JP]) 17 December 2008 (2008-12-17) abstract; figures	6

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 February 2012	14/02/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Roldán Abalos, Jaime

7

Form PCT/ISA/210 (second sheet) (April 2005)

NJOY Exhibit 1002.2059

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/068908

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 932 102 A1 (OREAL [FR]) 11 December 2009 (2009-12-11) page 10, lines 7-8 figures 1,2 -----	1-5

7

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

NJOY Exhibit 1002.2060

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2011/068908

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

1-19

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

NJOY Exhibit 1002.2061

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5

   Cartridge for an aerosol generator.

   ---

2. claims: 6-19

   Aerosol generator with vibrating horn.

   ---

3. claims: 20-24

   Aerosol generator with vibrating element.

NJOY Exhibit 1002.2062

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2011/068908

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007221212 A1	27-09-2007	TW M297751 U	21-09-2006
		US 2007221212 A1	27-09-2007
US 2002074426 A1	20-06-2002	JP 4198850 B2	17-12-2008
		JP 2001149834 A	05-06-2001
		US 2002074426 A1	20-06-2002
US 2008230052 A1	25-09-2008	US 2008230052 A1	25-09-2008
		US 2011041858 A1	24-02-2011
CN 100443036 C	17-12-2008	NONE	
FR 2932102 A1	11-12-2009	FR 2932102 A1	11-12-2009
		WO 2009150619 A1	17-12-2009

NJOY Exhibit 1002.2063

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 March 2013 (14.03.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/034453 A1

(51) International Patent Classification:
A24F 47/00 (2006.01)

(21) International Application Number:
PCT/EP2012/066481

(22) International Filing Date:
24 August 2012 (24.08.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2011 136 870 6 September 2011 (06.09.2011) RU

(71) Applicant *(for all designated States except US)*: **BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED** [GB/GB]; Globe House, 1 Water Street, London WC2R 3LA (GB).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **KUZNETSOV, Vladimir** [RU/RU]; 10 Dvinskaya Street, Building 5, Apartment 128, St.Petersburg, 198035 (RU). **CHECHURIN, Leonid** [RU/RU]; GEN3 (Algorithm), 16A, Ruzovskaya Street, St.Petersburg, 190013 (RU).

(74) Agents: **CHETTLE, John** et al.; Venner Shipley LLP, 200 Aldersgate, London EC1A 4HD (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(54) Title: HEATING SMOKEABLE MATERIAL

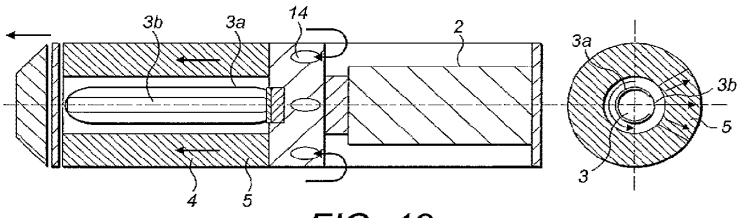


FIG. 19

(57) Abstract: An apparatus comprising a heater configured to heat smokeable material to volatilize at least one component of the smokeable material and a heat shield 5 configured to shield smokeable material from the heater.

WO 2013/034453 A1

NJOY Exhibit 1002.2064

Heating Smokeable Material

Field

The invention relates to heating smokeable material.

Background

Smoking articles such as cigarettes and cigars burn tobacco during use to create tobacco smoke. Attempts have been made to provide alternatives to these smoking articles by creating products which release compounds without creating tobacco smoke. Examples of such products are so-called heat-not-burn products which release compounds by heating, but not burning, tobacco.

The invention aims to provide an improved apparatus and method for heating tobacco, which can be used in a heat-not-burn device.

Summary

According to the invention, there is provided an apparatus comprising:

a heater configured to heat smokeable material to volatilize at least one component of the smokeable material; and

a heat shield configured to shield smokeable material from the heater, wherein the heat shield is moveable relative to the heater to selectively shield the smokeable material.

The heat shield may be moveable from a first position in which it is arranged to shield a first region of smokeable material to a second position in which it is arranged to shield a second region of smokeable material.

The heat shield may be configured to rotate around the heater from the first position to the second position.

The heat shield may be located co-axially around the heater.

The heat shield may be located co-axially inside of the heater.

NJOY Exhibit 1002.2065

The heat shield may be located co-axially around the smokeable material.

The heat shield may be configured to rotate around the smokeable material.

The heat shield may be substantially tubular in shape.

The heat shield may comprise a substantially thermally transparent window configured to transmit thermal energy from the heater to the smokeable material.

Movement of the heat shield may comprise moving the window from a first position in which it is arranged to transmit thermal energy to a first region of smokeable material to a second position in which it is arranged to transmit thermal energy to a second region of smokeable material.

The heat shield may comprise a heat-reflective material configured to reflect thermal energy.

The heat shield may comprise heat insulation configured to insulate the heater from the smokeable material.

The apparatus may comprise a stepper unit configured to incrementally move the heat shield.

The apparatus may comprise a manual actuator configured to move the heat shield in response to a user input.

The heat shield may be configured to move automatically following a predetermined heating period having elapsed.

The shield may be configured to move in response to a detection of a puff at a mouthpiece.

The apparatus may comprise a body of the smokeable material, wherein the heat shield is moveable in a region between the heater and the smokeable material.

The smokeable material may comprise a tubular body of smokeable material located co-axially around the heater and/or the heat shield.

The smokeable material may comprise a cylindrical body of smokeable material located co-axially inside the heater and heat shield.

The heater may be located along a longitudinal axis of a housing of the apparatus.

The apparatus may be configured to heat the smokeable material without combusting the smokeable material.

According to the invention, there is provided a heat shield configured to shield smokeable material from thermal energy emitted by a heater in a tobacco industry product, wherein the heat shield is moveable relative to the heater to selectively shield the smokeable material.

According to the invention, there is provided an apparatus comprising:

a heater configured to heat smokeable material to volatilize at least one component of the smokeable material;

a heat shield configured to shield smokeable material from the heater; and

a smokeable material chamber, wherein the chamber is moveable relative to the heat shield to selectively shield smokeable material in the chamber from the heater.

According to the invention, there is provided an apparatus comprising:

a heater configured to heat smokeable material to volatilize at least one component of the smokeable material;

a heat shield configured to shield smokeable material from the heater; and

a moveable apparatus configured to move smokeable material relative to the heat shield to selectively shield the smokeable material from the heater.

wherein the heating chamber is moveable relative to the heat shield to selectively shield smokeable material in the heating chamber.

According to an aspect of the invention, there is provided an apparatus configured to heat smokeable material to volatilize at least one component of the smokeable material, comprising an infra-red heater.

The infra-red heater may comprise a halogen infra-red heater.

For exemplary purposes only, embodiments of the invention are described below with reference to the accompanying figures in which:

Brief description of the figures

Figure 1 is a perspective, partially cut-away illustration of an apparatus configured to heat smokeable material to release aromatic compounds and/or nicotine from the smokeable material;

figure 2 is a perspective, partially cut-away illustration of an apparatus configured to heat smokeable material, in which the smokeable material is provided around an elongate ceramic heater divided into radial heating sections;

figure 3 is an exploded, partially cut-away view of an apparatus configured to heat smokeable material, in which the smokeable material is provided around an elongate ceramic heater divided into radial heating sections;

figure 4 is a perspective, partially cut-away illustration of an apparatus configured to heat smokeable material, in which the smokeable material is provided around an elongate infra-red heater;

figure 5 is an exploded, partially cut-away illustration of an apparatus configured to heat smokeable material, in which the smokeable material is provided around an elongate infra-red heater;

figure 6 is a schematic illustration of part of an apparatus configured to heat smokeable material, in which the smokeable material is provided around a plurality of longitudinal, elongate heating sections spaced around a central longitudinal axis;

NJOY Exhibit 1002.2068

figure 7 is a perspective illustration of part of an apparatus configured to heat smokeable material, in which the regions of smokeable material are provided between pairs of upstanding heating plates;

figure 8 is a perspective illustration of the apparatus shown in figure 7, in which an external housing is additionally illustrated;

figure 9 is an exploded view of part of an apparatus configured to heat smokeable material, in which the regions of smokeable material are provided between pairs of upstanding heating plates;

figure 10 is a flow diagram showing a method of activating heating regions and opening and closing heating chamber valves during puffing;

figure 11 is a schematic illustration of a gaseous flow through an apparatus configured to heat smokeable material;

figure 12 is a graphical illustration of a heating pattern which can be used to heat smokeable material using a heater;

figure 13 is a schematic illustration of a smokeable material compressor configured to compress smokeable material during heating;

figure 14 is a schematic illustration of a smokeable material expander configured to expand smokeable material during puffing;

figure 15 is a flow diagram showing a method of compressing smokeable material during heating and expanding the smokeable material for puffing;

figure 16 is a schematic, cross-sectional illustration of a section of vacuum insulation configured to insulate heated smokeable material from heat loss;

figure 17 is another schematic, cross-sectional illustration of a section of vacuum insulation configured to insulate heated smokeable material from heat loss;

figure 18 is a schematic, cross-sectional illustration of a heat resistive thermal bridge which follows an indirect path from a higher temperature insulation wall to a lower temperature insulation wall;

figure 19 is a schematic, cross-sectional illustration of a heat shield and a heat-transparent window which are moveable relative to a body of smokeable material to selectively allow thermal energy to be transmitted to different sections of the smokeable material through the window; and

NJOY Exhibit 1002.2069

figure 20 is schematic, cross sectional illustration of part of an apparatus configured to heat smokeable material, in which a heating chamber is hermetically sealable by check valves.

Detailed description

As used herein, the term 'smokeable material' includes any material that provides volatilized components upon heating and includes any tobacco-containing material and may, for example, include one or more of tobacco, tobacco derivatives, expanded tobacco, reconstituted tobacco or tobacco substitutes.

An apparatus 1 for heating smokeable material comprises an energy source 2, a heater 3 and a heating chamber 4. The energy source 2 may comprise a battery such as a Li-ion battery, Ni battery, Alkaline battery and/or the like, and is electrically coupled to the heater 3 to supply electrical energy to the heater 3 when required. The heating chamber 4 is configured to receive smokeable material 5 so that the smokeable material 5 can be heated in the heating chamber 4. For example, the heating chamber 4 may be located adjacent to the heater 3 so that thermal energy from the heater 3 heats the smokeable material 5 therein to volatilize aromatic compounds and nicotine in the smokeable material 5 without burning the smokeable material 5. A mouthpiece 6 is provided through which a user of the apparatus 1 can inhale the volatilized compounds during use of the apparatus 1. The smokeable material 5 may comprise a tobacco blend.

As shown in figure 1, the heater 3 may comprise a substantially cylindrical, elongate heater 3 and the heating chamber 4 is located around a circumferential, longitudinal surface of the heater 3. The heating chamber 4 and smokeable material 5 therefore comprise co-axial layers around the heater 3. However, as will be evident from the discussion below, other shapes and configurations of the heater 3 and heating chamber 4 can alternatively be used.

A housing 7 may contain components of the apparatus 1 such as the energy source 2 and heater 3. As shown in figure 1, the housing 7 may comprise an approximately cylindrical tube with the energy source 2 located towards its first end 8 and the

heater 3 and heating chamber 4 located towards its opposite, second end 9. The energy source 2 and heater 3 extend along the longitudinal axis of the housing 7. For example, as shown in figure 1, the energy source 2 and heater 3 can be aligned along the central longitudinal axis of the housing 7 in an end-to-end arrangement so that an end face of the energy source 2 faces an end face of the heater 3. The length of the housing 7 may be approximately 130mm, the length of energy source may be approximately 59mm, and the length of the heater 3 and heating region 4 may be approximately 50mm. The diameter of the housing 7 may be between approximately 15mm and approximately 18mm. For example, the diameter of the housing's first end 8 may be 18mm whilst the diameter of the mouthpiece 6 at the housing's second end 9 may be 15mm. The diameter of the heater 3 may be between approximately 2.0mm and approximately 6.0mm. The diameter of the heater 3 may, for example, be between approximately 4.0mm and approximately 4.5mm or between approximately 2.0mm and approximately 3.0mm. Heater diameters outside these ranges may alternatively be used. The depth of the heating chamber 4 may be approximately 5mm and the heating chamber 4 may have an exterior diameter of approximately 10mm at its outwardly-facing surface. The diameter of the energy source 2 may be between approximately 14.0mm and approximately 15.0mm, such as 14.6mm.

Heat insulation may be provided between the energy source 2 and the heater 3 to prevent direct transfer of heat from one to the other. The mouthpiece 6 can be located at the second end 9 of the housing 7, adjacent the heating chamber 4 and smokeable material 5. The housing 7 is suitable for being gripped by a user during use of the apparatus 1 so that the user can inhale volatilized smokeable material compounds from the mouthpiece 6 of the apparatus 1.

Referring to figures 2 and 3, the heater 3 may comprise a ceramics heater 3. The ceramics heater 3 may, for example, comprise base ceramics of alumina and/or silicon nitride which are laminated and sintered. Alternatively, referring to figures 4 and 5, the heater 3 may comprise an infra-red (IR) heater 3 such as a halogen-IR lamp 3. The IR heater 3 may have a low mass and therefore its use can help to reduce the overall mass of the apparatus 1. For example, the mass of the IR heater

may be 20% to 30% less than the mass of a ceramics heater 3 having an equivalent heating power output. The IR heater 3 also has low thermal inertia and therefore is able to heat the smokeable material 5 very rapidly in response to an activation stimulus. The IR heater 3 may be configured to emit IR electromagnetic radiation of between approximately 700nm and 4.5 μm in wavelength.

As indicated above and shown in figure 1, the heater 3 may be located in a central region of the housing 7 and the heating chamber 4 and smokeable material 5 may be located around the longitudinal surface of the heater 3. In this arrangement, thermal energy emitted by the heater 3 travels in a radial direction outwards from the longitudinal surface of the heater 3 into the heating chamber 4 and the smokeable material 5.

The heater 3 may optionally comprise a plurality of individual heating regions 10. The heating regions 10 may be operable independently of one another so that different regions 10 can be activated at different times to heat the smokeable material 5. The heating regions 10 may be arranged in the heater 3 in any geometric arrangement. However, in the examples shown in the figures, the heating regions 10 are geometrically arranged in the heater 3 so that different ones of the heating regions 10 are arranged to predominately and independently heat different regions of the smokeable material 5.

For example, referring to figure 2, the heater 3 may comprise a plurality of axially aligned heating regions 10. The regions 10 may each comprise an individual element of the heater 3. The heating regions 10 may, for example, all be aligned with each other along a longitudinal axis of the heater 3, thus providing a plurality of independent heating zones along the length of the heater 3. Each heating region 10 may comprise a heating cylinder 10 having a finite length which is significantly less than the length of the heater 3 as a whole. The arrangement and features of the cylinders 10 are discussed below in terms of heating disks, where each disk has a depth which is equivalent to cylinder length. The heating disks 10 are arranged with their radial surfaces facing one another along the length of the heater 3. The radial surfaces of each disk 10 may touch the radial surfaces of its neighbouring disks 10.

NJOY Exhibit 1002.2072

Alternatively, a heat insulating or heat reflecting layer may be present between the radial surfaces of the disks 10 so that thermal energy emitted from each one of the disks 10 does not substantially heat the neighbouring disks 10 and instead travels predominately outwards from the circumferential surface of the disk 10 into the heating chamber 4 and smokeable material 5. Each disk 10 may have substantially the same dimensions as the other disks 10.

In this way, when a particular one of the heating regions 10 is activated, it supplies thermal energy to the smokeable material 5 located radially around the heating region 10 without substantially heating the remainder of the smokeable material 5. For example, referring to figure 2, the heated region of smokeable material 5 may comprise a ring of smokeable material 5 located around the heating disk 10 which has been activated. The smokeable material 5 can therefore be heated in independent sections, for example rings, where each section corresponds to smokeable material 5 located directly around a particular one of the heating regions 10 and has a mass and volume which is significantly less than the body of smokeable material 5 as a whole.

Additionally or alternatively, referring to figure 6, the heater 3 may comprise a plurality of elongate, longitudinally extending heating regions 10 positioned at different locations around the central longitudinal axis of the heater 3. Although shown as being of different lengths in figure 6, the longitudinally extending heating regions 10 may be of substantially the same length so that each extends along substantially the whole length of the heater 3. Each heating region 10 may comprise, for example, an individual IR heating element 10 such as an IR heating filament 10. Optionally, a body of heat insulation or heat reflective material may be provided along the central longitudinal axis of the heater 3 so that thermal energy emitted by each heating region 10 travels predominately outwards from the heater 3 into the heating chamber 4 and thus heats the smokeable material 5. The distance between the central longitudinal axis of the heater 3 and each of the heating regions 10 may be substantially equal. The heating regions 10 may optionally be contained in a substantially infra-red and/or heat transparent tube, or other housing, which

forms a longitudinal surface of the heater 3. The heating regions 10 may be fixed in position relative to the other heating regions 10 inside the tube.

In this way, when a particular one of the heating regions 10 is activated, it supplies thermal energy to the smokeable material 5 located adjacent to the heating region 10 without substantially heating the remainder of the smokeable material 5. The heated section of smokeable material 5 may comprise a longitudinal section of smokeable material 5 which lies parallel and directly adjacent to the longitudinal heating region 10. Therefore, as with the previous example, the smokeable material 5 can be heated in independent sections.

As will be described further below, the heating regions 10 can each be individually and selectively activated.

The smokeable material 5 may be comprised in a cartridge 11 which can be inserted into the heating chamber 4. For example, as shown in figure 1, the cartridge 11 can comprise a smokeable material tube 11 which can be inserted around the heater 3 so that the internal surface of the smokeable material tube 11 faces the longitudinal surface of the heater 3. The smokeable material tube 11 may be hollow. The diameter of the hollow centre of the tube 11 may be substantially equal to, or slightly larger than, the diameter of the heater 3 so that the tube 11 is a close fit around the heater 3. The length of the cartridge 11 may be approximately equal to the length of the heater 3 so that the heater 3 can heat the cartridge 11 along its whole length.

The housing 7 of the apparatus 1 may comprise an opening through which the cartridge 11 can be inserted into the heating chamber 4. The opening may, for example, comprise a ring-shaped opening located at the housing's second end 9 so that the cartridge 11 can be slid into the opening and pushed directly into the heating chamber 4. The opening is preferably closed during use of the apparatus 1 to heat the smokeable material 5. Alternatively, a section of the housing 7 at the second end 9 is removable from the apparatus 1 so that the smokeable material 5 can be inserted into the heating chamber 4. An example of this is shown in figure

9. The apparatus 1 may optionally be equipped with a user-operable smokeable material ejection unit, such as an internal mechanism configured to slide used smokeable material 5 off and/or away from the heater 3. The used smokeable material 5 may, for example, be pushed back through the opening in the housing 7. A new cartridge 11 can then be inserted as required.

In an alternative configuration of heater 3, the heater 3 comprises a spirally shaped heater 3. The spirally shaped heater 3 may be configured to screw into the smokeable material cartridge 11 and may comprise adjacent, axially-aligned heating regions 10 so as to operate in substantially the same manner as described for the linear, elongate heater 3 described above.

In an alternative configuration of heater 3 and heating chamber 4, the heater 3 comprises a substantially elongate tube, which may be cylindrical, and the heating chamber 4 is located inside the tube 3 rather than around the heater's outside. The heater 3 may comprise a plurality of axially-aligned heating sections, which may each comprise a heating ring configured to heat smokeable material 5 located radially inwardly from the ring. In this way, the heater 3 is configured to independently heat separate sections of smokeable material 5 in the heating chamber 4 in a manner similar to the heater 3 described above in relation to figure 2. The heat is applied radially inwardly to the smokeable material 5, rather than radially outwardly as previously described.

Alternatively, referring to figures 7, 8 and 9, a different geometrical configuration of heater 3 and smokeable material 5 can be used. More particularly, the heater 3 can comprise a plurality of heating regions 10 which extend directly into an elongate heating chamber 4 which is divided into sections by the heating regions 10. During use, the heating regions 10 extend directly into an elongate smokeable material cartridge 11 or other substantially solid body of smokeable material 5. The smokeable material 5 in the heating chamber 4 is thereby divided into discrete sections separated from each other by the spaced-apart heating regions 10. The heater 3, heating chamber 4 and smokeable material 5 may extend together along a central, longitudinal axis of the housing 7. As shown in figures 7 and 9, the heating

regions 10 may each comprise a projection 10, such as an upstanding heating plate 10, which extends into the body of smokeable material 5. The projections 10 are discussed below in the context of heating plates 10. The principal plane of the heating plates 10 may be substantially perpendicular to the principal longitudinal axis of the body of smokeable material 5 and heating chamber 4 and/or housing 7. The heating plates 10 may be parallel to one another, as shown in figures 7 and 9. Each section of smokeable material 5 is bounded by a main heating surface of a pair of heating plates 10 located either side of the smokeable material section, so that activation of one or both of the heating plates 10 will cause thermal energy to be transferred directly into the smokeable material 5. The heating surfaces may be embossed to increase the surface area of the heating plate 10 against the smokeable material 5. Optionally, each heating plate 10 may comprise a thermally reflective layer which divides the plate 10 into two halves along its principal plane. Each half of the plate 10 can thus constitute a separate heating region 10 and may be independently activated to heat only the section of smokeable material 5 which lies directly against that half of the plate 10, rather than the smokeable material 5 on both sides of the plate 10. Adjacent plates 10, or facing portions thereof, may be activated to heat a section of smokeable material 5, which is located between the adjacent plates, from substantially opposite sides of the section of smokeable material 5.

The elongate smokeable material cartridge or body 11 can be installed between, and removed from, the heating chamber 4 and heating plates 10 by removing a section of the housing 7 at the housing's second end 9, as previously described. The heating regions 10 can be individually and selectively activated to heat different sections of the smokeable material 5 as required.

In this way, when a particular one or pair of the heating regions 10 is activated, it supplies thermal energy to the smokeable material 5 located directly adjacent to the heating region(s) 10 without substantially heating the remainder of the smokeable material 5. The heated section of smokeable material 5 may comprise a radial section of smokeable material 5 located between the heating regions 10, as shown in figures 7 to 9.

NJOY Exhibit 1002.2076

The apparatus 1 may comprise a controller 12, such as a microcontroller 12, which is configured to control operation of the apparatus 1. The controller 12 is electronically connected to the other components of the apparatus 1 such as the energy source 2 and heater 3 so that it can control their operation by sending and receiving signals. The controller 12 is, in particular, configured to control activation of the heater 3 to heat the smokeable material 5. For example, the controller 12 may be configured to activate the heater 3, which may comprise selectively activating one or more heating regions 10, in response to a user drawing on the mouthpiece 6 of the apparatus 1. In this regard, the controller 12 may be in communication with a puff sensor 13 via a suitable communicative coupling. The puff sensor 13 is configured to detect when a puff occurs at the mouthpiece 6 and, in response, is configured to send a signal to the controller 12 indicative of the puff. An electronic signal may be used. The controller 12 may respond to the signal from the puff sensor 13 by activating the heater 3 and thereby heating the smokeable material 5. The use of a puff sensor 13 to activate the heater 3 is not, however, essential and other means for providing a stimulus to activate the heater 3 can alternatively be used. The volatilized compounds released during heating can then be inhaled by the user through the mouthpiece 6. The controller 12 can be located at any suitable position within the housing 7. An example position is between the energy source 2 and the heater 3/heating chamber 4, as illustrated in figure 3.

If the heater 3 comprises two or more heating regions 10 as described above, the controller 12 may be configured to activate the heating regions 10 in a predetermined order or pattern. For example, the controller 12 may be configured to activate the heating regions 10 sequentially along or around the heating chamber 4. Each activation of a heating region 10 may be in response to detection of a puff by the puff sensor 13 or may be triggered in an alternative way, as described further below.

Referring to figure 10, an example heating method may comprise a first step S1 in which a first puff is detected followed by a second step S2 in which a first section of smokeable material 5 is heated in response to the first puff. In a third step S3,

hermetically sealable inlet and outlet valves 24 may be opened to allow air to be drawn through the heating chamber 4 and out of the apparatus 1 through the mouthpiece 6. In a fourth step, the valves 24 are closed. These valves 24 are described in more detail below with respect to figure 20. In fifth S5, sixth S6, seventh S7 and eighth S8 steps, a second section of smokeable material 5 may be heated in response to a second puff, with a corresponding opening and closing of the heating chamber inlet and outlet valves 24. In ninth S9, tenth S10, eleventh S11 and twelfth S12 steps, a third section of the smokeable material 5 may be heated in response to a third puff with a corresponding opening and closing of the heating chamber inlet and outlet valves 24, and so on. Means other than a puff sensor 13 could alternatively be used. For example, a user of the apparatus 1 may actuate a control switch to indicate that he/she is taking a new puff. In this way, a fresh section of smokeable material 5 may be heated to volatilize nicotine and aromatic compounds for each new puff. The number of heating regions 10 and/or independently heatable sections of smokeable material 5 may correspond to the number of puffs for which the cartridge 11 is intended to be used. Alternatively, each independently heatable smokeable material section 5 may be heated by its corresponding heating region(s) 10 for a plurality of puffs such as two, three or four puffs, so that a fresh section of smokeable material 5 is heated only after a plurality of puffs have been taken whilst heating the previous smokeable material section.

Instead of activating each heating region 10 in response to an individual puff, the heating regions 10 may alternatively be activated sequentially, one after the other, in response to a single, initial puff at the mouthpiece 6. For example, the heating regions 10 may be activated at regular, predetermined intervals over the expected inhalation period for a particular smokeable material cartridge 11. The inhalation period may, for example, be between approximately one and approximately four minutes. Therefore, at least the fifth and ninth steps S5, S9 shown in figure 10 are optional. Each heating region 10 may be activated for a predetermined period corresponding to the duration of the single or plurality of puffs for which the corresponding independently heatable smokeable material section 5 is intended to be heated. Once all of the heating regions 10 have been activated for a particular cartridge 11, the controller 12 may be configured to indicate to the user that the

cartridge 11 should be changed. The controller 12 may, for example, activate an indicator light at the external surface of the housing 7.

It will be appreciated that activating individual heating regions 10 in order rather than activating the entire heater 3 means that the energy required to heat the smokeable material 5 is reduced over what would be required if the heater 3 were activated fully over the entire inhalation period of a cartridge 11. Therefore, the maximum required power output of the energy source 2 is also reduced. This means that a smaller and lighter energy source 2 can be installed in the apparatus 1.

The controller 12 may be configured to de-activate the heater 3, or reduce the power being supplied to the heater 3, in between puffs. This saves energy and extends the life of the energy source 2. For example, upon the apparatus 1 being switched on by a user or in response to some other stimulus, such as detection of a user placing their mouth against the mouthpiece 6, the controller 12 may be configured to cause the heater 3, or next heating region 10 to be used to heat the smokeable material 5, to be partially activated so that it heats up in preparation to volatilize components of the smokeable material 5. The partial activation does not heat the smokeable material 5 to a sufficient temperature to volatilize nicotine. A suitable temperature could be below 120°C, such as 100°C or below. An example is a temperature between 60°C and 100°C, such as a temperature between 80°C and 100°C. The temperature may be less than 100°C. In response to detection of a puff by the puff sensor 13, the controller 12 can then cause the heater 3 or heating region 10 in question to heat the smokeable material 5 further in order to rapidly volatilize the nicotine and other aromatic compounds for inhalation by the user. If the smokeable material 5 comprises tobacco, a suitable temperature for volatilizing the nicotine and other aromatic compounds may be 100°C or above, such as 120°C or above. An example is a temperature between 100°C and 250°C, such as between 150°C and 250°C or between 130°C and 180°C. The temperature may be more than 100°C. An example full activation temperature is 150°C, although other values such as 250°C are also possible. A super-capacitor can optionally be used to provide the peak current used to heat the smokeable material 5 to the volatization temperature. An example of a suitable heating pattern is shown in figure 12, in which the peaks

NJOY Exhibit 1002.2079

may respectively represent the full activation of different heating regions 10. As can be seen, the smokeable material 5 is maintained at the volatization temperature for the approximate period of the puff which, in this example, is two seconds.

Three example operational modes of the heater 3 are described below.

In a first operational mode, during full activation of a particular heating region 10, all other heating regions 10 of the heater are deactivated. Therefore, when a new heating region 10 is activated, the previous heating region is deactivated. Power is supplied only to the activated region 10.

Alternatively, in a second operational mode, during full activation of a particular heating region 10, one or more of the other heating regions 10 may be partially activated. Partial activation of the one or more other heating regions 10 may comprise heating the other heating region(s) 10 to a temperature which is sufficient to substantially prevent condensation of components such as nicotine volatized from the smokeable material 5 in the heating chamber 4. The temperature of the heating regions 10 which are partially activated is less than the temperature of the heating region 10 which is fully activated. The smokeable material 10 located adjacent the partially activated regions 10 is not heated to a temperature sufficient to volatize components of the smokeable material 5.

Alternatively, in a third operational mode, once a particular heating region 10 has been activated, it remains fully activated until the heater 3 is switched off. Therefore, the power supplied to the heater 3 incrementally increases as more of the heating regions 10 are activated during inhalation from the cartridge 11. As with the second mode previously described, the continuing activation of the heating regions 10 substantially prevent condensation of components such as nicotine volatized from the smokeable material 5 in the heating chamber 4.

The apparatus 1 may comprise a heat shield 3a, which is located between the heater 3 and the heating chamber 4/smokeable material 5. The heat shield 3a is configured to substantially prevent thermal energy from flowing through the heat shield 3a and

therefore can be used to selectively prevent the smokeable material 5 from being heated even when the heater 3 is activated and emitting thermal energy. Referring to figure 19, the heat shield 3a may, for example, comprise a cylindrical layer of heat reflective material which is located co-axially around the heater 3. Alternatively, if the heater 3 is located around the heating chamber 4 and smokeable material 5 as previously described, the heat shield 3a may comprise a cylindrical layer of heat reflective material which is located co-axially around the heating chamber 4 and co-axially inside of the heater 3. The heat shield 3a may additionally or alternatively comprise a heat-insulating layer configured to insulate the heater 3 from the smokeable material 5. The heat shield 3a comprises a substantially heat-transparent window 3b which allows thermal energy to propagate through the window 3b and into the heating chamber 4 and smokeable material 5. Therefore, the section of smokeable material 5 which is aligned with the window 3b is heated whilst the remainder of the smokeable material 5 is not. The heat shield 3a and window 3b may be rotatable or otherwise moveable with respect to the smokeable material 5 so that different sections of the smokeable material 5 can be selectively and individually heated by rotating or moving the heat shield 3a and window 3b. The effect is similar to the effect provided by selectively and individually activating the heating regions 10 referred to above. For example, the heat shield 3a and window 3b may be rotated or otherwise moved incrementally in response to a signal from the puff detector 13. Additionally or alternatively, the heat shield 3a and window 3b may be rotated or otherwise moved incrementally in response to a predetermined heating period having elapsed. Movement or rotation of the heat shield 3a and window 3b may be controlled by electronic signals from the controller 12. The relative rotation or other movement of the heat shield 3a/window 3b and smokeable material 5 may be driven by a stepper motor 3c under the control of the controller 12. This is illustrated in figure 19. Alternatively, the heat shield 3a and window 3b may be manually rotated using a user control such as an actuator on the housing 7. The heat shield 3a does not need to be cylindrical and may comprise optionally comprise one or more suitably positioned longitudinally extending elements and or/plates.

NJOY Exhibit 1002.2081

It will be appreciated that a similar result can be obtained by rotating or moving the smokeable material 5 relative to the heater 3, heat shield 3a and window 3b. For example, the heating chamber 4 may be rotatable around the heater 3. If this is the case, the above description relating to movement of the heat shield 3a can be applied instead to movement of the heating chamber 4 relative to the heat shield 3a.

The heat shield 3a may comprise a coating on the longitudinal surface of the heater 3. In this case, an area of the heater's surface is left uncoated to form the heat-transparent window 3b. The heater 3 can be rotated or otherwise moved, for example under the control of the controller 12 or user controls, to cause different sections of the smokeable material 5 to be heated. Alternatively, the heat shield 3a and window 3b may comprise a separate shield 3a which is rotatable or otherwise moveable relative to both the heater 3 and the smokeable material 5 under the control of the controller 12 or other user controls.

Referring to figure 6, the apparatus 1 may comprise air inlets 14 which allow external air to be drawn into the housing 7 and through the heated smokeable material 5 during puffing. The air inlets 14 may comprise apertures 14 in the housing 7 and may be located upstream from the smokeable material 5 and heating chamber 4 towards the first end 8 of the housing 7. This is shown in figure 1. Another example is shown in figure 11. Air drawn in through the inlets 14 travels through the heated smokeable material 5 and therein is enriched with smokeable material vapours, such as aroma vapours, before being inhaled by the user at the mouthpiece 6. Optionally, as shown in figure 11, the apparatus 1 may comprise a heat exchanger 15 configured to warm the air before it enters the smokeable material 5 and/or to cool the air before it is drawn through the mouthpiece 6. For example, the heat exchanger 15 may be configured to use heat extracted from the air entering the mouthpiece 6 to warm new air before it enters the smokeable material 5.

The apparatus 1 may comprise a smokeable material compressor 16 configured to cause the smokeable material 5 to compress upon activation of the compressor 16. The apparatus 1 can also comprise a smokeable material expander 17 configured to

cause the smokeable material 5 to expand upon activation of the expander 17. The compressor 16 and expander 17 may, in practice, be implemented as the same unit as will be explained below. The smokeable material compressor 16 and expander 17 may optionally operate under the control of the controller 12. In this case, the controller 12 is configured to send a signal, such as an electrical signal, to the compressor 16 or expander 17 which causes the compressor 16 or expander 17 to respectively compress or expand the smokeable material 5. Alternatively, the compressor 16 and expander 17 may be actuated by a user of the apparatus 1 using a manual control on the housing 7 to compress or expand the smokeable material 5 as required.

The compressor 16 is principally configured to compress the smokeable material 5 and thereby increase its density during heating. Compression of the smokeable material increases the thermal conductivity of the body of smokeable material 5 and therefore provides a more rapid heating and consequent rapid volatization of nicotine and other aromatic compounds. This is preferable because it allows the nicotine and aromatics to be inhaled by the user without substantial delay in response to detection of a puff. Therefore, the controller 12 may activate the compressor 16 to compress the smokeable material 5 for predetermined heating period, for example one second, in response to detection of a puff. The compressor 16 may be configured to reduce its compression of the smokeable material 5, for example under the control of the controller 12, after the predetermined heating period. Alternatively, the compression may be reduced or automatically ended in response to the smokeable material 5 reaching a predetermined threshold temperature. A suitable threshold temperature may be in the range of approximately 100°C to 250°C, such as between 100°C and 220°C, between 150°C and 250°C, between 100°C and 200°C or between 130°C and 180°C. The threshold temperature may be above 100°C, such as a value above 120°C, and may be user selectable. A temperature sensor may be used to detect the temperature of the smokeable material 5.

The expander 17 is principally configured to expand the smokeable material 5 and thereby decrease its density during puffing. The arrangement of smokeable material

5 in the heating chamber 4 becomes more loose when the smokeable material 5 has been expanded and this aids the gaseous flow, for example air from the inlets 14, through the smokeable material 5. The air is therefore more able to carry the volatilized nicotine and aromatics to the mouthpiece 6 for inhalation. The controller 12 may activate the expander 17 to expand the smokeable material 5 immediately following the compression period referred to above so that air can be drawn more freely through the smokeable material 5. Actuation of the expander 17 may be accompanied by a user-audible sound or other indication to indicate to the user that the smokeable material 5 has been heated and that puffing can commence.

Referring to figures 13 and 14, the compressor 16 and expander 17 may comprise a spring-actuated driving rod which is configured to compress the smokeable material 5 in the heating chamber 4 when the spring is released from compression. This is schematically illustrated in figures 13 and 14, although it will be appreciated that other implementations could be used. For example, the compressor 16 may comprise a ring, having a thickness approximately equal to the tubular-shaped heating chamber 4 described above, which is driven by a spring or other means into the heating chamber 4 to compress the smokeable material 5. Alternatively, the compressor 16 may be comprised as part of the heater 3 so that the heater 3 itself is configured to compress and expand the smokeable material 5 under the control of the controller 12. For example, where the heater 3 comprises upstanding heating plates 10 of the type previously described, the plates 10 may be independently moveable in a longitudinal direction of the heater 3 to expand or compress the sections of smokeable material 5 which are located adjacent to them. A method of compressing and expanding the smokeable material 5 is shown in figure 15.

Thermal insulation 18 may be provided between the smokeable material 5 and an external surface 19 of the housing 7 to reduce heat loss from the apparatus 1 and therefore improve the efficiency with which the smokeable material 5 is heated. For example, referring to figure 1, a wall of the housing 7 may comprise a layer of insulation 18 which extends around the outside of the heating chamber 4. The insulation layer 18 may comprise a substantially tubular length of insulation 18 located co-axially around the heating chamber 4 and smokeable material 5. This is

shown in figure 1. It will be appreciated that the insulation 18 could also be comprised as part of the smokeable material cartridge 11, in which it would be located co-axially around the outside of the smokable material 5.

Referring to figure 16, the insulation 18 may comprise vacuum insulation 18. For example, the insulation 18 may comprise a layer which is bounded by a wall material 19 such as a metallic material. An internal region or core 20 of the insulation 18 may comprise an open-cell porous material, for example comprising polymers, aerogels or other suitable material, which is evacuated to a low pressure. The pressure in the internal region 20 may be in the range of 0.1 to 0.001 mbar. The wall 19 of the insulation 18 is sufficiently strong to withstand the force exerted against it due to the pressure differential between the core 20 and external surfaces of the wall 19, thereby preventing the insulation 18 from collapsing. The wall 19 may, for example, comprise a stainless steel wall 19 having a thickness of approximately 100μm. The thermal conductivity of the insulation 18 may be in the range of 0.004 to 0.005 W/mK. The heat transfer coefficient of the insulation 18 may be between approximately 1.10 $W/(m^2K)$ and approximately 1.40 $W/(m^2K)$ within a temperature range of between 100 degrees Celsius and 250 degrees Celsius, such as between approximately 150 degrees Celsius and approximately 250 degrees Celsius. The gaseous conductivity of the insulation 18 is negligible. A reflective coating may be applied to the internal surfaces of the wall material 19 to minimize heat losses due to radiation propagating through the insulation 18. The coating may, for example, comprise an aluminium IR reflective coating having a thickness of between approximately 0.3μm and 1.0μm. The evacuated state of the internal core region 20 means that the insulation 18 functions even when the thickness of the core region 20 is very small. The insulating properties are substantially unaffected by its thickness. This helps to reduce the overall size of the apparatus 1.

As shown in figure 16, the wall 19 may comprise an inwardly-facing section 21 and an outwardly-facing section 22. The inwardly-facing section 21 substantially faces the smokeable material 5 and heating chamber 4. The outwardly-facing section 22 substantially faces the exterior of the housing 7. During operation of the apparatus 1, the inwardly-facing section 21 may be warmer due to the thermal energy

originating from the heater 3, whilst the outwardly-facing section 22 is cooler due to the effect of the insulation 18. The inwardly-facing section 21 and the outwardly-facing section 22 may, for example, comprise substantially parallel longitudinally-extending walls 19 which are at least as long as the heater 3. The internal surface of the outwardly-facing wall section 22, i.e. the surface facing the evacuated core region 20, may comprise a coating for absorbing gas in the core 20. A suitable coating is a titanium oxide film.

Referring to the schematic illustration in figure 17, a thermal bridge 23 may connect the inwardly-facing wall section 21 to the outwardly-facing wall section 22 at the edges of the insulation 18 in order to completely encompass and contain the low pressure core 20. The thermal bridge 23 may comprise a wall 19 formed of the same material as the inwardly and outwardly-facing sections 21, 22. A suitable material is stainless steel, as previously discussed. The thermal bridge 23 has a greater thermal conductivity than the insulating core 20 and therefore may undesirably conduct heat out of the apparatus 1 and, in doing so, reduce the efficiency with which the smokeable material 5 is heated.

To reduce heat losses due to the thermal bridge 23, the thermal bridge 23 may be extended to increase its resistance to heat flow from the inwardly-facing section 21 to the outwardly-facing section 22. This is schematically illustrated in figure 18. For example, the thermal bridge 23 may follow an indirect path between the inwardly-facing section 21 of wall 19 and the outwardly-facing section 22 of wall 19. This may be facilitated by providing the insulation 18 over a longitudinal distance which is longer than the lengths of the heater 3, heating chamber 4 and smokeable material 5 so that the thermal bridge 23 can gradually extend from the inwardly-facing section 21 to the outwardly-facing section 22 along the indirect path, thereby reducing the thickness of the core 20 to zero, at a longitudinal location in the housing 7 where the heater 3, heating chamber 4 and smokeable material 5 are not present.

Referring to figure 20, as previously discussed, the heating chamber 4 insulated by the insulation 18 may comprise inlet and outlet valves 24 which hermetically seal the

NJOY Exhibit 1002.2086

heating chamber 4 when closed. The valves 24 can thereby prevent air from undesirably entering and exiting the chamber 4 and can prevent smokeable material flavours from exiting the chamber 4. The inlet and outlet values 24 may, for example, be provided in the insulation 18. For example, between puffs, the valves 24 may be closed by the controller 12 so that all volatilized substances remain contained inside the chamber 4 in-between puffs. The partial pressure of the volatized substances between puffs reaches the saturated vapour pressure and the amount of evaporated substances therefore depends only on the temperature in the heating chamber 4. This helps to ensure that the delivery of volatilized nicotine and aromatic compounds remains constant from puff to puff. During puffing, the controller 12 is configured to open the valves 24 so that air can flow through the chamber 4 to carry volatilized smokeable material components to the mouthpiece 6. A membrane can be located in the valves 24 to ensure that no oxygen enters the chamber 4. The valves 24 may be breath-actuated so that the valves 24 open in response to detection of a puff at the mouthpiece 6. The valves 24 may close in response to a detection that a puff has ended. Alternatively, the valves 24 may close following the elapse of a predetermined period after their opening. The predetermined period may be timed by the controller 12. Optionally, a mechanical or other suitable opening/closing means may be present so that the valves 24 open and close automatically. For example, the gaseous movement caused by a user puffing on the mouthpiece 6 may be used to open and close the valves 24. Therefore, the use of the controller 12 is not necessarily required to actuate the valves 24.

The mass of the smokeable material 5 which is heated by the heater 3, for example by each heating region 10, may be in the range of 0.2 to 1.0g. The temperature to which the smokeable material 5 is heated may be user controllable, for example to any temperature within the temperature range of 100°C to 250°C, such as any temperature within the range of 150°C to 250°C and the other volatizing temperature ranges previously described. The mass of the apparatus 1 as a whole may be in the range of 70 to 125g. A battery 2 with a capacity of 1000 to 3000mAh and voltage of 3.7V can be used. The heating regions 10 may be configured to

individually and selectively heat between approximately 10 and 40 sections of smokeable material 5 for a single cartridge 11.

It will be appreciated that any of the alternatives described above can be used singly or in combination. For example, as discussed above, the heater 3 may be located around the outside of the smokeable material 5 rather than the smokeable material 5 being located around the heater 3. The heater 3 may therefore circumscribe the smokeable material 5 to apply heat to the smokeable material 5 in a substantially radially inward direction.

NJOY Exhibit 1002.2088

Claims

1. An apparatus comprising:

a heater configured to heat smokeable material to volatilize at least one component of the smokeable material; and

a heat shield configured to shield smokeable material from the heater, wherein the heat shield is moveable relative to the heater to selectively shield the smokeable material.

2. An apparatus according to claim 1, wherein the heat shield is moveable from a first position in which it is arranged to shield a first region of smokeable material to a second position in which it is arranged to shield a second region of smokeable material.

3. An apparatus according to claim 2, wherein the heat shield is configured to rotate around the heater from the first position to the second position.

4. An apparatus according to any preceding claim, wherein the heat shield is located co-axially around the heater.

5. An apparatus according to claim 1 or 2, wherein the heat shield is located co-axially inside of the heater.

6. An apparatus according to claim 5, wherein the heat shield is located co-axially around the smokeable material.

7. An apparatus according to claim 1, 2, 5 or 6, wherein the heat shield is configured to rotate around the smokeable material.

8. An apparatus according to any preceding claim, wherein the heat shield is substantially tubular in shape.

9. An apparatus according to any preceding claim, wherein the heat shield comprises a substantially thermally transparent window configured to transmit thermal energy from the heater to the smokable material.

10. An apparatus according to claim 9, wherein movement of the heat shield comprises moving the window from a first position in which it is arranged to transmit thermal energy to a first region of smokeable material to a second position in which it is arranged to transmit thermal energy to a second region of smokeable material.

11. An apparatus according to any preceding claim, wherein the heat shield comprises a heat-reflective material configured to reflect thermal energy.

12. An apparatus according to any preceding claim, wherein the heat shield comprises heat insulation configured to insulate the heater from the smokeable material.

13. An apparatus according to any preceding claim, comprising a stepper unit configured to incrementally move the heat shield.

14. An apparatus according to any preceding claim, comprising a manual actuator configured to move the heat shield in response to a user input.

15. An apparatus according to any preceding claim, wherein the heat shield is configured to move automatically following a predetermined heating period having elapsed.

16. An apparatus according to any preceding claim, wherein the shield is configured to move in response to a detection of a puff at a mouthpiece.

17. An apparatus according to any preceding claim, comprising a body of the smokeable material, wherein the heat shield is moveable in a region between the heater and the smokeable material.

18. An apparatus according to claim 17, wherein the smokeable material comprises a tubular body of smokeable material located co-axially around the heater and/or the heat shield.

19. An apparatus according to claim 17, wherein the smokeable material comprises a cylindrical body of smokeable material located co-axially inside the heater and heat shield.

20. An apparatus according to any preceding claim, wherein the heater is located along a longitudinal axis of a housing of the apparatus.

21. An apparatus according to any preceding claim, wherein the apparatus is configured to heat the smokeable material without combusting the smokeable material.

22. A heat shield configured to shield smokeable material from thermal energy emitted by a heater in a tobacco industry product, wherein the heat shield is moveable relative to the heater to selectively shield the smokeable material.

23. An apparatus comprising:

a heater configured to heat smokeable material to volatilize at least one component of the smokeable material;

a heat shield configured to shield smokeable material from the heater; and

a smokeable material chamber, wherein the chamber is moveable relative to the heat shield to selectively shield smokeable material in the chamber from the heater.

24. An apparatus comprising:

a heater configured to heat smokeable material to volatilize at least one component of the smokeable material;

a heat shield configured to shield smokeable material from the heater; and

NJOY Exhibit 1002.2091

a moveable apparatus configured to move smokeable material relative to the heat shield to selectively shield the smokeable material from the heater.

wherein the heating chamber is moveable relative to the heat shield to selectively shield smokeable material in the heating chamber.

NJOY Exhibit 1002.2092

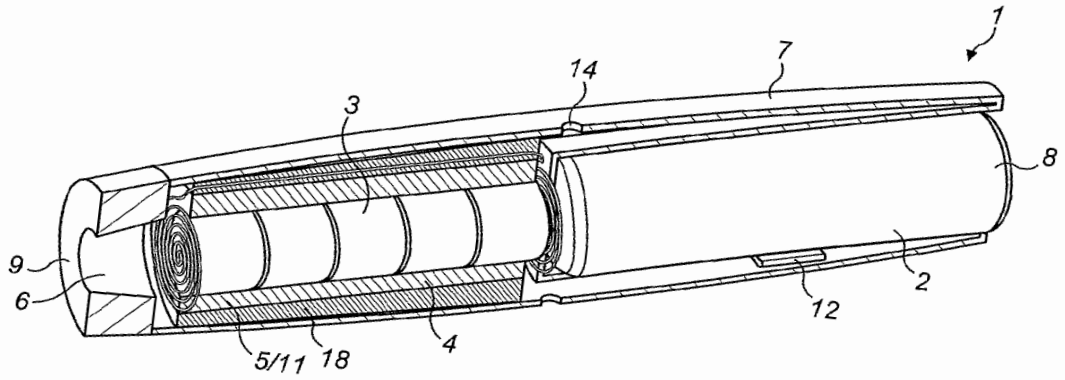


FIG. 1

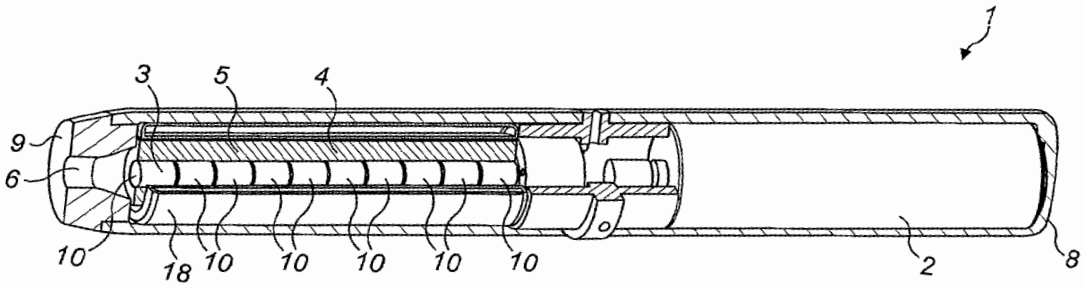


FIG. 2

NJOY Exhibit 1002.2093

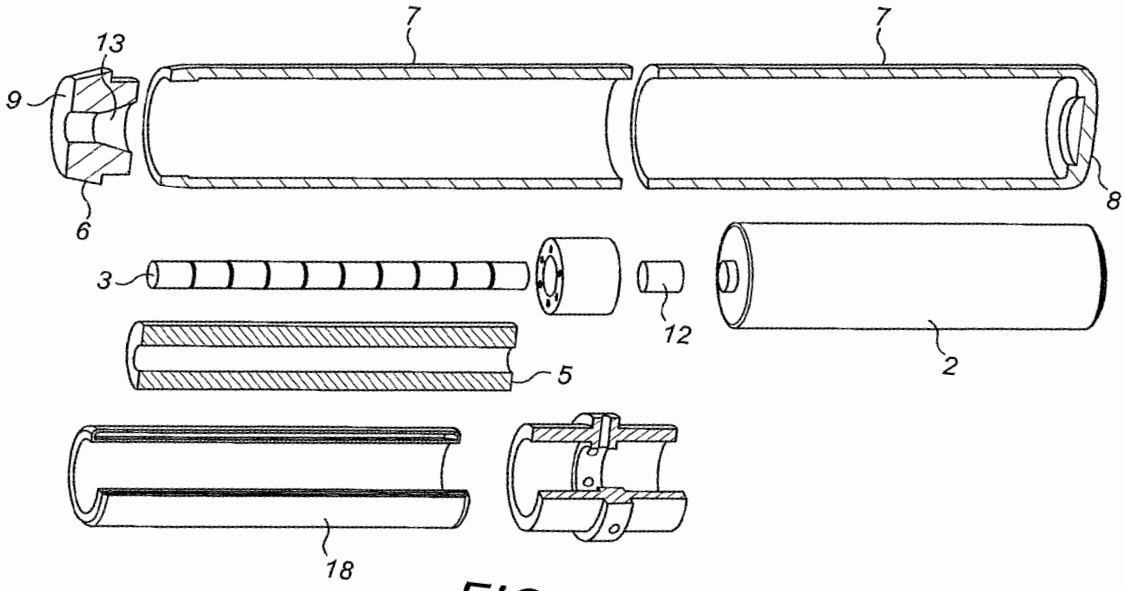


FIG. 3

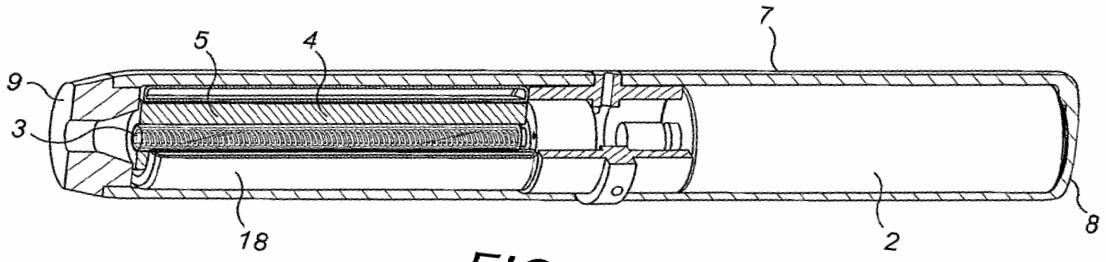


FIG. 4

NJOY Exhibit 1002.2094

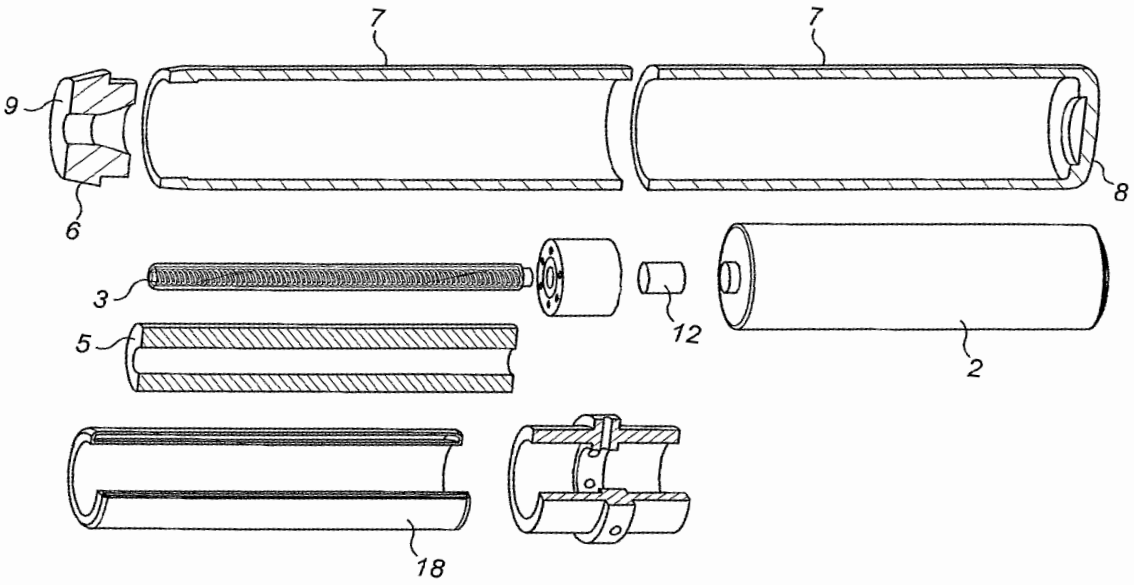


FIG. 5

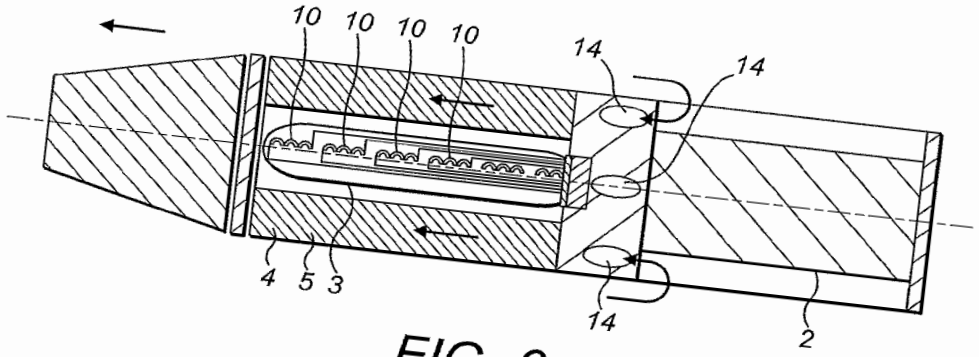


FIG. 6

NJOY Exhibit 1002.2095

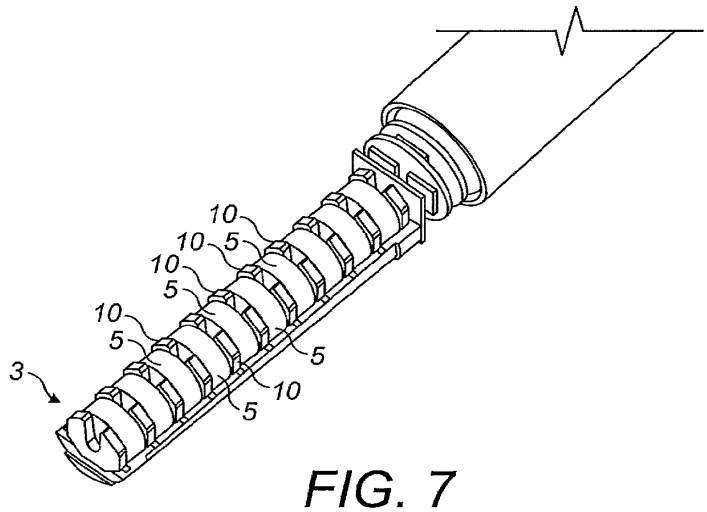


FIG. 7

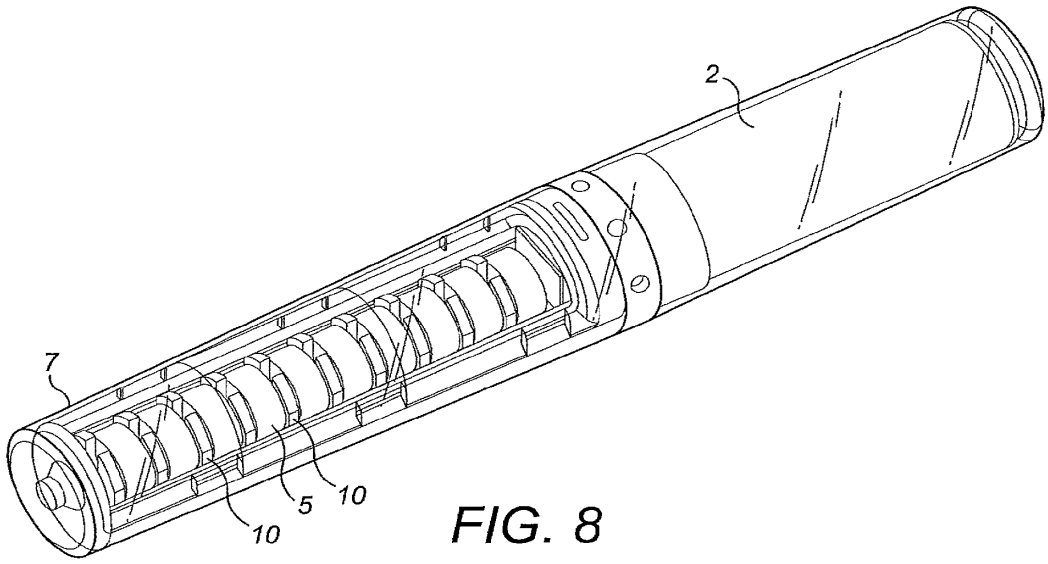


FIG. 8

NJOY Exhibit 1002.2096

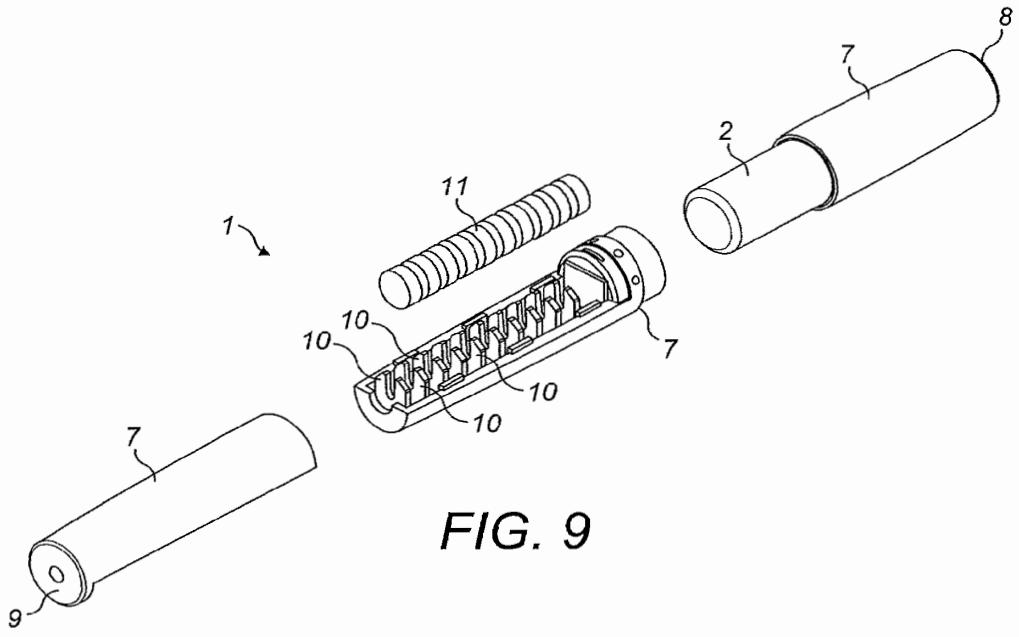


FIG. 9

NJOY Exhibit 1002.2097

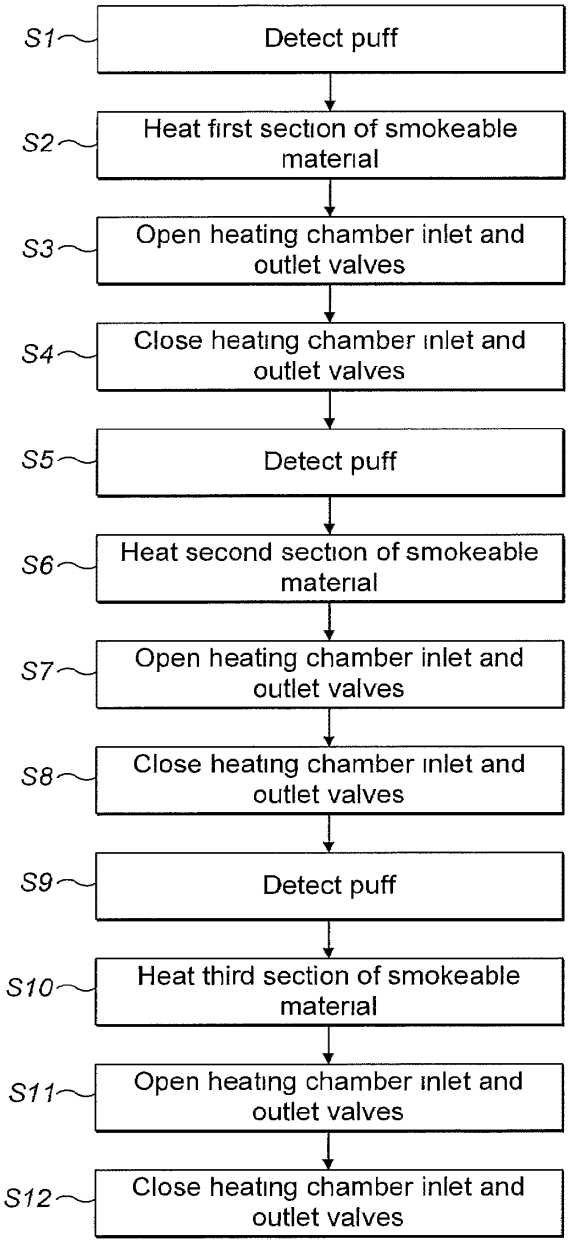


FIG. 10

NJOY Exhibit 1002.2098

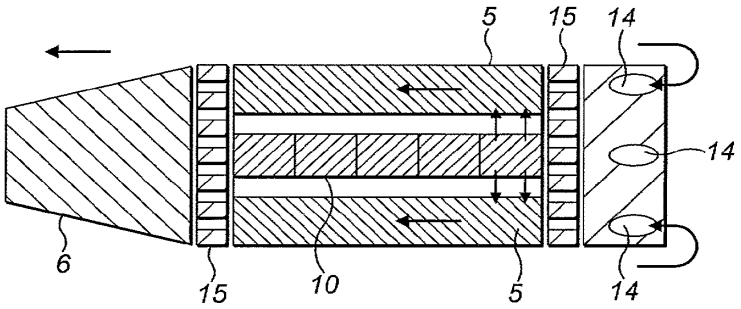


FIG. 11

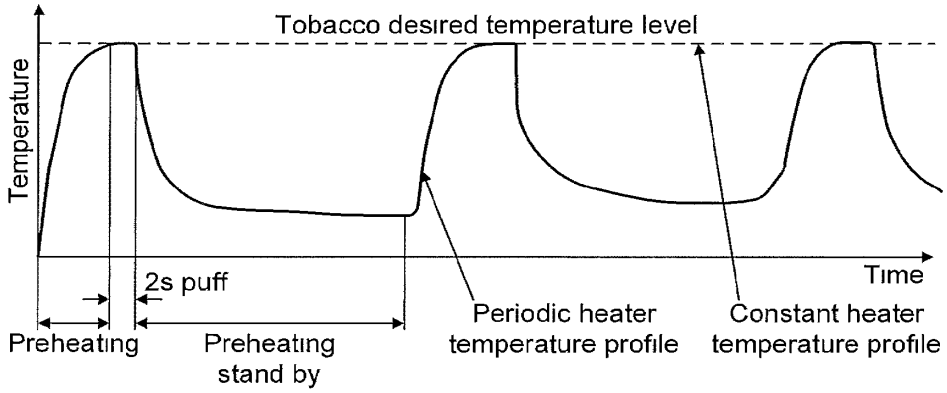


FIG. 12

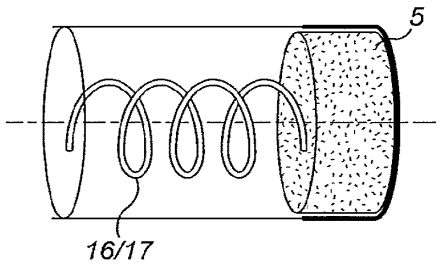


FIG. 13

NJOY Exhibit 1002.2099

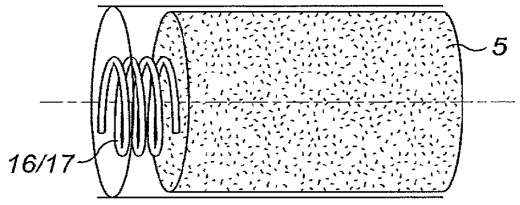


FIG. 14

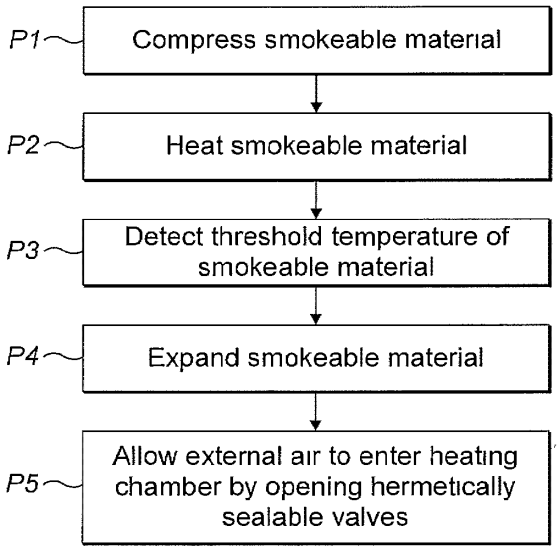


FIG. 15

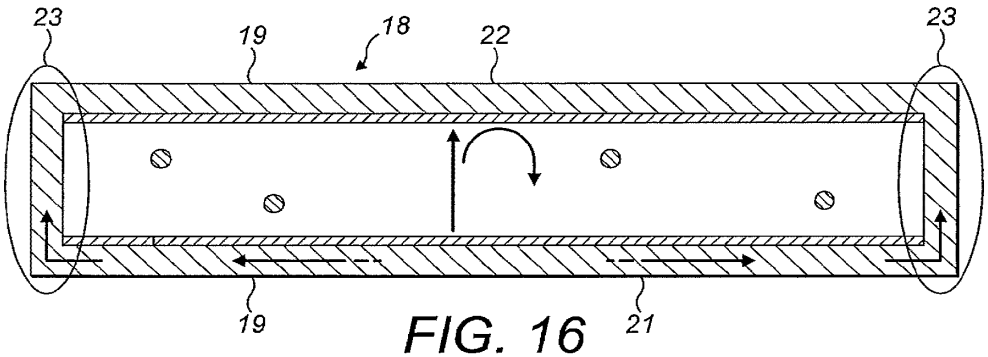


FIG. 16

NJOY Exhibit 1002.2100

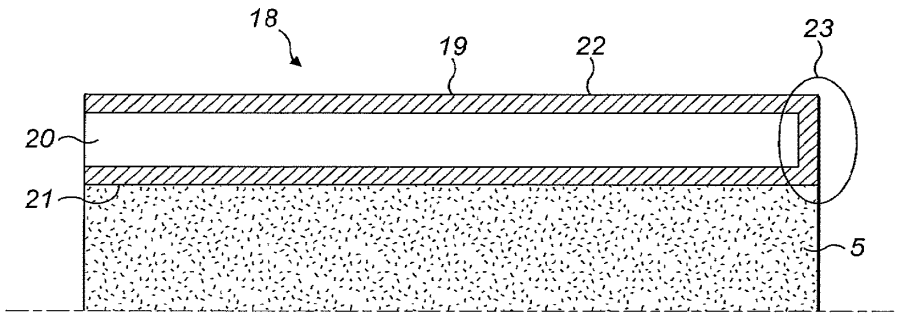


FIG. 17

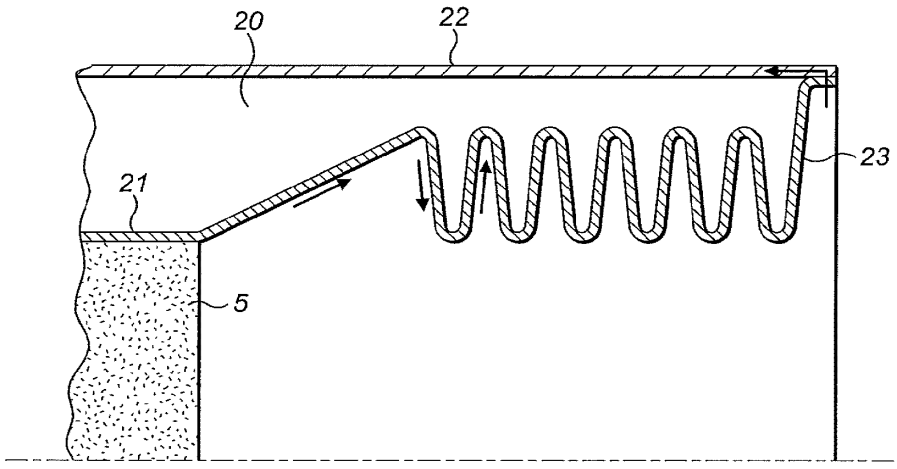


FIG. 18

NJOY Exhibit 1002.2101

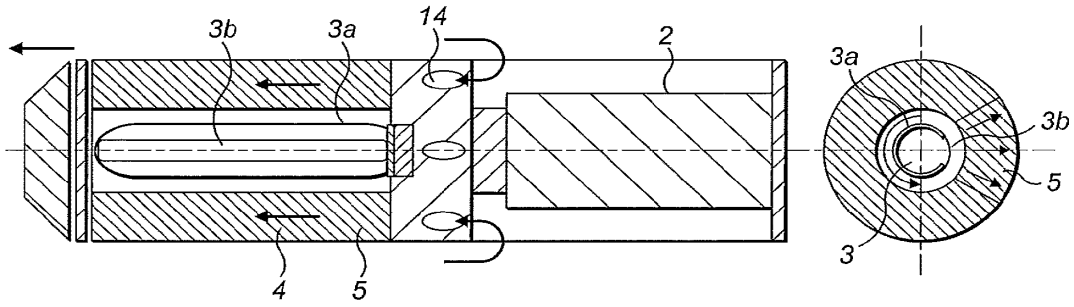


FIG. 19

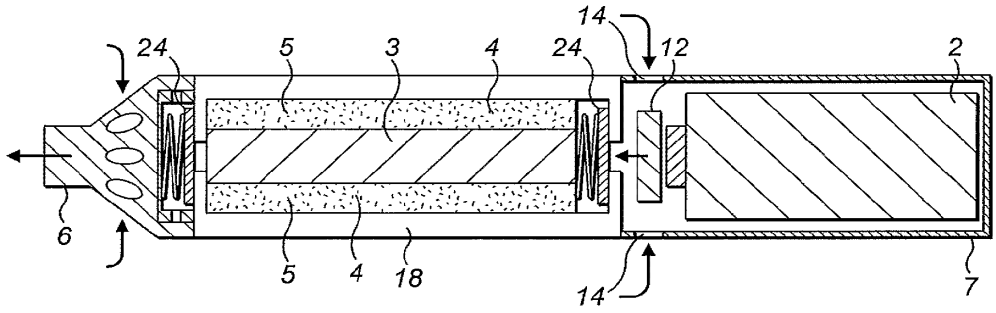


FIG. 20

NJOY Exhibit 1002.2102

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/066481

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24F47/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010/065075 A1 (BANERJEE CHANDRA KUMAR [US] ET AL) 18 March 2010 (2010-03-18) paragraphs [0045] - [0049]; figure 1	1-24
A	US 2007/074734 A1 (BRAUNSHTEYN MICHAEL S [US] ET AL) 5 April 2007 (2007-04-05) paragraphs [0019] - [0021]; figures 1-4	1-24
A	EP 0 430 559 A2 (PHILIP MORRIS [US] PHILIP MORRIS PROD [US]) 5 June 1991 (1991-06-05) column 4, lines 36-58; figure 1	1-24
A	US 5 394 894 A (ZADE ISMAIL Y [US]) 7 March 1995 (1995-03-07) column 1, line 10 - column 1, line 14; figures 1-5	22

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 December 2012	10/01/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Kock, Søren

1

Form PCT/ISA/210 (second sheet) (April 2005)

NJOY Exhibit 1002.2103

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2012/066481

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010065075 A1	18-03-2010	CN 102159100 A	17-08-2011
		EP 2328428 A1	08-06-2011
		JP 2012502658 A	02-02-2012
		US 2010065075 A1	18-03-2010
		WO 2010033665 A1	25-03-2010
US 2007074734 A1	05-04-2007	AT 457136 T	15-02-2010
		AU 2006298495 A1	12-04-2007
		BR PI0616797 A2	28-06-2011
		CA 2622543 A1	12-04-2007
		CN 101277622 A	01-10-2008
		EA 200800999 A1	29-08-2008
		EP 1947965 A2	30-07-2008
		ES 2340072 T3	28-05-2010
		HK 1115009 A1	30-04-2010
		JP 2009509521 A	12-03-2009
		KR 20080059567 A	30-06-2008
		MY 143490 A	31-05-2011
		PT 1947965 E	10-05-2010
		US 2007074734 A1	05-04-2007
		WO 2007039794 A2	12-04-2007
EP 0430559 A2	05-06-1991	AT 118992 T	15-03-1995
		AU 646415 B2	24-02-1994
		AU 6762090 A	06-06-1991
		CA 2031225 A1	02-06-1991
		DE 69017371 D1	06-04-1995
		DE 69017371 T2	12-10-1995
		DK 0430559 T3	01-05-1995
		EP 0430559 A2	05-06-1991
		ES 2069027 T3	01-05-1995
		JP 3232481 A	16-10-1991
		JP 3392138 B2	31-03-2003
		NO 905150 A	03-06-1991
		TR 25316 A	01-01-1993
		US 5144962 A	08-09-1992
US 5394894 A	07-03-1995	NONE	

NJOY Exhibit 1002.2104

(12) 按照专利合作条约所公布的国际申请

(19) 世界知识产权组织
国 际 局

(43) 国际公布日
2013 年 4 月 4 日 (04.04.2013)

WIPO | PCT

(10) 国际公布号
WO 2013/044537 A1

(51) 国际专利分类号:
A24F 47/00 (2006.01)

(21) 国际申请号: PCT/CN2011/080976

(22) 国际申请日: 2011 年 10 月 19 日 (19.10.2011)

(25) 申请语言: 中文

(26) 公布语言: 中文

(30) 优先权:
201110300233.X 2011 年 9 月 28 日 (28.09.2011) CN

(71) 申请人 (对除美国外的所有指定国): 卓尔悦（常州）电子科技有限公司 (JOYETECH (CHANGZHOU) ELECTRONICS CO., LTD.) [CN/CN]; 中国江苏省常州市新北区太湖东路 8 号府琛大厦 2 号楼 607, Jiangsu 213022 (CN)。

(72) 发明人; 及
(75) 发明人/申请人 (仅对美国): 邱伟华 (QIU, Weihua) [CN/CN]; 中国江苏省常州市新北区太湖东路 8 号府琛大厦 2 号楼 607, Jiangsu 213022 (CN)。

(74) 代理人: 常州市维益专利事务所 (CHINA CHANGZHOU VEI PATENT OFFICE); 中国江苏省常州市武进区延政中路行政中心 C 座六楼, Jiangsu 213159 (CN)。

(81) 指定国 (除另有指明，要求每一种可提供的国家保护): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW。

(84) 指定国 (除另有指明，要求每一种可提供的地区保护): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), 欧亚 (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), 欧洲 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)。

根据细则 4.17 的声明:
— 关于申请人有权申请并被授予专利(细则 4.17(ii))
— 关于申请人有权要求在先申请的优先权(细则 4.17(iii))
— 发明人资格(细则 4.17(iv))

本国际公布:
— 包括国际检索报告(条约第 21 条(3))。

(54) Title: ELECTRONIC CIGARETTE

(54) 发明名称 : 电子烟

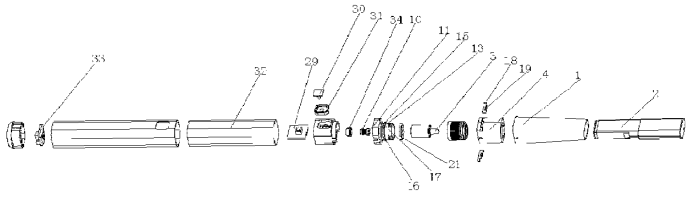


图1 / Fig. 1

(57) Abstract: An electronic cigarette comprises an atomizer, a power supply device (35) and an alignment connection member connecting the atomizer and the power supply device (35). The atomizer comprises an atomization rod (1) and an atomization head disposed inside the atomization rod (1), the power supply device (35) and the atomization rod (1) have a rectangular shape, the end portion of the atomization rod (1) is connected to a cigarette holder body (2), the atomization head comprises a liquid guiding pipe (3), an atomization head base (4) and a heating device (5) disposed inside the atomization head base (4). The electronic cigarette of the present invention is capable of guaranteeing the alignment connection of a rectangular shell and increasing the service life of an electronic cigarette.

(57) 摘要: 一种电子烟，包括雾化器、供电装置（35）以及连接雾化器和供电装置（35）的对正连接部件，所述的雾化器包括雾化杆（1）和设置于雾化杆（1）内的雾化头，所述的供电装置（35）和雾化杆（1）外形为方形，雾化杆（1）端部与烟嘴主体（2）连接，雾化头包括导液管（3）、雾化头座体（4）以及设置于雾化头座体（4）内的发热装置(5）。本发明的电子烟能够确保方形壳体的对正连接，并提高电子烟的使用寿命。

WO 2013/044537 A1

NJOY Exhibit 1002.2105

电子烟

技术领域

本发明涉及电子烟领域，特别是一种烟感为方形的电子烟。

背景技术

随着人们对身体健康的关注度上升，人们都意识到了烟草对于人们身体的危害，因此，产生了电子烟。电子烟通常是将烟液经过雾化器雾化供使用者使用，烟液在制作时，去除了尼古丁、焦油等危害身体的物质，消除了对于人体的危害，而且正因为烟液中没有尼古丁、焦油等有害物质，人们抽电子烟后，烟瘾也会渐渐地变小，因此，电子烟具有辅助戒烟的效果。随着电子烟设计的发展，产生了电子烟的设计，现有的方形的电子烟供电装置和雾化器之间通常是螺纹连接，在用螺纹连接时，可能供电装置和雾化器的方形端面无法正好对正，在使用一段时间后，偏差会更大，拧的太紧则方形端面无法对正，如果要保证了二者的对正则无法拧紧，电池的接触性不好，雾化器无法工作。

发明内容

本发明的目的在于针对背景技术中所述的现有的方形的电子烟存在的连接端面无法对正，而且电池接触性不好的问题，提供一种能够解决前述问题的电子烟。

能够实现本发明的发明目的的技术方案如下：

一种电子烟，其包括雾化器、供电装置以及连接雾化器和供电装置的对正连接部件，所述的雾化器包括雾化杆和设置于雾化杆内的雾化头，所述的供电装置和雾化杆外形为方形，雾化杆端部与烟嘴主体连接，雾化头包括导液管、雾化头座体以及设置于雾化头座体内的发热装置，雾化头座体侧壁设置有通烟

NJOY Exhibit 1002.2106

空隙，导液管与烟嘴主体内的烟液腔连接，雾化头座体外设置有镍网，镍网外部设置有与发热装置的负极连接的导体环，雾化头座体底部设置有通孔，雾化头底部设置有第一导电部件，第一导电部件与发热装置的正极电连接，第一导电部件中心设置有通孔，通孔部位与第二导电部件接触，第二导电部件的端部设置有通气槽，雾化杆侧壁开有通气孔，烟嘴主体中设置有用于抽烟的烟道。

所述的对正连接部件包括第一连接部件和第二连接部件，第一连接部件的外壁面设置有限位凸起圈，该限位凸起圈上呈一定角度间隔设置有若干个平槽口和若干个弧形凹槽口，所述的第二连接部件侧壁设置有用于限位的弹簧片，弹簧片上设置有直限位片和弯曲限位片，直限位片和平槽口的尺寸对应，弯曲限位片与弧形凹槽口形状相对应，对正连接状态，弯曲限位片与弧形凹槽口的位置相对应，所述的第一连接部件与供电装置连接，所述的第二连接部件设置于雾化杆内，雾化头设置于第二连接部件内，第二连接部件端部设置有对雾化头进行限位的限位口。

为了防止发生漏液现象，所述的第一连接部件的顶端设置有密封槽，密封槽内设置密封圈。

所述的平槽口和弧形凹槽口之间的间隔弧度为 10°～170°。

所述的限位凸起圈上设置有两个平槽口和两个弧形凹槽口，两个平槽口之间间隔 180°，两个弧形凹槽口之间间隔 180°，相邻的平槽口和弧形凹槽口之间间隔 90°，在第二连接部件上相应的设置有两个弹簧片，对正连接状态，弹簧片的弯曲限位片与弧形凹槽口位置对应。

所述的对正连接部件包括连接件 A、连接件 B、连接件 C 以及与连接件 A 固定连接的弹性定位杆，所述的连接件 C 上设置有凸起的限位圈，该限位圈上

NJOY Exhibit 1002.2107

设置有平限位口和弧形限位口，所述的连接件 B 内设置有具有与平限位口对应的平限位部的孔，所述的连接件 B 上还设置有用于穿过弹性定位杆的通孔，该通孔设置于所述的平限位部的外侧在对正连接状态，弹性定位杆端部与弧形限位口相对应，连接件 A 设置于雾化杆内，连接件 B 与连接件 A 固定连接，所述的雾化头设置于连接件 A 内，连接件 A 端部设置有对雾化头进行限位的限位口。

所述的连接件 A 上固定有两个弹性定位杆，在连接件 B 上对应设置有两个用于穿过定位杆的孔和两个平限位部，连接件 C 的限位圈上设置有两个平限位口和两个弧形限位口，平限位口和弧形限位口间隔设置，相邻平限位口和弧形槽口之间间隔 90° 。

为了能够显示供电装置的电量，并能对其充放电进行控制，所述的供电装置与对正连接部件之间设置有电路控制装置，该电路控制装置包括壳体、控制电路板、按键开关和具有 LED 灯的电量显示导光圈。

所述的供电装置内设置有充电电池，供电装置的底部设置有充电控制板和充电控制端口。

所述的第二导电部件上设置有密封槽，密封槽上设置有绝缘圈。

本发明的有益效果为因为本发明的方形的电子烟的供电装置和雾化装置的外形为方形，通过对正连接部件进行连接，连接时，能够保证供电装置和雾化装置的连接部位方形棱角完美对接，而且与现有方形的电子烟的螺纹配合相比，装配更简单，而且连接好之后，连接部位不论是轴向还是周向都能很好的定位，保证用户的正常使用。而且因为连接可靠，对正连接部件不容易损坏，提升了电子烟的质量，同时延长了电子烟的使用寿命。

附图说明

NJOY Exhibit 1002.2108

图 1 为实施例 1 的爆炸示意图；

图 2 为实施例 1 示意图；

图 3 为图 2 的 A-A 向剖视图；

图 4 为实施例 1 的 B-B 向剖视气体流向图；

图 5 为实施例 2 的爆炸示意图；

图 6 为实施例 2 的示意图；

图 7 为图 6 的 C-C 向剖视图；

图 8 为图 6 的 D-D 向剖视图；

图 9 为图 7 的 E-E 向剖视图；

图 10 为实施例 2 的 D-D 向气体流向图；

附图中，1 为雾化杆，2 为烟嘴主体，3 为导液管，4 为雾化头座体，5 为发热装置，6 为烟液腔，7 为镍网，8 为导体环，9 为第一导电部件，10 为第二导电部件，11 为通气槽，12 为通气孔，13 为第一连接部件，14 为第二连接部件，15 为限位凸起圈，16 为平槽口，17 为弧形凹槽口，18 为直限位片，19 为弯曲限位片，20 为弹簧片，21 为密封圈，22 为连接件 A，23 为连接件 B，24 为连接件 C，25 为弹性定位杆，26 为限位圈，27 为平限位口，28 为弧形限位口，29 为控制电路板，30 为按键开关，31 为电量显示导光圈，32 为充电电池，33 为充电控制板，34 为绝缘圈，35 为供电装置，36 为导液绳，37 为充电控制端口，38 为通烟空隙，39 为平限位部，40 为通孔。

具体实施方式

下面结合附图 1 至附图 10 对本发明的实施方式进行进一步的阐述：

实施例 1

NJOY Exhibit 1002.2109

作为本发明的第一优选实施方式，参照图 1 至图 4 所示的一种电子烟，其包括雾化器、供电装置 35 以及连接雾化器和供电装置 35 的对正连接部件，所述的雾化器包括雾化杆 1 和设置于雾化杆 1 内的雾化头，所述的供电装置 35 和雾化杆 1 外形为方形，雾化杆 1 端部与烟嘴主体 2 连接，雾化头包括导液管 3、雾化头座体 4 以及设置于雾化头座体 4 内的发热装置 5，雾化头座体 4 侧壁设置有通烟空隙 38，导液管 3 与烟嘴主体 2 内的烟液腔 6 连接，导液管 3 内设置有导液绳 36，雾化头座体 4 外设置有镍网 7，镍网 7 外部设置有与发热装置 5 的负极连接的导体环 8，雾化头座体 4 底部设置有通孔 40，雾化头底部设置有第一导电部件 9，第一导电部件 9 与发热装置 5 的正极电连接，第一导电部件 9 通过硅胶塑封至导体环 8 的端部，第一导电部件 9 中心设置有通孔 40，通孔 40 部位与第二导电部件 10 接触，第二导电部件 10 的端部设置有通气槽 11，第二导电部件 10 上设置有密封槽，密封槽上设置有绝缘圈 34，雾化杆 1 侧壁开有通气孔 12，烟嘴主体 2 中设置有用于抽烟的烟道。所述的对正连接部件包括第一连接部件 13 和第二连接部件 14，第一连接部件 13 的外壁面设置有限位凸起圈 15，该限位凸起圈 15 上呈一定角度间隔设置有平槽口 16 和弧形凹槽口 17，为了确保对正连接的稳定，设置有两个平槽口 16 和两个弧形凹槽口 17，两个平槽口 16 之间间隔 180° 弧度，两个弧形凹槽口 17 之间间隔 180° 弧度，相邻的平槽口 16 和弧形凹槽口 17 之间间隔 90° 弧度，所述的第二连接部件 14 侧壁设置有用于限位的弹簧片 20，弹簧片 20 上设置有直限位片 18 和弯曲限位片 19，直限位片 18 和平槽口 16 的尺寸对应，弯曲限位片 19 与弧形凹槽口 17 形状相对应，所述的第一连接部件 13 与供电装置 35 连接，所述的第二连接部件 14 设置于雾化杆 1 内，雾化头设置于第二连接部件 14 内，第二连接部件 14 端部设置有对

NJOY Exhibit 1002.2110

雾化头进行限位的限位口。所述的第一连接部件 13 的顶端设置有密封槽，密封槽内设置密封圈 21。

对于具有两个平槽口 16 和两个弧形凹槽口 17 的电子烟，相邻的平槽口 16 和弧形凹槽口 17 之间间隔 90° 弧度，在连接时，将供电装置 35 和雾化杆 1 的棱角相差 90° 放置，这时弹簧片 20 与平槽口 16 的位置相对，第一连接部件 13 能够穿入到第二连接部件 14 内，然后，使第一连接部件 13 和第二连接部件 14 之间发生 90° 旋转，这时，弹簧片 20 的弯曲限位片 19 转动至弧形凹槽口 17 的位置，被弧形凹槽口 17 卡住，对第一连接部件 13 和第二连接部件 14 进行周向定位，使其无法自由转动，直限位片 18 则被限位凸起圈 15 卡住，对第一连接部件 13 和第二连接部件 14 进行轴向定位，使二者保持紧密的连接。如图 4 所示，抽烟时，空气从雾化杆 1 侧壁的通气孔 12 进入，通过第二导电部件 10 的通气槽 11、雾化头座体 4 底部的通孔 40 进入雾化头内，人在从烟嘴主体 2 抽烟时，雾化头座体 4 内的空气通过雾化头座体 4 侧壁设置的通烟空隙 38 到达烟嘴主体 2，然后到达吸烟者口中，这时雾化头座体 4 内产生负压，烟液在负压作用下通过导液管 3 进入雾化头内，在加热装置的作用下雾化，然后通过雾化头座体 4 侧壁设置的通烟空隙 38 到达烟嘴主体 2，然后到达吸烟者口中。

实施例 2

作为本发明的第二种优选实施方式，参照图 5-10 所示的一种电子烟，其包括雾化器、供电装置 35 以及连接雾化器和供电装置 35 的对正连接部件，所述的雾化器包括雾化杆 1 和设置于雾化杆 1 内的雾化头，所述的供电装置 35 和雾化杆 1 外形为方形，雾化杆 1 端部与烟嘴主体 2 连接，雾化头包括导液管 3、雾化头座体 4 以及设置于雾化头座体 4 内的发热装置 5，雾化头座体 4 侧壁设置有

NJOY Exhibit 1002.2111

通烟空隙 38，导液管 3 与烟嘴主体 2 内的烟液腔 6 连接，导液管 3 内设置有导液绳 36，雾化头座体 4 外设置有镍网 7，镍网 7 外部设置有与发热装置 5 的负极连接的导体环 8，雾化头座体 4 底部设置有通孔 40，雾化头底部设置有第一导电部件 9，第一导电部件 9 与发热装置 5 的正极电连接，第一导电部件 9 通过硅胶塑封至导体环 8 的端部，第一导电部件 9 中心设置有通孔 40，通孔 40 部位与第二导电部件 10 接触，第二导电部件 10 的端部设置有通气槽 11，第二导电部件 10 上设置有密封槽，密封槽上设置有绝缘圈 34，雾化杆 1 侧壁开有通气孔 12，烟嘴主体 2 中设置有用于抽烟的烟道。对正连接部件包括连接件 A22、连接件 B23、连接件 C24 以及与连接件 A22 固定连接的两个弹性定位杆 25，这两个弹性定位杆 25 之间相隔 180° 弧度设置，所述的连接件 C24 上设置有凸起的限位圈 26，该限位圈 26 上设置有两个平限位口 27 和两个弧形限位口 28，平限位口 27 和弧形限位口 28 间隔设置，相邻平限位口 27 和弧形槽口之间间隔 90°，所述的连接件 B23 内设置有具有与平限位口 27 对应的平限位部 39 的孔，所述的连接件 B23 上还设置有用于穿过弹性定位杆 25 的通孔 40，该通孔 40 设置于平限位部 39 的外侧旁边，在对正连接状态，弹性定位杆 25 端部与弧形限位口 28 相对应，连接件 A22 设置于雾化杆 1 内，连接件 B23 与连接件 A22 固定连接，所述的雾化头设置于连接件 A22 内，连接件 A22 端部设置有对雾化头进行限位的限位口。

在连接时，将连接部件 A 和 B 固定连接，然后将供电装置 35 和雾化杆 1 的棱角相差 90° 放置，这时连接部件 B 的平限位部 39 与限位圈 26 的平限位口 27 相对，弹性定位杆 25 也可以从平限位口 27 的空隙处穿过，然后使供电装置 35 和雾化杆 1 发生相对转动，转动 90°，这时，供电装置 35 和雾化杆 1 的棱

NJOY Exhibit 1002.2112

角正好对其，弹性定位杆 25 到达弧形限位口 28，供电装置 35 和雾化杆 1 无法自由转动，起到周向限位的作用，平限位部 39 则被限位圈 26 卡住，无法进行轴向移动，对其起到轴向限位的作用，这样就保证了供电装置 35 和雾化杆 1 之间的对正连接和紧密连接。实施例 2 的空气流向与实施例 1 基本相同。

实施例 3

在实施例 1 和实施例 2 的基础上，作为本发明的技术方案的进一步改进，所述的供电装置 35 与对正连接部件之间设置有电路控制装置，该电路控制装置包括壳体、控制电路板 29、按键开关 30 和具有 LED 灯的电量显示导光圈 31；所述的供电装置 35 内设置有充电电池 32，供电装置 35 的底部设置有充电控制板 33 和充电控制端口 37。

NJOY Exhibit 1002.2113

1、一种电子烟，其特征在于：其包括雾化器、供电装置以及连接雾化器和供电装置的对正连接部件，所述的雾化器包括雾化杆和设置于雾化杆内的雾化头，所述的供电装置和雾化杆外形为方形，雾化杆端部与烟嘴主体连接，雾化头包括导液管、雾化头座体以及设置于雾化头座体内的发热装置，雾化头座体侧壁设置有通烟空隙，导液管与烟嘴主体内的烟液腔连接，雾化头座体外设置有镍网，镍网外部设置有与发热装置的负极连接的导体环，雾化头座体底部设置有通孔，雾化头底部设置有第一导电部件，第一导电部件与发热装置的正极电连接，第一导电部件中心设置有通孔，通孔部位与第二导电部件接触，第二导电部件的端部设置有通气槽，雾化杆侧壁开有通气孔，烟嘴主体中设置有用于抽烟的烟道。

2、根据权利要求 1 所述的电子烟，其特征在于：所述的对正连接部件包括第一连接部件和第二连接部件，第一连接部件的外壁面设置有限位凸起圈，该限位凸起圈上呈一定角度间隔设置有若干个平槽口和若干个弧形凹槽口，所述的第二连接部件侧壁设置有用于限位的弹簧片，弹簧片上设置有直限位片和弯曲限位片，直限位片和平槽口的尺寸对应，弯曲限位片与弧形凹槽口形状相对应，对正连接状态，弯曲限位片与弧形凹槽口的位置相对应，所述的第一连接部件与供电装置连接，所述的第二连接部件设置于雾化杆内，雾化头设置于第二连接部件内，第二连接部件端部设置有对雾化头进行限位的限位口。

3、根据权利要求 2 所述的电子烟，其特征在于：所述的第一连接部件的顶端设置有密封槽，密封槽内设置密封圈。

4、根据权利要求 2 所述的电子烟，其特征在于：所述的平槽口和弧形凹槽口之间的间隔弧度为 10°～170°。

5、根据权利要求 2 所述的电子烟，其特征在于：所述的限位凸起圈上设置有两个平槽口和两个弧形凹槽口，两个平槽口之间间隔 180°，两个弧形凹槽口之间间隔 180°，相邻的平槽口和弧形凹槽口之间间隔 90°，在第二连接部件上相应的设置有两个弹簧片，对正连接状态，弹簧片的弯曲限位片与弧形凹槽口位置对应。

6、根据权利要求 1 所述的电子烟，其特征在于：所述的对正连接部件包括连接件 A、连接件 B、连接件 C 以及与连接件 A 固定连接的弹性定位杆，所述的连接件 C 上设置有凸起的限位圈，该限位圈上设置有若干个平槽口和若干个弧形凹槽口，所述的连接件 B 内设置有具有与平槽口对应的平限位部的孔，所述的连接件 B 上还设置有用于穿过弹性定位杆的通孔，该通孔设置于所述的平限位部的外侧在对正连接状态，弹性定位杆端部与弧形凹槽口相对应，连接件 A 设置于雾化杆内，连接件 B 与连接件 A 固定连接，所述的雾化头设置于连接件 A 内，连接件 A 端部设置有对雾化头进行限位的限位口。

7、根据权利要求 6 所述的电子烟，其特征在于：所述的连接件 A 上固定有两个弹性定位杆，在连接件 B 上对应设置有两个用于穿过定位杆的孔和两个平限位部，连接件 C 的限位圈上设置有两个平限位口和两个弧形限位口，平限位口和弧形限位口间隔设置，相邻平限位口和弧形槽口之间间隔 90°。

8、根据权利要求 1 至 7 中任意一项所述的电子烟，其特征在于：所述的供电装置与对正连接部件之间设置有电路控制装置，该电路控制装置包括壳体、控制电路板、按键开关和具有 LED 灯的电量显示导光圈。

9、根据权利要求 1 至 7 中任意一项所述的电子烟，其特征在于：所述的供电装置内设置有充电电池，供电装置的底部设置有充电控制板和充电控制端口。

10、根据权利要求 1 至 7 中任意一项所述的电子烟，其特征在于：所述的第二导电部件上设置有密封槽，密封槽上设置有绝缘圈。

NJOY Exhibit 1002.2116

图1

NJOY Exhibit 1002.2117

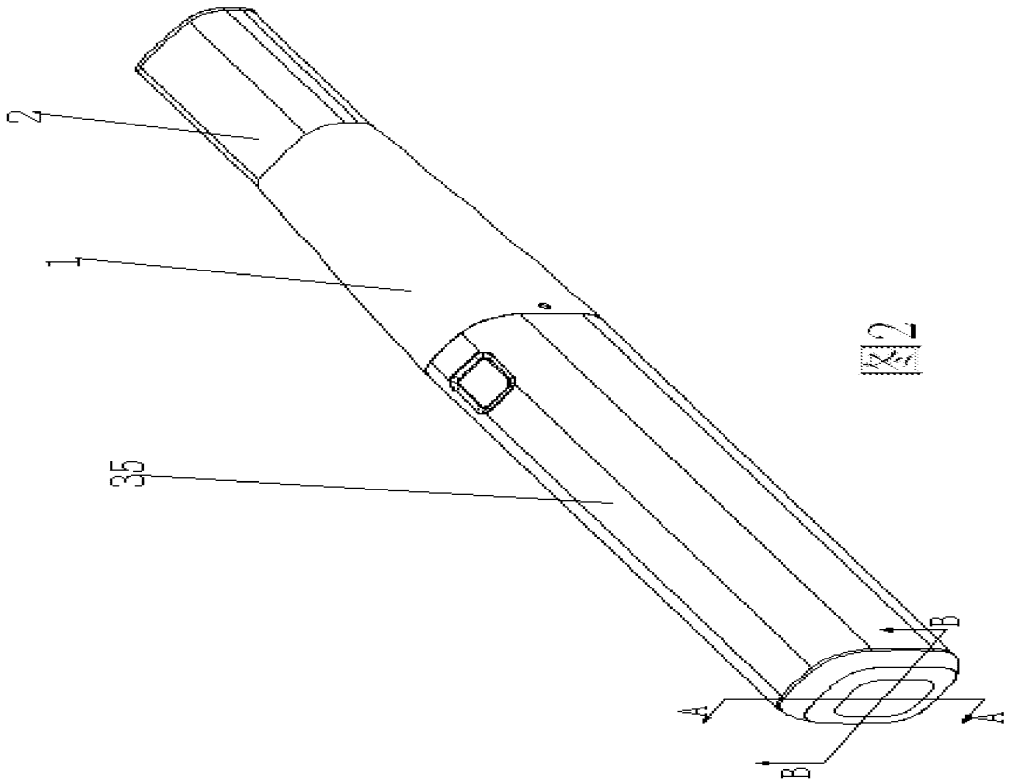


图2

NJOY Exhibit 1002.2118

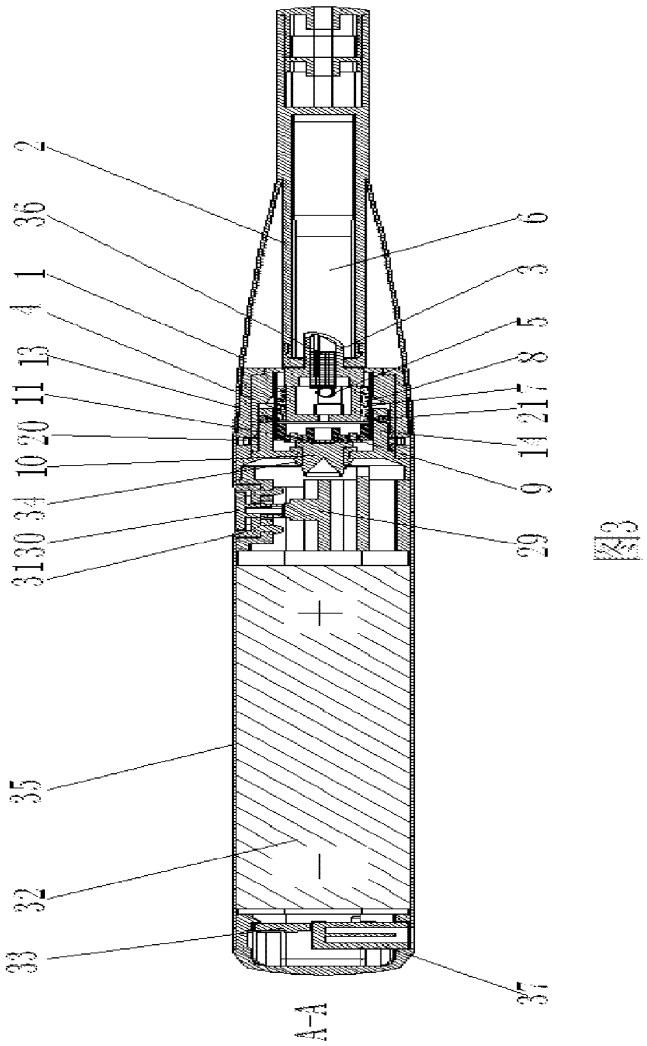


图3

NJOY Exhibit 1002.2119

NJOY Exhibit 1002.2120

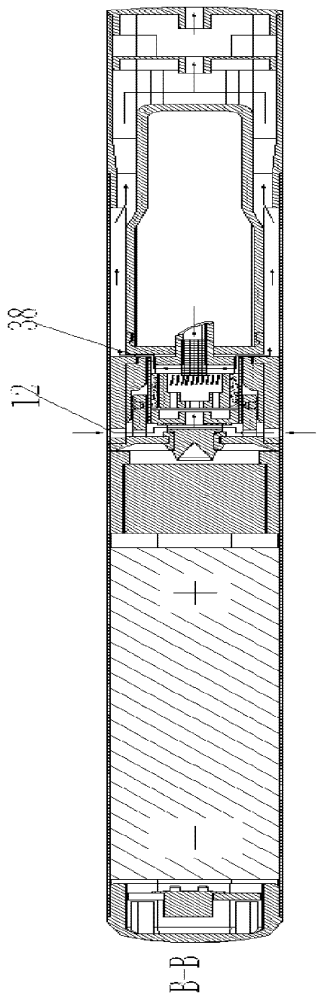


图4

图5

NJOY Exhibit 1002.2121

NJOY Exhibit 1002.2122

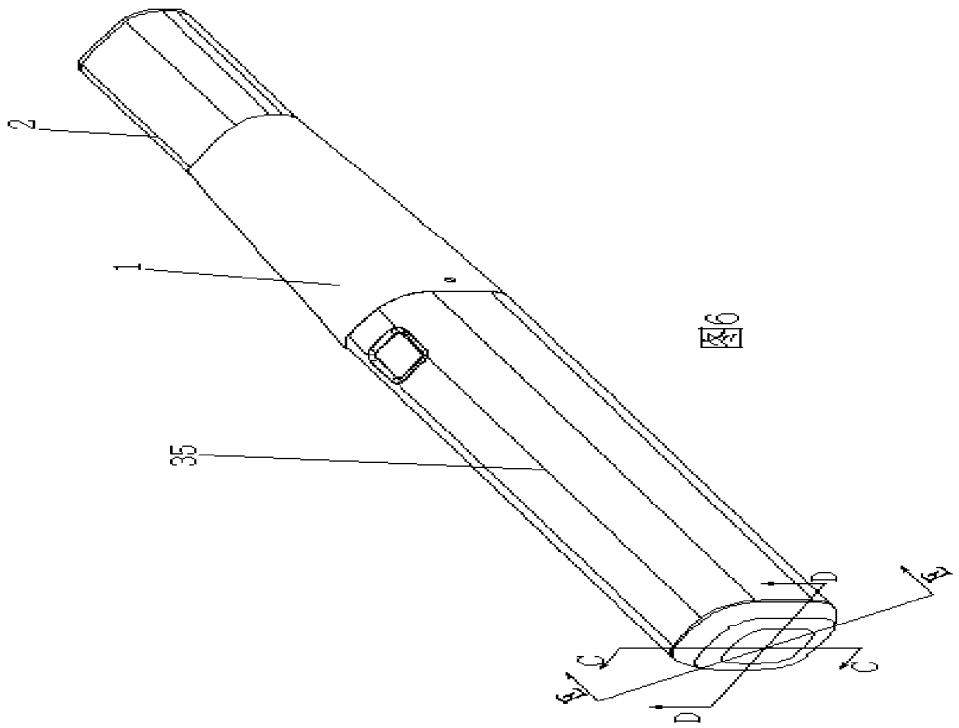
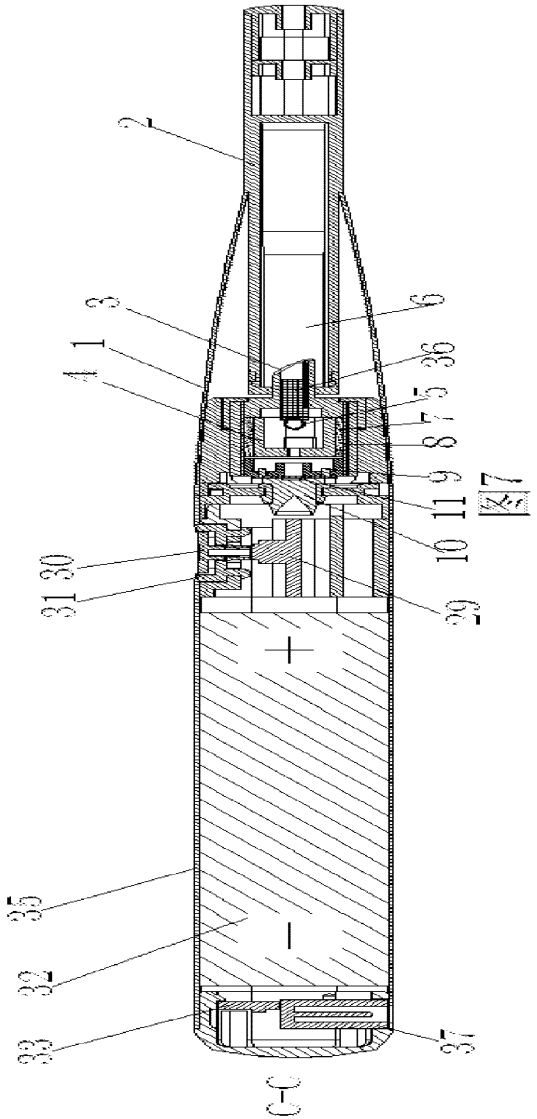


图6



NJOY Exhibit 1002.2123

NJOY Exhibit 1002.2124

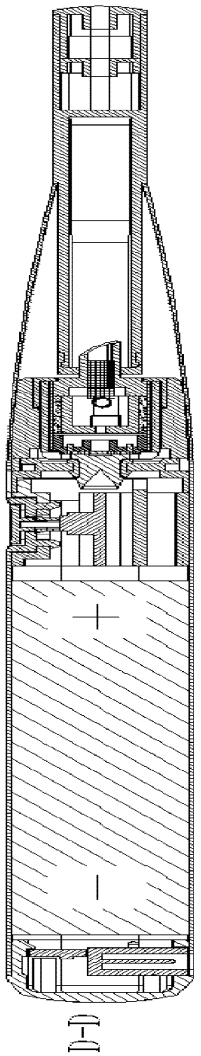


图8

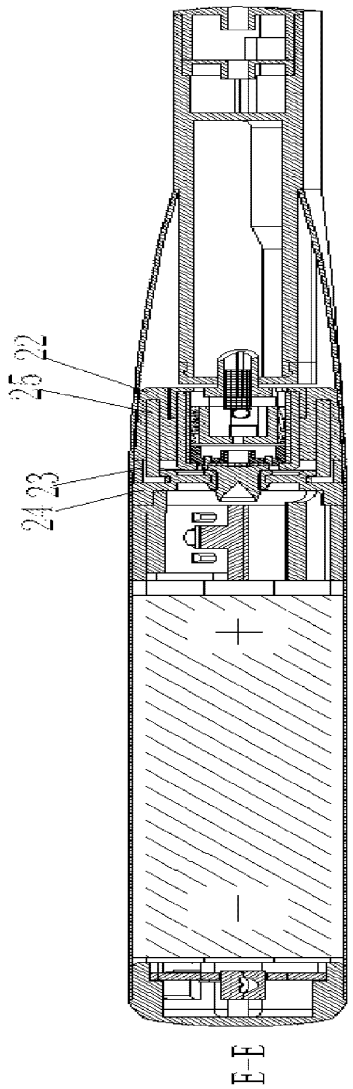


图9

NJOY Exhibit 1002.2125

NJOY Exhibit 1002.2126

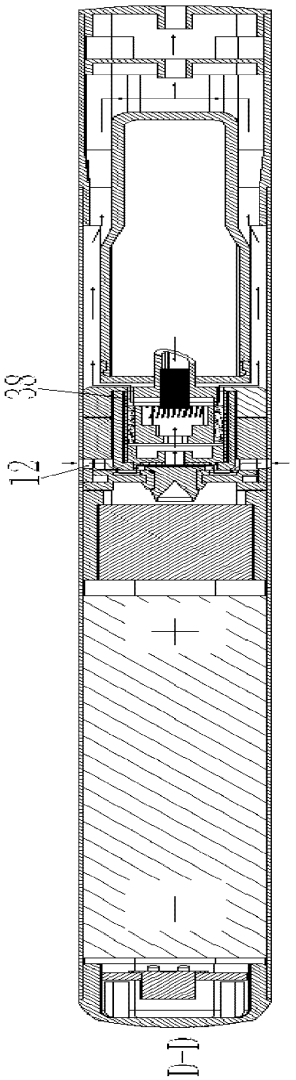


图10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2011/080976

A. CLASSIFICATION OF SUBJECT MATTER

A24F 47/00 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT: heating, atomization

WPI, EPODOC: heat, atomization

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 201781984 U (CHEN, Zhenlai), 06 April 2011 (06.04.2011), the whole document	1-10
A	CN 101627837 A (CEN, Liming), 20 January 2010 (20.01.2010), the whole document	1-10
A	CN 101986906 A (JBS INC.), 23 March 2011 (23.03.2011), the whole document	1-10
A	WO 2009155734 A1 (BERNARD, M.), 30 December 2009 (30.12.2009), the whole document	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 June 2012 (11.06.2012)	**12 July 2012 (12.07.2012)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **HE, Wenjing** Telephone No.: (86-10) **62085686**

Form PCT/ISA/210 (second sheet) (July 2009)

NJOY Exhibit 1002.2127

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2011/080976

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 201781984 U	06.04.2011	None	
CN 101627837 A	20.01.2010	CN 101627837 B	02.02.2011
CN 101986906 A	23.03.2011	CN 101986906 B	07.03.2012
WO 2009155734 A1	30.12.2009	US 2011232654 A	29.09.2011
		CN 202197836 U	25.04.2012
		EP 2443946 A	25.04.2012

NJOY Exhibit 1002.2128

国际检索报告

国际申请号
PCT/CN2011/080976

A. 主题的分类

A24F47/00(2006.01)i

按照国际专利分类(IPC)或者同时按照国家分类和 IPC 两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

A24F, A61M

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用）)

CNPAT: 加热，雾化

WPI, EPODOC: heat, atomization

C. 相关文件

类　型*	引用文件，必要时，指明相关段落	相关的权利要求
A	CN201781984U(陈珍来),06.4 月 2011(06.04.2011),全文	1-10
A	CN101627837A(岑利明),20.1 月 2010(20.01.2010),全文	1-10
A	CN101986906A(日本 JBS 株式会社),23.3 月 2011(23.03.2011),全文	1-10
A	WO2009155734A1(马斯·伯纳德), 30.12 月 2009(30.12.2009) ,全文	1-10

☐ 其余文件在 C 栏的续页中列出。　　☒ 见同族专利附件。

* 引用文件的具体类型：

"A" 认为不特别相关的表示了现有技术一般状态的文件

"E" 在国际申请日的当天或之后公布的在先申请或专利

"L" 可能对优先权要求构成怀疑的文件，或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件（如具体说明的）

"O" 涉及口头公开、使用、展览或其他方式公开的文件

"P" 公布日先于国际申请日但迟于所要求的优先权日的文件

"T" 在申请日或优先权日之后公布，与申请不相抵触，但为了理解发明之理论或原理的在后文件

"X" 特别相关的文件，单独考虑该文件，认定要求保护的发明不是新颖的或不具有创造性

"Y" 特别相关的文件，当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时，要求保护的发明不具有创造性

"&" 同族专利的文件

国际检索实际完成的日期	国际检索报告邮寄日期
11.6 月 2012(11.06.2012)	**12.7 月 2012 (12.07.2012)**
ISA/CN 的名称和邮寄地址： 中华人民共和国国家知识产权局 中国北京市海淀区蓟门桥西土城路 6 号 100088 传真号：　(86-10)62019451	受权官员 贺文晶 电话号码：(86-10) **62085686**

NJOY Exhibit 1002.2129

国际检索报告

关于同族专利的信息

国际申请号
PCT/CN2011/080976

检索报告中引用的专利文件	公布日期	同族专利	公布日期
CN201781984U	06.04.2011	无	
CN101627837A	20.01.2010	CN101627837B	02.02.2011
CN101986906A	23.03.2011	CN101986906B	07.03.2012
WO2009155734A1	30.12.2009	US2011232654A	29.09.2011
		CN202197836U	25.04.2012
		EP2443946A	25.04.2012

NJOY Exhibit 1002.2130

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 May 2013 (16.05.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/068100 A1

(51) International Patent Classification:
A24D 3/04 (2006.01)

(21) International Application Number:
PCT/EP2012/004623

(22) International Filing Date:
6 November 2012 (06.11.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11008826.7 7 November 2011 (07.11.2011) EP

(71) Applicant: **PHILIP MORRIS PRODUCTS S.A.** [CH/CH]; Quai Jeanrenaud 3, CH-2000 Neuchatel (CH).

(72) Inventors: **BESSO, Clément**; Chemin de la Favarge 26, CH-2000 Neuchâtel (CH). **CAMUS, Alexandre**; Rue Basse 21, CH-2013 Colombier (CH). **TRITZ, Dorothy**; Chemin des Sources 44, CH-1400 Yverdon-Les-Bains (CH). **KUERSTEINER, Charles**; Promenade de Flusel 30, CH-1008 Jouxtens-Mezery (CH).

(74) Agent: **HILGERS, Hans**; Grünecker, Kinkeldey, Stockmair & Schwanhäusser, Leopoldstrasse 4, 80802 München (DE).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

WO 2013/068100 A1

(54) **Title**: SMOKING ARTICLE WITH VISIBLE CONTENTS

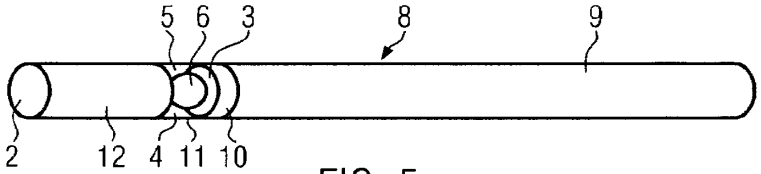


FIG. 5

(57) **Abstract**: The present invention relates to a smoking article (8) comprising a smokeable material and a mouthpiece (1), the mouthpiece comprising at least three segments (2, 3, 5) in axial alignment. One segment defining a cavity (5) is disposed between two other segments (2, 3) and a fluid-containing breakable capsule (6) is arranged in the cavity. A first wrapper (4) circumscribes at least the cavity, wherein the first wrapper comprises a substantially smooth transparent section overlaying at least a part of the cavity, such that the capsule is at least partially visible through the first wrapper. The first wrapper has one or more layers of transparent varnish applied thereto. The invention further relates to a mouthpiece for a smoking article and a method of producing a smoking article.

NJOY Exhibit 1002.2131

Smoking Article with Visible Contents

The present invention relates to a smoking article comprising a visible, crushable liquid-containing capsule, a mouthpiece for such a smoking article and a method for producing such a smoking article.

Some smoking articles, such as filter cigarettes, typically comprise a cylindrical rod of tobacco cut filler surrounded by a paper wrapper and a cylindrical filter axially aligned in an abutting end-to-end relationship with the wrapped tobacco rod. Conventionally, the wrapped tobacco rod end and the filter are joined by a tipping paper, typically formed of a band of paper material that circumscribes the entire length of the filter and an adjacent portion of the wrapped tobacco rod.

A number of smoking articles in which tobacco is heated rather than combusted have also been proposed in the art. In heated smoking articles, an aerosol is generated by heating a flavour generating substrate, such as tobacco. Known heated smoking articles include, for example, electrically heated smoking articles and smoking articles, in which an aerosol is generated by the transfer of heat from a combustible heat source to a physically separate aerosol forming material. During smoking, volatile compounds are released from the aerosol forming substrate by heat transfer from the heat source and entrained in air drawn through the smoking article. As the released compounds cool they condense to form an aerosol that is inhaled by the consumer.

EP-A-1895863 describes a cigarette, wherein a capsule is provided in between a first absorbent member and a second absorbent member of a filter element. The capsule is adapted to release at least a portion of a fluid when the capsule is subjected to external force, such as squeezing, by the consumer.

Furthermore, smoking articles with transparent sections, such that at least part of the smoking article is visible through the wrapper are known in the art. For instance, WO-A-2009/147122 discloses a smoking article with a tipping material attached to the filter portion of the smoking article, the tipping material comprising at least one transparent section through which a filter segment is at least partly visible. The filter segment may comprise a flavour release segment which may be a cavity filled with at least one of plant leaf, tobacco beads, flavour loaded cellulose beads, one or more flavour containing capsules or flavoured threads. A view on the flavour release segment is enabled by the transparent section. Where the cavity is filled with flavour loaded beads, these are porous and allow for gradual release of the flavour without requiring the consumer to crush or break the beads. Since such beads are suitable for continued release of flavor rather than providing a burst of flavor, the smoking article does not permit a consumer to choose when to activate or release the flavor.

NJOY Exhibit 1002.2132

CN 201 667 985 U discloses a filter rod with visible perfume beads, wherein a cavity is formed between tow sections, and one or more of the perfume beads are arranged in the cavity. The perfume beads contain perfume liquid and can optionally be broken by a consumer to emit fragrance. The filter rod further comprises transparent molding paper and tipping paper with a transparent section or transparent tipping paper. However, it is difficult to ensure that the perfume liquid remains substantially in the cavity.

It is thus a preferred object to address these issues.

It is also a preferred object of the invention to provide a smokeable article that allows to visualize the presence and operation of a breakable capsule in the smoking article in an intuitive way.

Breakable capsules are known for delivering a burst of flavor when ruptured. However, it is an issue that the flavor, typically a liquid, can travel through the smokeable article, such as by capillary action, when the capsule is ruptured.

Thus, it is yet another preferred object to reduce or avoid that the liquid released from a breakable article reaches the mouth or hands of the consumer.

Accordingly, the invention provides a smoking article comprising a smokeable material and a mouthpiece in axial alignment with the smokeable material, the mouthpiece comprising at least three segments, one segment defining a cavity disposed between two other segments, the cavity enclosing a fluid-containing breakable capsule, and a first wrapper circumscribing the mouthpiece, wherein the wrapper comprises a substantially smooth transparent section overlaying at least a part of the cavity, such that the capsule is at least partially visible through the wrapper, wherein the first wrapper has one or more layers of transparent varnish applied thereto.

This provides the benefit, that the consumer can see the capsule, and therefore knows how to operate the capsule. In particular, as the consumer can see the capsule before activating the fluid release by rupturing the capsule, this provides an effective and rapid way of notifying the consumer of the presence of the capsule in the smoking article. It further allows the consumer to confirm the intactness of the capsule prior to rupture. Additionally, where rupture is to be caused by the application of pressure against the capsule, it enables the consumer to apply pressure in exactly the right location to achieve an efficient rupture of the capsule. The transparent varnish applied on the first wrapper enables that the first wrapper, which may be transparent, remains substantially or entirely impermeable to fluids, in particular after the capsule is broken. Thus, the fluid released from the capsule does not travel through the first wrapper after being released from the capsule, such that it can be avoided that the liquid reaches the mouth or hands of the consumer.

The invention further provides a mouthpiece for a smoking article, the mouthpiece comprising at least two segments, a cavity being disposed between two of the segments, the

NJOY Exhibit 1002.2133

cavity enclosing a fluid-containing breakable capsule, and a first wrapper circumscribing at least part of the mouthpiece, wherein the wrapper has one or more layers of transparent varnish applied thereto, and wherein the wrapper comprises a substantially smooth transparent section overlaying at least a part of the cavity, such that the capsule is at least partially visible through the wrapper.

The invention also provides a method of producing a smoking article comprising:
providing a plurality of discrete filters comprising two or more filter segments,
providing a substantially smooth sheet of transparent material, which has one or more layers of transparent varnish applied thereto,
placing the discrete filters in axial alignment with a tobacco rod such that at least two of the filter segments are placed in a spaced apart arrangement so as to define a cavity section,
placing a breakable fluid-containing capsule in the cavity section; and
wrapping the sheet of transparent material around at least a portion of the discrete filters, the cavity section and the tobacco rod, forming a smoking article.

The capsule may be adapted to release a fluid material, when the capsule is subjected to external force or pressure, such as squeezing, by the consumer. In particular, the capsule may release a liquid material. The capsule thus comprises a breakable wall. In some embodiments, several capsules may be provided in a cavity, though it is preferred that a single capsule is located in the cavity.

The capsule may contain an additive, which modifies the characteristics of the smoke of the smoking article. Such additives may comprise flavours, neutralizing agents, or other smoke modifiers, such as chemical reagents. Additionally, the additives may also include diluents, solvents or processing aids. In a preferred embodiment, the additive is one or more flavorants, such as a liquid flavour, flavour formulation or flavour-containing material. Suitable capsules as well as their manufacture are known in the art. An example of capsules that can be used in the present context are described in WO-A-2007/010407.

The transparent section of the first wrapper is substantially smooth. By "substantially smooth" it is meant that the transparent section does not have a pattern or image impressed onto its surface such that the pattern or image is raised from the overall surface. In particular, the surface of the transparent section of the filter element has only a normal surface roughness inherent to the respective material. That means that the transparent section in this embodiment is not embossed. This provides an advantageous feature that the transparent section can be located not only visually but also preferably by touch since the smooth section will typically have a different feel from the sections surrounding it.

The term "transparent" is used to describe a material which allows at least a significant proportion of incident light to pass through, so that it is possible to see through the material. In the present invention, the transparent section allows sufficient light to pass

NJOY Exhibit 1002.2134

through it such that capsule is visible in the filter element. The transparent section may be completely transparent. Alternatively, the transparent section may have a lower level of transparency while still transmitting sufficient light such that the capsule is visible from the outside of the filter element. Preferably, "transparent" denotes a total percentage light transmission of 40% or more, more preferably 50% or more, even more preferably 60% or more, most preferably 70% or more, as measured using a Hunterlab Colorquest XE Spectrophotometer.

In some cases, the substantially transparent section of the wrapper may be tinted or colored, or may have repeating patterns or other type of graphics applied thereto as long as such patterns or graphics are not raised from the overall surface of the sheet.

The first wrapper is usually an inner wrapper. Thus, the substantially smooth first wrapper may form a circumferential wall for the cavity. The first wrapper may only be partially transparent, such as by comprising transparent window portions, while otherwise being at least partially printed or formed of an opaque material. In other embodiments, substantially all of the first wrapper may be transparent. The thickness of the first wrapper is preferably at least about 25 micrometers, more preferably between about 25 micrometers and about 45 micrometers. The base weight of the first wrapper is preferably at least about 40 grams per square meter (gsm) and more preferably between about 40 gsm and about 65 gsm. In a particularly preferred aspect, the first wrapper is a transparent film.

Preferably, the first wrapper is substantially air impermeable. It may be biodegradable. Examples of suitable materials for use as wrapper materials include polymers and cellulose-based materials. Transparent cellulose film is preferred and cellophane is particularly preferred. This is because cellophane is biodegradable. Other biodegradable polymers may also be suitable. Polypropylene may be suitable since it is substantially impermeable to fluid.

The first wrapper is covered with a transparent varnish. Throughout the specification, the term 'varnish' is used to denote a liquid coating that solidifies upon curing. Curing can be performed using any known standard technique, though ultraviolet curing is preferred.

Suitable varnishes for use in the present invention are known in the art and commercially available from, for example, Schmid Rhyner AG of Adliswil, Switzerland. An example of a particularly preferred varnish is a nitrocellulose lacquer. Such a lacquer can further improve air impermeability of the first wrapper. The transparent varnish is preferably provided on the inside of the first wrapper. In particular, the transparent varnish may be applied by printing.

In one embodiment, multiple layers of transparent varnish can be provided on the first wrapper.

In a further aspect, an opaque second wrapper comprising at least one opening may be provided around the first wrapper. The second or outer wrapper may be formed by using paper with a weight from about 40 to about 60 gsm. The at least one opening may be formed by a die-cut. The, or each, opening forms a window, through which the capsule can be seen.

Alternatively, the outer wrapper may comprise a transparent film, while the first wrapper is preferably only at least partially formed from a transparent film.

An outer wrapper made from a transparent film preferably has a weight of about 40 gsm to about 90 gsm.

In one embodiment, the at least one opening is a die-cut opening. This facilitates the production of an outer wrapper, which may be die-cut before being used in a standard cigarette manufacturing equipment.

In another embodiment, the outer wrapper may only cover part of the filter element, namely substantially the upstream segment. A further outer wrapper may be provided, which covers the downstream segment, such that the cavity is not covered by the outer wrappers. In this case, the outer wrappers can both be opaque.

As used herein, the terms 'upstream' and 'downstream' are used to describe the relative position of portions or components of mouthpieces and smoking articles according to the invention in relation to the direction of mainstream smoke drawn through the mouthpieces and smoking articles during use thereof. For example, in a mouthpiece where the cavity is upstream of a mouth end segment, mainstream smoke is drawn first through the cavity and then through the mouth end segment.

In one embodiment, the diameter of the capsule relative to the diameter of the cavity is such that the capsule is substantially immobilized inside the cavity. For instance, the relative diameter of the capsule may be about 88% to about 99% of the diameter of the cavity. This renders the capsule easy to locate and rupture whilst still allowing air to flow past the unruptured capsule. In another embodiment, the relative diameter of the capsule to the cavity is such that it is mobile within the cavity. For instance the capsule may be about 60 to about 87% of the diameter of the cavity. This improves the visibility of the capsule as a separate element and allows the capsule to move inside the cavity to attract further attention of the consumer. Furthermore, the cavity being larger than the capsule provides a better visibility of the release of the fluid, when the capsule is opened. Nevertheless, it is important that the capsule is not so small that it becomes very difficult for a consumer to crush. For instance, a capsule having a relative diameter of about 30% or less compared to the diameter of the cavity is not preferred.

Preferably, the segments either side of the cavity are adapted such that the main fraction of the fluid of the capsule remains in the cavity when the capsule is broken. However, the fluid may be slowly absorbed by the segments. Nevertheless, immediately

following breakage of the capsule, the visibility of free fluid in the cavity is beneficial as it confirms activation of the fluid release to the consumer.

Preferably, the segments comprise at least one of filter tow material or sorbents such as for example, carbon, carbon beads or a carbon structure, activated carbon, active aluminum, zeolites, sepiolites, molecular sieves and silica gel. The filtration material in the filter segment is useful for the removal of particulate and gaseous components of the mainstream smoke. A carbon structure is known in the art, for example in the form of an extruded carbon honeycomb structure. Such a carbon structure is disclosed for example in the Japanese patent application JP-A 2001-120250. It is particularly preferred that the filter segments comprise a cellulose acetate tow, which may be aligned or randomly oriented.

The fluid released from the ruptured capsule may travel slowly through the filter segment dues to a capillary effect. However, the filter segments may be at least partially rendered less absorbent to fluid, for example by coating or sealing, so that the movement of fluid through the filter segment is slowed. This has the advantage of making the fluid visible in the cavity for a longer period.

Preferably, the fluid in the capsule is colored. Thus, the visibility of the release of the fluid is improved.

Additionally or alternatively, the capsule may be colored. In particular, the walls of the capsule may be colored. Thus, the visibility of the capsule in the cavity is improved. Furthermore, if the fluid and the capsule are provided in different colors, the visibility of the release of the fluid may be yet further improved.

The color of the capsule or the fluid comprised in the capsule is preferably different from the color of the remaining filter element.

Preferably, the cavity is arranged between a mouth end filter segment and a rod end filter segment, wherein the mouth end filter segment is longer than the rod end filter segment. This has the advantage of preventing the fluid from the opened capsule from reaching a consumer's mouth by means of capillary effect. Preferably, the filter segments are segments comprising a filter tow. The rod end filter segment preferably may have a length up to about 12 mm. The cavity preferably may have a length up to about 7 mm. The mouth end filter segment preferably may have a length of at least 15 mm. The capsule preferably has a spherical or ellipsoidal form with a diameter of about 4.5 mm. In some embodiments, perforations may be provided in the rod end filter segment, which allow a dilution of the smoke with air in the rod end filter segment.

The filter may also comprise more than two filter segments wrapped in and connected by the first wrapper. For instance, up to five segments may be present. The different segments may comprise filtration materials, absorbent materials, flavours, plant materials,

NJOY Exhibit 1002.2137

botanicals or spices. Some or all of these segments may be at least partially visible through transparent sections of the filter element.

Preferably the smokeable material comprises a tobacco rod.

Preferably, a wrapper, namely the first wrapper or the outer wrapper, is at least partially wrapped around the mouthpiece and the tobacco rod, to connect the mouthpiece and the tobacco rod.

Thus, the invention further relates to a smoking article according to the present invention, wherein an outer wrapper is at least partially wrapped around mouthpiece in the form of the filter element and a tobacco rod, to connect the filter element and the tobacco rod. The outer wrapper may circumscribe the filter element along the entire length of the filter element.

Smoking articles according to the present invention may be filter cigarettes or other smoking articles in which smokeable material, in particular tobacco material, or another combustible material is combusted to form smoke. Alternatively, smoking articles according to the invention may be articles in which material is heated to form an aerosol, rather than combusted. In one type of heated smoking article, tobacco material or another aerosol generating material is heated by one or more electrical heating elements to produce an aerosol. In another type of heated smoking article, an aerosol is produced by the transfer of heat from a combustible or chemical heat source to a physically separate aerosol forming material, which may be located within, around or downstream of the heat source.

The capsule is visible through at least one opening. Alternatively, several openings may be provided around the circumference of the outer wrapper in the region of the cavity.

Filters that comprise a cavity as used in the smoking article according to the invention may be produced using known machinery for producing charcoal filters, such as that described in EP-A-1,571,933. Such machinery is commercially available, for example from Filtrona International Ltd., Great Britain.

Preferably, the overall length of smoking articles according to the present invention is between about 70 mm and about 128 mm, more preferably about 84 mm.

Preferably, the external diameter of filters and smoking articles according to the present invention is between about 3 mm and 8.5 mm, more preferably about 7.9 mm.

Preferably, the overall length of filters according to the present invention is between about 18 mm and about 36 mm, more preferably about 27 mm.

Preferably, the length of each individual segment of filters according to the present invention is between about 5 mm and about 22 mm.

In smoking articles according to the invention, the mouth end segment of the filter may comprise a hollow tube or recess. The hollow tube or recess may be formed when the filter is attached to a rod of smokeable material by, for example, tipping paper to form a

smoking article according to the present invention. Preferably, the recess further comprises a cylindrical element that adds structural strength to the tube, for example a paper or carton tube that is overwrapped by the tipping material. Recess filters are well known in the art, for example, in WO-A-2004/089124.

In smoking articles according to the invention, the filter may comprise a restrictor segment. A restrictor segment affects the resistance to draw and other fluid dynamics of the smoking article and also affects the formation of carbon monoxide and carbon dioxide. Restrictors in smoking articles are known in the art, for example from the International patent application WO-A2-2008/059377.

Filters according to the present invention may be produced by forming separate continuous rods comprising multiple units of each individual segment of the filter. Then these separate rods are combined in a known manner in one or more stages to form a continuous filter rod comprising multiple units of the filter. The continuous filter rod may then be subsequently severed at regular intervals by a cutting mechanism to yield a succession of discrete filters according to the invention.

Preferably, smoking articles according to the present invention comprise a wrapped rod of tobacco cut filler. Preferably, smoking articles according to the present invention have a total nicotine free dry particulate matter (NFDPM) or "tar" delivery of up and about 10 mg. More preferably, the "tar delivery" is between 1 mg and 10 mg and more preferably about 6 mg.

Smoking articles according to the present invention may be packaged in containers, for example in soft packs or hinge-lid packs, with an inner liner coated with one or more flavorants.

The invention will now be further described with reference to exemplary embodiments as shown in the following figures:

Figure 1 shows a cross sectional view of a filter element according to one embodiment of the invention.

Figure 2 shows a cross sectional view of a filter element according to another embodiment of the invention.

Figure 3 shows a cross sectional view of a smoking article according to one embodiment of the invention.

Figure 4 shows a cross sectional view of a smoking article according to another embodiment of the invention.

Figure 5 shows a perspective side view of a smoking article according to an embodiment of the invention.

Figure 1 shows a mouthpiece in the form of a filter element 1 for a smoking article according to a first embodiment of the invention. The filter element 1 has a substantially

cylindrical form. In particular, it comprises a mouth end filter segment 2 and, spaced apart from the mouth end filter segment, a rod end filter segment 3. By "spaced apart", it is meant that the segments are not in an abutting or adjacent relationship. Both the mouth end filter segment 2 and the rod end filter segment 3 have a substantially cylindrical form. Preferably, the filter segments 2, 3 are formed from cellulose acetate, such that they are able to filter the smoke or aerosol provided by the smoking article comprising the filter element 1.

A first wrapper 4, in particular an inner wrapper in the form of a plug wrap, is wrapped around and connects both filter segments 2, 3. The first wrapper 4 is a transparent, impermeable film, in particular made of cellophane. The first wrapper preferably fully circumscribes the mouth end filter segment 2 and the rod end filter segment 3.

The mouth end filter segment 2 and the rod end filter segment 3 are spaced apart and a cavity 5 is provided between them. In particular, the first wrapper 4 forms the outer circumferential wall of the cavity 5, while the mouth end filter segment 2 and the rod end filter segment 3 form the boundary of the cavity 5 in the longitudinal direction 100 of the filter element 1. The longitudinal direction 100 corresponds to the axial direction of the cylindrical filter element 1.

The first wrapper 4 is preferably substantially impermeable to fluid. The impermeability is in particular improved by providing a transparent varnish in the form of nitrocellulose lacquer on the inner side of the first wrapper 4.

Inside the cavity 5 a capsule 6 is located, wherein the capsule 6 encloses a fluid. In particular, the capsule 6 is a breakable capsule, which releases the fluid when it is subjected to sufficient pressure to cause its rupture. Other mechanisms for rupturing the capsule can be provided, such as rupture when the capsule 6 is subjected to smoke or heat but pressure is most preferred.

In the presently exemplified embodiment, the fluid is released from the capsule 6, when the consumer applies a pressure on the filter element 1 in the region of the cavity 5, such that the first wrapper 4 comes into contact with capsule 6, and pressure is applied to the capsule 6. Thus, the wall of the capsule 6 breaks such that the fluid is released into the cavity 5, and may be visible from the outside, as the first wrapper 4 is transparent. However, as the first wrapper 4 is substantially impermeable, the fluid material will substantially remain in the cavity 5, until it is evaporated or absorbed by either the mouth end filter segment 2, the rod end filter segment 3, or both. Preferably, the fluid comprised in the capsule 6 is colored, such that the release of the fluid is visible. In particular, the fluid comprised in the cavity 5 may have a color which is different from the remaining filter element 1, to improve the visibility thereof. More preferably, the color of the fluid may also be different from the outer wall of the capsule 6 enclosing the fluid. The fluid may be formed of or comprise an additive or flavour. Additives may modify the smoke provided by the smoking article, while flavourants

NJOY Exhibit 1002.2140

may in particular modify the taste or flavour of the smoke of the smoking article. In particular, the fluid of the capsule 6 may provide a menthol taste. Thus, at a desired time during the smoking of the smoking article, the consumer can activate the additional menthol taste, by pressing the filter element 1 with sufficient force to rupture the capsule wall, such that the fluid is released and by means of evaporation of the fluid, the menthol taste will be delivered through the mouth end filter segment together with the smoke. As the first wrapper 4 is transparent, the consumer can readily confirm the release of the fluid.

Figure 2 shows a second embodiment of a mouthpiece in the form of a filter element 1, which is substantially the same as the first embodiment of the filter element 1, with a different first wrapper 4. The first wrapper 4 is generally opaque, and only comprises a transparent window 7 in the region of the cavity 5. In particular, the first wrapper 4 may be a transparent film, and opacity is achieved by printing the wrapper with an opaque ink in its entirety apart from the region of the window 7. In other embodiments, the window 7 may be created by treatment of an otherwise opaque material, such as a thin paper, to make it transparent in the region of the window 7. In yet other embodiments, the first wrapper 4 may be made of an opaque material with an opening formed therein, wherein the opening is overlayed or underlayed with a transparent material to form the window 7. The transparent material may in particular be fixed by means of adhesive to the remaining material of the first wrapper 4.

The transparent window 7 has a length in the longitudinal direction 100, which is substantially equal or less than the distance between the filter segments 2, 3. Furthermore, the window 7 may have a width, which is the same or less than the circumference of the first wrapper 4. In particular, several windows 7 may be provided in the circumferential direction or in the longitudinal direction of the first wrapper 4 in the region of the cavity 5.

In Figure 3, a first embodiment of a smoking article 8 according to the invention is shown in a cross section. The smoking article 8 comprises the filter element 1 as described with respect to Figure 1 and a smoking material rod 9, in axially aligned arrangement in the longitudinal direction 100. The rod end filter segment 3 abuts the smoking material rod 9. An outer wrapper 10 is wrapped around the filter element 1 and at least a portion of the smoking material rod 9, to connect the smoking material rod 9 and the filter element 1. The outer wrapper 10 fully circumscribes at least a portion of the smoking material rod 9 and the filter element 1. The outer wrapper 10 may be fixed by means of adhesive to the smoking material rod 9 and the filter element 1.

The smoking material rod 9 is in particular a cylindrical rod of tobacco material which is comprised in a cigarette paper.

The outer wrapper 10 is made from opaque material, such as standard tipping paper. The outer wrapper 10 comprises an opening 11 in the region of the cavity 5. Thus, as the first

NJOY Exhibit 1002.2141

wrapper 4 is transparent, the inside of the cavity 5, and therefore the capsule 6, is visible from the outside of the smoking article 8 through the opening 11. The opening 11 forms a window in the outer wrapper 10. The window formed by the opening 11 has in particular a length in the longitudinal direction, which is substantially equal to or less than the distance in between the filter segments 2, 3. Furthermore, the window may have a width, which is the same or less as the circumference of the outer wrapper 10. In particular, several windows may be provided in the circumferential direction or in the longitudinal direction of the outer wrapper 10 in the region of the cavity 5.

The opening 11 is in particular a die-cut opening in the outer wrapper 10. However, in other embodiments, instead of the opening 11, a transparent window may be provided in the outer wrapper 10. Furthermore, several openings 11 in the outer wrapper 10 may be provided in the region of the cavity 5 of the filter element 1. In particular, a plurality of openings 11 may be arranged spaced from each other in the longitudinal direction or circumferential direction of the outer wrapper 10 in the region of cavity 5.

In Figure 4, a second embodiment of a smoking article 8 with a filter element 1 according to Figure 2 is shown. In this embodiment, the outer wrapper 10 is made from a substantially transparent material, while the first wrapper 4 is only transparent in a window 7 in the region of the cavity 5. Thus, the cavity 5 and the capsule 6 will be visible through the window 7.

In a further embodiment of the present invention, the first wrapper 4 and the outer wrapper 10 may be fully transparent. Thus, the filter segments 2, 3 as well as the cavity 5 are visible from the outside. However in other embodiments, it is preferred that only the cavity 5 is visible from the outside, and thus the transparent outer wrapper may be partially printed.

In Figure 5, a smoking article 8 is shown, in which the whole cavity 5 is visible through a transparent first wrapper 4. An outer wrapper 10 is provided in the region of the rod end filter segment 3 and a neighboring portion of the smoking material rod 9. An further outer wrapper 12 is provided in the region of the mouth end filter segment 2. The outer wrappers 10, 12 are arranged in a spaced apart relationship, such that the capsule 6 is visible from the outside of the smoking article 8. As the fluid comprised in the capsule 6 is colored, the fluid release will be visible by the free colored fluid in the cavity 6.

Thus, in Figure 5 the opening 11 in the outer wrapper 10, 12 fully extends around the circumference of outer wrapper 10, 12, and the outer wrapper 10, 12 is in fact formed by two separate outer wrappers 10, 12, wherein one wrapper 12 is mainly arranged around the mouth end filter segment 2, while the other outer wrapper 10 is mainly arranged in the region of the rod end filter segment 3 and the neighboring end of the smoking material rod 9. The outer wrapper 12 forms the circumferential outside of the mouth end of the filter element 1,

NJOY Exhibit 1002.2142

while the other outer wrapper 10 is provided for connecting the filter element 1 and the smoking material rod 9.

Thus, the opening 11 in the outer wrapper 10 may be provided in the whole region of the cavity 5, such that only the filter segments 2, 3 are covered by the outer wrappers 10, 12. Therefore, the cavity 5 and the capsule 6 therein are fully visible from the outside.

Further, in some embodiments, the outer wrapper 10 may only extend in the region of the rod end filter segment 3 and the smoking material rod 9, and no outer wrapper is provided around the mouth end filter segment 2. Then, the first wrapper 4 forms the circumferential outside of the mouth end of the smoking article 8.

NJOY Exhibit 1002.2143

Claims

1. A smoking article comprising a smokeable material and a mouthpiece, the mouthpiece comprising at least three segments in axial alignment, one segment defining a cavity disposed between two other segments, a fluid-containing breakable capsule arranged in the cavity, and a first wrapper circumscribing at least the cavity, wherein the first wrapper comprises a substantially smooth transparent section overlaying at least a part of the cavity, such that the capsule is at least partially visible through the first wrapper, wherein the first wrapper has one or more layers of transparent varnish applied thereto.

2. The smoking article according to claim 1, wherein the cavity is arranged in between a downstream segment and an upstream segment, wherein the downstream segment is longer than the upstream segment.

3. The smoking article according to claim 1 or claim 2, wherein an opaque second wrapper comprising at least one opening is provided around the first wrapper and the at least one opening overlays the transparent section of the first wrapper.

4. The smoking article according to any one of the preceding claims, wherein the downstream and upstream segments reduce or prevent the release of fluid from the capsule, when ruptured, from the cavity.

5. The smoking article according to any one of the previous claims, wherein the fluid in the capsule is colored.

6. The smoking article according to any one of the previous claims, wherein the capsule is colored.

7. The smoking article according to any one of the previous claims, wherein the diameter of the capsule relative to the diameter of the cavity is such that the capsule is substantially immobilized inside the cavity.

8. The smoking article according to any one of claims 1 to 6, wherein the diameter of the capsule relative to the diameter of the cavity is such that it is mobile within the cavity.

NJOY Exhibit 1002.2144

9. The smoking article according to any one of the previous claims, wherein the smokeable material is a tobacco rod and an outer wrapper is at least partially wrapped around the mouthpiece and the tobacco rod, to connect the mouthpiece and the tobacco rod.

10. The smoking article according to claim 9, wherein the outer wrapper is made from a transparent film.

11. The smoking article according to claim 9, wherein the wrapper is opaque and comprises at least one opening overlaying the transparent section of the first wrapper.

12. A mouthpiece for a smoking article, the mouthpiece comprising at least three segments, one segment defining a cavity and being disposed between two other segments, a fluid-containing breakable capsule arranged in the cavity, and a first wrapper circumscribing at least the cavity, wherein the first wrapper has one or more layers of transparent varnish applied thereto, and wherein the first wrapper comprises a substantially smooth transparent section overlaying at least a part of the cavity, such that the capsule is at least partially visible through the first wrapper.

13. A method of producing a smoking article comprising:
providing a plurality of discrete filters comprising two or more filter segments,
providing a substantially smooth sheet of transparent material, which has one or more layers of transparent varnish applied thereto,
placing the discrete filters in axial alignment such that at least two of the filter segments are placed in a spaced apart arrangement so as to define a cavity section,
placing a breakable fluid-containing capsule in the cavity section; and
wrapping the sheet of the at least partially transparent material around at least a portion of the discrete filters and the cavity section, and wrapping a further wrapper around the discrete filters and a tobacco rod, forming a smoking article.

14. The method according to claim 13, wherein the filter segments comprise a downstream filter segment and an upstream filter segment, wherein the downstream filter segment is longer than the upstream filter segment.

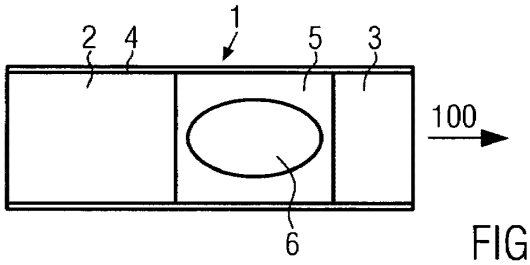


FIG. 1

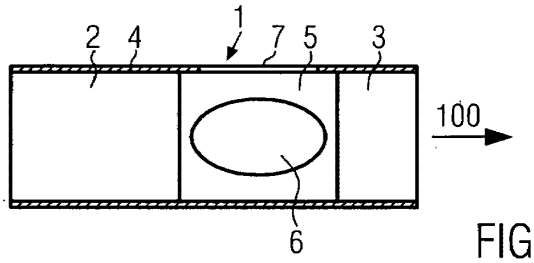


FIG. 2

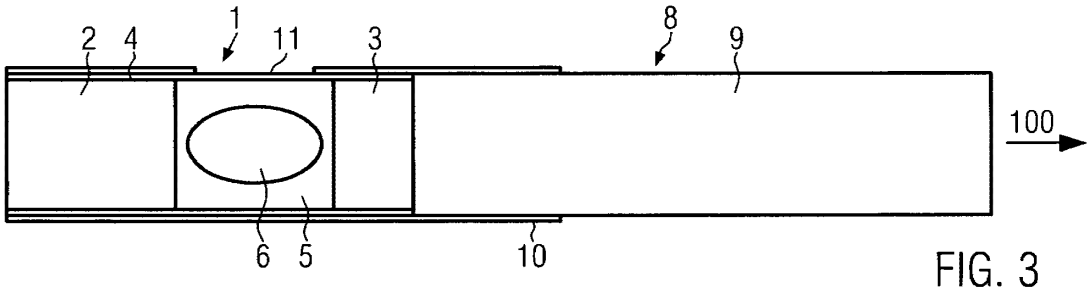


FIG. 3

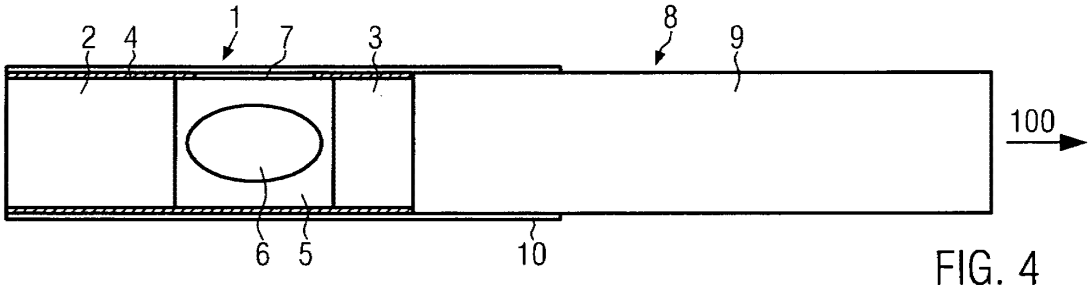


FIG. 4

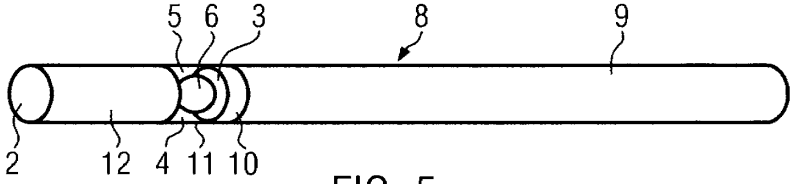


FIG. 5

NJOY Exhibit 1002.2146

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/004623

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24D3/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A24D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 201 667 985 U (HUBEI CHINA TOBACCO IND CO LTD; WUHAN CITY HUANGHELOU TECHNOLOGY PARK) 15 December 2010 (2010-12-15) EPO abstact and automatic translation of the SIPO; figures 1-3	1,13
A	WO 2011/077141 A1 (BRITISH AMERICAN TOBACCO CO [GB]; RUSHFORTH DAVID [GB]) 30 June 2011 (2011-06-30) page 5, lines 2-20 page 10, lines 1-15 page 19, lines 5-23	1,13
A	US 3 530 861 A (CARTY MARGARET F) 29 September 1970 (1970-09-29) column 1, lines 26-42	1,13

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 April 2013	24/04/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Koob, Michael

1

Form PCT/ISA/210 (second sheet) (April 2005)

NJOY Exhibit 1002.2147

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2012/004623

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 201667985 U	15-12-2010	NONE	
WO 2011077141 A1	30-06-2011	AR 081053 A1	06-06-2012
		AU 2010334634 A1	19-07-2012
		CA 2784479 A1	30-06-2011
		CN 102781265 A	14-11-2012
		EP 2515688 A1	31-10-2012
		KR 20120103727 A	19-09-2012
		US 2013047999 A1	28-02-2013
		WO 2011077141 A1	30-06-2011
US 3530861 A	29-09-1970	BE 737209 A	16-01-1970
		CH 497144 A	15-10-1970
		DE 6930491 U	11-12-1969
		FR 2015242 A1	24-04-1970
		GB 1220026 A	20-01-1971
		IE 33627 B1	04-09-1974
		IT 1036502 B	30-10-1979
		JP S4818837 B1	08-06-1973
		US 3530861 A	29-09-1970

NJOY Exhibit 1002.2148

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 June 2013 (13.06.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/083631 A1

(51) International Patent Classification:
A24F 47/00 (2006.01) *A61M 15/06* (2006.01)

(21) International Application Number:
PCT/EP2012/074510

(22) International Filing Date:
5 December 2012 (05.12.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11192696.0 8 December 2011 (08.12.2011) EP

(71) Applicant: **PHILIP MORRIS PRODUCTS S.A.** [CH/CH]; Quai Jeanrenaud 3, CH-2000 Neuchatel (CH).

(72) Inventors: **DUBIEF, Flavien**; Rue du Rocher 52, CH-2000 Neuchatel (CH). **COCHAND, Olivier**; Faubourg 30, CH-2056 Dombresson (CH). **THORENS, Michel**; Les Combremonts 24, CH-1510 Moudon (CH). **FLICK, Jean-Marc**; Rue de la Poste 3, CH-1405 Pomy (CH). **DEGOUMOIS, Yvan**; Vieux-Moulin 6, CH-2013 Colombier (CH).

(74) Agent: **PONDER, W.**; Reddie & Grose LLP, 16 Theobalds Road, London, Greater London WX1C 8PL (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

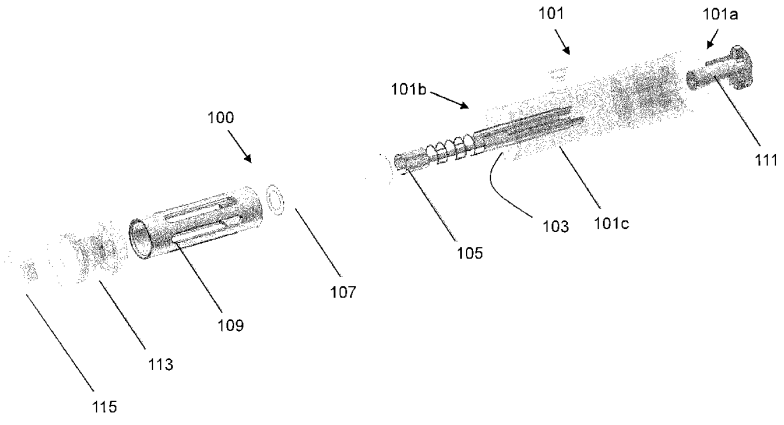
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: AN AEROSOL GENERATING DEVICE HAVING AN INTERNAL HEATER

Figure 2



(57) **Abstract**: There is provided an aerosol generating device for heating an aerosol-forming substrate. The device comprises a storage portion (101) for storing the aerosol-forming substrate and a vaporizer (105; 105') for heating the aerosol-forming substrate to form an aerosol. The storage portion (101) has an outer housing and an internal passageway (103), the storage portion forming a reservoir for the aerosol-forming substrate between the outer housing and the internal passageway, and the vaporizer (105; 105') extends at least partially inside the internal passageway (103) in the storage portion(101). The device further comprises a porous interface (107) at least partially lining the internal passageway (103) for conveying the aerosol-forming substrate from the storage portion (101) towards the vaporizer (105; 105').

WO 2013/083631 A1

NJOY Exhibit 1002.2149

AN AEROSOL GENERATING DEVICE HAVING AN INTERNAL HEATER

The present invention relates to an aerosol generating device for heating an aerosol-forming substrate. Particularly, but not exclusively, the present invention relates to an electrically operated aerosol generating device for heating a liquid aerosol-forming substrate.

WO-A-2009/132793 discloses an electrically heated smoking device. A liquid is stored in a liquid storage portion, and a capillary wick has a first end which extends into the liquid storage portion for contact with the liquid therein, and a second end which extends out of the liquid storage portion. A heating element heats the second end of the capillary wick. The heating element is in the form of a spirally wound electric heating element in electrical connection with a power supply, and surrounding the second end of the capillary wick. In use, the heating element may be activated by the user to switch on the power supply. Suction on a mouthpiece by the user causes air to be drawn into the electrically heated smoking device over the capillary wick and heating element and subsequently into the mouth of the user.

It is an objective of the present invention to improve the generation of aerosol in an aerosol generating device or system.

According to one aspect of the invention, there is provided an aerosol generating device comprising: a storage portion for storing an aerosol-forming substrate, the storage portion having an outer housing and an internal passageway, the storage portion forming a reservoir for the aerosol-forming substrate between the outer housing and the internal passageway; a vaporizer for heating the aerosol-forming substrate to form an aerosol, the vaporizer at least partially inside the internal passageway in the storage portion; and a porous interface at least partially lining the internal passageway for conveying the aerosol-forming substrate from the storage portion towards the vaporizer.

The aerosol generating device is arranged to vaporize an aerosol-forming substrate to form the aerosol. The aerosol generating device may include the aerosol-forming substrate or may be adapted to receive the aerosol-forming substrate. As known to those skilled in the art, an aerosol is a suspension of solid particles or liquid droplets in a gas, such as air.

According to another aspect of the invention, there is provided a cartridge comprising: a storage portion for storing an aerosol-forming substrate, the storage portion having an outer housing and an internal passageway, the storage portion forming a reservoir for the aerosol-forming substrate between the outer housing and the internal passageway; a vaporizer for heating the aerosol-forming substrate to form an aerosol, the vaporizer at least partially inside the internal passageway in the storage portion; and a porous interface at least partially lining the internal passageway for conveying the aerosol-forming substrate from the storage portion towards the vaporizer.

NJOY Exhibit 1002.2150

The aerosol generating device and cartridge may cooperate to provide an aerosol generating system for heating the aerosol-forming substrate. The cartridge or aerosol generating device may comprise the storage portion having the internal passageway. The vaporizer and the porous interface may be contained in the aerosol generating device. The vaporizer and the porous interface may also be contained in the cartridge.

The aerosol generating device may comprise the vaporizer for heating the aerosol-forming substrate. Alternatively or additionally, the aerosol generating device may comprise the porous interface. The aerosol generating device may comprise the storage portion for storing the aerosol forming substrate.

The cartridge may comprise the vaporizer for heating the aerosol-forming substrate. Alternatively or additionally, the cartridge may comprise the porous interface. The cartridge may comprise the storage portion for storing the aerosol forming substrate.

According to another aspect of the invention, there is provided an aerosol generating system comprising: a cartridge and an aerosol generating device, the cartridge or the aerosol generating device comprising: a storage portion for storing an aerosol-forming substrate, the storage portion having an internal passageway; a vaporizer for heating the aerosol-forming substrate to form an aerosol, the vaporizer at least partially inside the internal passageway in the storage portion; and a porous interface at least partially lining the internal passageway for conveying the aerosol-forming substrate from the storage portion towards the vaporizer.

For all aspects of the invention, the storage portion may be a liquid storage portion. For all aspects of the invention, the aerosol forming substrate may be a liquid aerosol forming substrate. The aerosol-forming substrate may contain nicotine. The aerosol-forming substrate may be adsorbed, coated, impregnated or otherwise loaded onto a carrier or support.

The aerosol-forming substrate may alternatively be any other sort of substrate, for example, a gas substrate or a gel substrate, or any combination of the various types of substrate. The aerosol-forming substrate may be a solid substrate.

The porous interface may be arranged to be in contact with liquid aerosol-forming substrate in the liquid storage portion. In one embodiment, liquid aerosol-forming substrate in the porous interface is vaporized by the heater to form a supersaturated vapour. The supersaturated vapour is mixed with air. The supersaturated vapour condenses to form the aerosol and the aerosol is carried towards the mouth of a user. The liquid aerosol-forming substrate has suitable physical properties, including surface tension and viscosity, which allow the liquid to be transported through the porous interface.

In this invention, the vaporizer at least partially extends inside the internal passageway of the storage portion. By having the vaporizer at least partially inside the internal passageway, a number of advantages can be found. First, manufacture and assembly of the aerosol

NJOY Exhibit 1002.2151

generating device and cartridge is easier and faster because of the simplified design of the parts. Second, because the vaporizer extends at least partially inside the internal passageway of the storage portion rather than downstream of the storage portion, the length of the aerosol generating device and the cartridge can be optionally reduced. Third, because the vaporizer extends at least partially inside the internal passageway of the storage portion, the vaporizer may be protected from damage, bending, or distortion. Fourth, the storage portion may act as an insulator which, if the vaporizer comprises a heater, may prevent the housing of the aerosol generating device from overheating. Fifth, because the porous interface at least partially lines the internal passageway, gravity may assist in conveying liquid from the storage portion and this reduces the chance of the porous interface drying out. Finally, any aerosol which condenses after formation may be used again by the porous interface, thereby reducing wastage and leakage.

The storage portion may protect the aerosol-forming substrate from ambient air (because air cannot generally enter the storage portion). The storage portion may protect the aerosol-forming substrate from light, so that the risk of degradation of the aerosol-forming substrate is significantly reduced. Moreover, a high level of hygiene can be maintained. The storage portion may not be refillable. Thus, when the aerosol-forming substrate in the storage portion has been used up, the aerosol generating device or cartridge is replaced. Alternatively, the storage portion may be refillable. In that case, the aerosol generating device or cartridge may be replaced after a certain number of refills of the storage portion. The storage portion may be arranged to hold aerosol-forming substrate for a pre-determined number of puffs. Therefore, the volume of the storage portion may be expanded or contracted based on the number of desirable puffs.

In one embodiment, the storage portion comprises a container. Preferably, the container has a constant cross sectional shape and size along its length. The storage portion preferably has an outer dimension defining the exterior of the storage portion. The outer dimension may be substantially equal to the dimension of the aerosol generating device, thereby allowing the storage portion to cooperate effectively with the aerosol generating device. Preferably, the internal passageway has a constant cross sectional shape and size along its length. Preferably, the internal passageway is aligned with the longitudinal axis of the storage portion. That is to say, preferably the internal passageway is a central passageway. Alternatively, the internal passageway may not be aligned with the longitudinal axis of the storage portion. That is to say, the internal passageway may be off-centre. The storage portion preferably has an inner dimension defining the dimension of the internal passageway.

In a preferred embodiment, the storage portion comprises a prism-shaped container having an annular cross section, wherein the inner radius of the annulus is the radius of the

internal passageway of the container, and the outer radius of the annulus defines the exterior of the container.

Preferably, in use, liquid is transferred from the storage portion to the vaporizer through the porous interface. The construction of the vaporizer may enable it to be usable with a variety of different shapes and sizes of storage portion. The inner side of the porous interface could be in contact with the liquid in the storage portion. The outer side of the porous interface could be in contact with or adjacent the vaporizer. In one embodiment, liquid in the outer side of the porous interface is vaporized to form the supersaturated vapour. The liquid aerosol-forming substrate has suitable physical properties, including surface tension and viscosity, which allow the liquid to be transported through the porous interface.

The porous interface may comprise any suitable material or combination of materials which is able to convey the aerosol-forming substrate towards the vaporizer. The porous interface may comprise a capillary material, but this need not be the case. The porous interface may have a fibrous or spongy structure. The porous interface may comprise a bundle of capillaries. For example, the porous interface may comprise a plurality of fibres or threads or other fine bore tubes. Alternatively, the porous interface may comprise sponge-like or foam-like material. The structure of the porous interface may form a plurality of small bores or tubes, through which the aerosol-forming substrate can be transported by capillary action from the storage portion towards the vaporizer. The particular preferred porous material or materials will depend on the suitable physical properties of the aerosol-forming substrate. Examples of suitable porous materials include a sponge or foam material, ceramic- or graphite-based materials in the form of fibres or sintered powders, foamed metal or plastics material, a fibrous material, for example made of spun or extruded fibres, such as cellulose acetate, polyester, or bonded polyolefin, polyethylene, terylene or polypropylene fibres, nylon fibres or ceramic. The porous interface may have any suitable porosity so as to be used with different liquids. The liquid has suitable physical properties and certain parameters need to be taken into account, including, but not limited to, viscosity, surface tension, density, thermal conductivity, boiling point and vapour pressure, which allow the liquid to be transported through the porous interface.

The porous interface may have any suitable shape for cooperation with the storage portion. Preferably, the porous interface has the same shape and dimension as the internal passageway, thereby allowing the porous interface to fit snugly in the internal passageway. Preferably, the porous interface fully lines the internal passageway. However, the porous interface may only partially line the internal passageway.

In a preferred embodiment, in which the storage portion comprises a container in the shape of a prism having an annular cross section. Preferably the porous interface comprises a hollow tube of porous material, the outer dimension of the hollow tube being substantially equal

to the diameter of the internal passageway of the storage portion. The tube of porous material may extend along all of or part of the length of the internal passageway in the storage portion.

The vaporiser may be a heater. The heater may heat the aerosol-forming substrate means by one or more of conduction, convection and radiation. The heater may be an electric heater powered by an electric power supply. The heater may alternatively be powered by a non-electric power supply, such as a combustible fuel: for example, the heater may comprise a thermally conductive element that is heated by combustion of a gas fuel. The heater may heat the aerosol-forming substrate by means of conduction and may be at least partially in contact with the substrate, or a carrier on which the substrate is deposited. Alternatively, the heat from the heater may be conducted to the substrate by means of an intermediate heat conductive element. Alternatively, the heater may transfer heat to the incoming ambient air that is drawn through the aerosol-generating system during use, which in turn heats the aerosol-forming substrate by convection.

In a preferred embodiment, the aerosol generating device is electrically operated and the vaporizer of the aerosol generating device comprises an electric heater for heating the aerosol-forming substrate.

The electric heater may comprise a single heating element. Alternatively, the electric heater may comprise more than one heating element for example two, or three, or four, or five, or six or more heating elements. The heating element or heating elements may be arranged appropriately so as to most effectively heat the aerosol-forming substrate.

The at least one electric heating element preferably comprises an electrically resistive material. Suitable electrically resistive materials include but are not limited to: semiconductors such as doped ceramics, electrically "conductive" ceramics (such as, for example, molybdenum disilicide), carbon, graphite, metals, metal alloys and composite materials made of a ceramic material and a metallic material. Such composite materials may comprise doped or undoped ceramics. Examples of suitable doped ceramics include doped silicon carbides. Examples of suitable metals include titanium, zirconium, tantalum and metals from the platinum group. Examples of suitable metal alloys include stainless steel, Constantan, nickel-, cobalt-, chromium-, aluminium- titanium- zirconium-, hafnium-, niobium-, molybdenum-, tantalum-, tungsten-, tin-, gallium-, manganese- and iron-containing alloys, and super-alloys based on nickel, iron, cobalt, stainless steel, Timetal®, iron-aluminium based alloys and iron-manganese-aluminium based alloys. Timetal® is a registered trade mark of Titanium Metals Corporation, 1999 Broadway Suite 4300, Denver Colorado. In composite materials, the electrically resistive material may optionally be embedded in, encapsulated or coated with an insulating material or vice-versa, depending on the kinetics of energy transfer and the external physicochemical properties required. The heating element may comprise a metallic etched foil insulated between

two layers of an inert material. In that case, the inert material may comprise Kapton®, all-polyimide or mica foil. Kapton® is a registered trade mark of E.I. du Pont de Nemours and Company, 1007 Market Street, Wilmington, Delaware 19898, United States of America.

Alternatively, the at least one electric heating element may comprise an infra-red heating element, a photonic source or an inductive heating element.

The at least one electric heating element may take any suitable form. For example, the at least one electric heating element may take the form of a heating blade or heating needles or rods. Alternatively, the at least one electric heating element may take the form of a casing or substrate having different electro-conductive portions, or an electrically resistive metallic tube. The liquid storage portion may incorporate a disposable heating element. The at least one electric heating element may comprise a flexible sheet of material. Other alternatives include a heating wire or filament, for example a Ni-Cr (nickel-chromium), platinum, tungsten or alloy wire, or a heating plate. Optionally, the heating element may be deposited in or on a rigid carrier material.

The at least one electric heating element may comprise a heat sink, or heat reservoir, comprising a material capable of absorbing and storing heat and subsequently releasing the heat over time to heat the aerosol-forming substrate. The heat sink may be formed of any suitable material, such as a suitable metal or ceramic material. Preferably, the material has a high heat capacity (sensible heat storage material), or is a material capable of absorbing and subsequently releasing heat via a reversible process, such as a high temperature phase change. Suitable sensible heat storage materials include silica gel, alumina, carbon, glass mat, glass fibre, minerals, a metal or alloy such as aluminium, silver or lead, and a cellulose material. Other suitable materials which release heat via a reversible phase change include paraffin, sodium acetate, naphthalene, wax, polyethylene oxide, a metal, metal salt, a mixture of eutectic salts or an alloy.

The heat sink may be arranged such that it is directly in contact with the aerosol-forming substrate in the porous interface and can transfer the stored heat directly to the aerosol-forming substrate. Alternatively, the heat stored in the heat sink or heat reservoir may be transferred to the aerosol-forming substrate in the porous interface by means of a heat conductor, such as a metallic tube.

The at least one heating element may heat the aerosol-forming substrate by means of conduction. The heating element may be at least partially in contact with the aerosol-forming substrate. Alternatively, the heat from the heating element may be conducted to the aerosol-forming substrate by means of a heat conductor.

Alternatively or in addition, the at least one heating element may transfer heat to the incoming ambient air that is drawn through the aerosol generating device during use, which in

turn heats the aerosol-forming substrate by convection. The ambient air may be heated before passing through the aerosol-forming substrate. Alternatively, the ambient air may be first drawn through the aerosol-forming substrate and then heated.

In one preferred embodiment in which the vaporizer comprises an electric heater, the electric heater comprises: a first electrical connection portion; a second electrical connection portion; and a heating filament between the first and second electrical connection portions.

In one embodiment, when the device is in use with the cartridge the first electrical connection portion is located at a first end of the internal passageway, the second electrical connection portion is located at a second end of the internal passageway, and the heating filament has a first end joined to the first electrical connection portion and a second end joined to the second electrical connection portion. In this embodiment, the first electrical connection portion, the second connection portion and the heating filament are manufactured separately and are then connected together, for example by welding. The heating filament may comprise a heating coil between the first and second electrical connection portions. Other shapes for the heating filament are also possible.

All portions of the heating filament may have the same cross sectional shape and area. Alternatively, some portions of the heating filament may have a different cross sectional shape or area from other portions of the heating filament.

In an alternative embodiment, the electric heater comprises a sheet of electrically resistive material shaped to form the first electrical connection portion, the second electrical connection portion and the heating filament. In this embodiment, the first electrical connection portion, the second electrical connection portion and the heating filament are integrally formed from the sheet of electrically resistive material. The term "integrally formed" refers to the first electrical connection portion, the second electrical connection portion and the heating filament being manufactured as one single part from a single piece of material. Providing an integrally formed electric heater simplifies manufacture of the heater.

The sheet of electrically resistive material may have any suitable shape. The heating filament, first electrical connection portion and second electrical connection portion may be formed by shaping from the sheet of electrically resistive material. For example, the heating filament may be cut from the sheet of electrically resistive material, for example, by a laser or by a chemical or electrical processor by high pressure water jet. Alternatively, the heating filament may be pre-formed in the desired shape.

The sheet of electrically resistive material may be a flexible sheet of material. Preferably, the flexible sheet of material is folded, rolled, curved or bent so as to form the electric heater, which is correctly shaped to extend through the internal passageway of the liquid storage portion. The sheet of electrically resistive material may have any suitable flexibility.

The heating filament may have the shape of a square wave extending between the electrical connection portions. That is to say, the heating filament may comprise portions extending substantially parallel to the longitudinal axis of the internal passageway and portions extending substantially perpendicular to the longitudinal axis of the internal passageway. The number and size of the portions extending substantially parallel to the longitudinal axis of the internal passageway may be varied. The number and size of the portions extending substantially perpendicular to the longitudinal axis of the internal passageway may be varied. This will affect the ultimate flexibility of the heating element. Alternatively, the heating filament may have any other suitable shape.

All portions of the heating filament may have the same cross sectional shape and area. Alternatively, some portions of the heating filament may have a different cross sectional shape or area from other portions of the heating filament.

In one preferred embodiment, when the device is in use with the cartridge the electric heater at least partially inside the internal passageway is in contact with the porous interface. This improves the heat transfer from the electric heater to the aerosol-forming substrate in the porous interface.

Preferably, the electric heater is elastic. The electric heater may have any suitable elasticity. The elasticity may provide the contact between the electric heater and the porous interface. For example, if the electric heater comprises a sheet of electrically resistive material shaped to form the first and second electrical contact portions and the heating filament, preferably, the folding of the sheet of electrically resistive material results in a spring effect when the electric heater is assembled. This ensures good contact with the porous interface when the electric heater is inside the internal passageway. This ensures a consistent and repeatable smoking experience. In addition, this reduces the likelihood that the electric heater will become dislodged from the internal passageway.

Various shapes for the electric heater have been disclosed, but the skilled person will appreciate that any suitable shape may be used. In addition, the heating filament need not have the same shape extending all the way between the first and second electrical connection portions.

In one preferred embodiment, the aerosol generating device is electrically operated, the vaporizer comprises an electric heater, the liquid storage portion comprises a prism-shaped container, and the porous interface comprises a hollow tube of porous material, having an inner face in contact with liquid in the liquid storage portion and an outer face opposite the inner face, the electric heater being arranged to heat the liquid aerosol-forming substrate near the outer face of the porous interface. Preferably, the electric heater comprises a heating filament in contact with the outer face of the porous interface. In this embodiment, in use, liquid is

NJOY Exhibit 1002.2157

transferred from the liquid storage portion through the porous interface lining the internal passageway. When the heater is activated, the liquid near the outer face of the porous interface is vaporized by the heater to form the supersaturated vapour. The supersaturated vapour is mixed with and carried in the air flow through the internal passageway in the liquid storage portion. During the flow, the vapour condenses to form the aerosol and the aerosol is carried towards the mouth of a user.

However, the invention is not limited to electric heater vaporizers but may be used in aerosol generating devices and systems in which the vapour and resulting aerosol is generated by a mechanical vaporizer, for example but not limited to a piezo vaporizer or an atomizer using pressurized liquid.

The storage portion and the porous interface, and optionally the vaporizer, may be removable from the aerosol generating device as a single component.

The aerosol generating device or cartridge may comprise at least one air inlet. The aerosol generating device or cartridge may comprise at least one air outlet. In a preferred embodiment, the aerosol generating device or cartridge further comprises at least one air inlet and at least one air outlet, the air inlet and air outlet being arranged so as to define an air flow route from the air inlet to the air outlet via the internal passageway of the storage portion.

Thus, the internal passageway may additionally act as an aerosol-forming chamber for assisting or facilitating generation of the aerosol. One or more additional aerosol-forming chambers may be provided. The aerosol is carried in the air flow route through the internal passageway so as to convey the aerosol to the air outlet and into the mouth of a user. In addition, the size of the internal passageway may be used to assist with control of the aerosol. In particular, a small internal passageway may result in a high air flow rate through the aerosol generating device or cartridge which may result in smaller droplets in the aerosol. A large internal passageway, on the other hand, may result in a low air flow rate through the aerosol generating device or cartridge which may result in larger droplets. The droplet size in the aerosol may affect the user experience. Preferably, the air flows through the vaporizer which has the same diameter as that of the internal passageway. Preferably the size of the internal passageway, and vaporizer, is pre-set according to the aerosol-forming substrate and the desired aerosol properties. Alternatively, however, the size of the internal passageway, and vaporizer, may be variable by a user.

In one embodiment, there is provided a nozzle arranged to extend into the internal passageway. The nozzle allows the incoming air flow to be directed. For example, the nozzle may allow the incoming air flow to be directed directly onto the vaporizer, directly onto the porous interface, across the surface of the vaporizer, across the surface of the porous interface, or in any other desired direction. This may affect the aerosol formation which may, in turn affect

NJOY Exhibit 1002.2158

the user experience. In addition, the nozzle may provide an air inlet or inlets having a small cross section, which will increase the air flow speed. This may also affect the aerosol formation by reducing the droplet size in the aerosol.

The aerosol generating device may be electrically operated and may further comprise an electric power supply. The electric power supply may be an AC power source or a DC power source. Preferably, the electric power supply is a battery. The aerosol generating device may further comprise electric circuitry. In one embodiment, the electric circuitry comprises a sensor to detect air flow indicative of a user taking a puff. In that case, preferably, the electric circuitry is arranged to provide an electric current pulse to the vaporizer when the sensor senses a user taking a puff. Preferably, the time-period of the electric current pulse is pre-set, depending on the amount of liquid desired to be vaporized. The electric circuitry is preferably programmable for this purpose. Alternatively, the electric circuitry may comprise a manually operable switch for a user to initiate a puff. The time-period of the electric current pulse is preferably pre-set depending on the amount of liquid desired to be vaporized. The electric circuitry is preferably programmable for this purpose.

The liquid aerosol-forming substrate preferably has suitable physical properties, for example boiling point and vapour pressure, suitable for use in the aerosol generating device or cartridge or system. If the boiling point is too high, it may not be possible to vaporize the liquid but, if the boiling point is too low, the liquid may vaporize too readily. The liquid preferably comprises a tobacco-containing material comprising volatile tobacco flavour compounds which are released from the liquid upon heating. Alternatively, or in addition, the liquid may comprise a non-tobacco material. The liquid may include aqueous solutions, non-aqueous solvents such as ethanol, plant extracts, nicotine, natural or artificial flavours or any combination of these. Preferably, the liquid further comprises an aerosol former that facilitates the formation of a dense and stable aerosol. Examples of suitable aerosol formers are glycerine and propylene glycol.

Preferably, the aerosol generating device or cartridge comprises a housing. Preferably, the housing is elongate. Preferably, the longitudinal axis of the housing is substantially aligned with the longitudinal axis of the internal passageway in the storage portion. The housing may comprise a shell and a mouthpiece. In that case, all the components may be contained in either the shell or the mouthpiece. In one embodiment, the housing includes a removable insert comprising the storage portion, the vaporizer and the porous interface. In that embodiment, those parts of the aerosol generating device may be removable from the housing as a single component. This may be useful for refilling or replacing the storage portion, for example.

The housing may comprise any suitable material or combination of materials. Examples of suitable materials include metals, alloys, plastics or composite materials containing one or

more of those materials, or thermoplastics that are suitable for food or pharmaceutical applications, for example polypropylene, polyetheretherketone (PEEK) and polyethylene. Preferably, the material is light and non-brittle. The storage portion may also comprise any suitable material or combination of materials, and may comprise the same or different materials as the housing.

In one particularly preferred embodiment, the cartridge comprises: a mouthpiece; a vaporizer comprising an electric heater for heating the aerosol-forming substrate, the heater being connectable to an electric power supply and electric circuitry in a device; and a storage portion for storing the aerosol forming substrate, wherein the electric heater and a porous interface are arranged in the cartridge.

The storage portion, and optionally the porous interface and the heater, may be removable from the aerosol generating system as a single component. The storage portion, and optionally the porous interface and the heater, may be removable from the aerosol generating system as a cartridge.

Preferably, the aerosol generating device and cartridge are portable, both individually and in cooperation. Preferably, the device is reusable by a user. Preferably, the cartridge is disposable by a user, for example when there is no more liquid contained in the liquid storage portion. The device and cartridge may cooperate to form an aerosol generating system which is a smoking system. The device may have a size comparable to a conventional cigar or cigarette. The cartridge may have a size comparable to a conventional cigar or cigarette. The smoking system may have a total length between approximately 30 mm and approximately 150 mm. The smoking system may have an external diameter between approximately 5 mm and approximately 30 mm.

Preferably, the aerosol generating system is an electrically operated smoking system.

According to the invention, there is also provided an aerosol generating system comprising a storage portion for storing liquid aerosol-forming substrate, the liquid storage portion having an internal passageway; a vaporizer for heating the liquid aerosol-forming substrate to form an aerosol, the vaporizer at least partially inside the internal passageway in the liquid storage portion; and a porous interface at least partially lining the internal passageway for conveying the liquid aerosol-forming substrate from the liquid storage portion towards the vaporizer.

In one embodiment, the container is prism-shaped having an annular cross section, the inner radius of the annulus is the radius of the internal passageway of the container, and the outer radius of the annulus defines the exterior of the container.

NJOY Exhibit 1002.2160

In that embodiment, the porous interface may comprise a hollow tube of porous material, the outer dimension of the hollow tube being substantially equal to the diameter of the internal passageway of the container.

Preferably, the aerosol generating device is electrically operated and the vaporizer comprises an electric heater for heating the liquid aerosol-forming substrate, the electric heater being connectable to an electric power supply in the aerosol generating device.

In that embodiment, the electric heater is preferably in contact with the porous interface.

In a preferred embodiment, the cartridge or the aerosol generating device or both the cartridge and the aerosol generating device comprise at least one air inlet; the cartridge or the aerosol generating device or both the cartridge and the aerosol generating device comprise at least one air outlet, and the air inlet and the air outlet are arranged, when the cartridge is in use with the aerosol generating device, to define an air flow route from the air inlet to the air outlet via the internal passageway of the container.

Features described in relation to one aspect of the invention may be applicable to another aspect of the invention.

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

Figure 1 shows a perspective view of an embodiment of a cartridge for use with an aerosol generating device according to the invention;

Figure 2 shows a perspective exploded view of the cartridge of Figure 1;

Figure 3 shows a perspective view of a first embodiment of an internal heater for use with a cartridge according to the invention; and

Figure 4 shows a perspective view of a second embodiment of an internal heater for use with a cartridge according to the invention.

Figure 1 is a perspective view of an embodiment of a cartridge for use with an aerosol generating device according to the invention. Figure 2 is a perspective exploded view of the cartridge of Figure 1. In Figures 1 and 2, the cartridge is for use with an electrically operated aerosol generating device having an electric power supply and electric circuitry.

Referring to Figures 1 and 2, the cartridge 100 comprises a storage portion in the form of a cylindrical container 101. Container 101 has a first end 101a, a second end 101b, and an outer housing 101c. Container 101 defines an internal passageway 103. Container 101 forms a reservoir for liquid aerosol-forming substrate between the outer housing 101c of the container and the internal passageway 103. Inside the internal passageway 103, there is provided a vaporizer (not visible in Figure 1) in the form of internal heater 105 surrounded by a porous interface in the form of porous tube 107. The structure of the internal heater 105 will be described further with reference to Figures 3 and 4. In this embodiment, there is further

NJOY Exhibit 1002.2161

provided a separation wall 109 between the porous tube 107 and container 101, closing part 111, and mouthpiece parts 113 and 115.

The cartridge 101 is arranged to be received in an aerosol generating device (not shown) including an electric power supply and electric circuitry. The aerosol generating device may further, although not necessarily, include a puff detection device. The electric circuitry and puff detection device may be programmable and may be used to manage the aerosol generating device operation. In this embodiment, the first end 101a of the container 101 is received closest to the electric power supply and electric circuitry in the aerosol generating device. The internal heater 105 is connected to the electric power supply and electric circuitry in the aerosol generating device. The second end 101b of the container 101 is received at the mouthpiece end of the aerosol generating device. The cartridge 100 or the aerosol generating device (not shown) or both the cartridge and the aerosol generating device may include an air inlet, an air outlet at the mouthpiece end, and an aerosol-forming chamber.

In use, operation is as follows. Liquid aerosol-forming substrate in the reservoir formed by container 101 is conveyed through the porous tube 107 towards the internal heater 105. When a user draws on the aerosol generating device at the mouthpiece end, ambient air is drawn through an air inlet in either the cartridge or the aerosol generating device and through the internal passageway 103 in the container 101. If the aerosol generating device includes a puff detection device, the puff detection device senses the puff and activates the internal heater 105. Otherwise, the internal heater 105 may be activated manually. The electric power supply in the aerosol generating device supplies electrical energy to the internal heater 105 to heat the liquid in the porous tube 107 adjacent the internal heater 105. The liquid in the porous tube 107 is vaporized by the internal heater 105 to create a supersaturated vapour in the internal passageway 103. At the same time, the liquid being vaporized is replaced by further liquid moving through the porous tube 107 from the reservoir. The supersaturated vapour created is mixed with and carried in the air flow from the air inlet through the internal passageway 103. The vapour condenses to form an inhalable aerosol, which is carried towards the air outlet and into the mouth of a user.

Figures 1 and 2 show one example of a cartridge for use with an aerosol generating device according to the present invention. Other examples are possible, however. The cartridge simply needs to include or receive a liquid aerosol-forming substrate and comprise a vaporizer located at least partially in the internal passageway of the container and separated from the liquid by a porous interface at least partially lining the internal passageway. For example, the vaporizer may not comprise a heater, in which case another device may be included to vaporize the liquid aerosol-forming substrate. For example, a puff detection device need not be provided. Instead, the device could operate by manual activation, for example the user operating a switch

when a puff is taken. For example, the overall shape and size of the housing could be altered.

Preferably, the cartridge is disposable and is arranged to cooperate with an aerosol generating device which is reusable. The cartridge may be refilled or replaced when the liquid is used. Thus, when the liquid aerosol-forming substrate in the cartridge has been used up, the cartridge may be disposed of and replaced with a new cartridge, or the empty cartridge may be refilled. However, the aerosol generating device may not be designed to operate in conjunction with a separate cartridge. Instead, the aerosol generating device may include or receive a liquid aerosol-forming substrate in a storage portion and comprise a vaporizer located at least partially in the internal passageway of the liquid storage portion and separated from the liquid by a porous interface at least partially lining the internal passageway. That is to say, the aerosol generating device may comprise all the components described in relation to the cartridge. Additionally, the aerosol generating device may comprise an electric power supply and electric circuitry. Preferably, however, there is provided an aerosol generating device arranged to operate in conjunction with a cartridge. Preferably, the aerosol generating device is reusable and the cartridge is replaceable or refillable. Thus, when the liquid aerosol-forming substrate in the cartridge has been used up, the cartridge may be disposed of and replaced with a new cartridge, or the empty cartridge may be refilled.

The cartridge shown in Figures 1 and 2 has a relatively straightforward construction, which simplifies manufacture. The internal heater 105 is protected from damage by the container 101 and, because the internal heater 105 is contained within the internal passageway 103 of the container 101 (rather than downstream of the container as in prior art arrangements), the overall length of the cartridge, and hence the aerosol generating device, can be reduced. Moreover, the container 101 acts as an insulator thereby preventing the outside of the cartridge, and aerosol generating device, from overheating. Gravity may assist in conveying the liquid in the top part of the container 101 through the porous interface, and the chance of the porous interface drying out is reduced. As the supersatured vapour condenses in the internal passageway 103 to form the aerosol, any aerosol droplets which accumulate in the internal passageway, may be absorbed by the porous interface. This enables the accumulating droplets to be reused, which reduced wastage.

The porous tube 107 can be made from a variety of porous materials and preferably has a known, pre-defined porosity. Examples include a sponge or foam material, ceramic- or graphite-based materials in the form of fibres or sintered powders, foamed metal or plastics material, a fibrous material, for example made of spun or extruded fibres, such as cellulose acetate, polyester, or bonded polyolefin, polyethylene, terylene or polypropylene fibres, nylon fibres or ceramic. Porous tubes of different porosities can be used to accommodate different liquid suitable physical properties such as density, viscosity, surface tension and vapour

pressure. The porous tube must be suitable so that the required amount of liquid can be delivered to the heater. In the embodiment shown in Figures 1 and 2, the porous tube extends along the length of the internal passageway. However, this need not be the case and the porous tube may extend only along part of the internal passageway. The dimensions of the porous tube can be chosen according to the desired operating characteristics of the aerosol generating device, for example, the amount of liquid aerosol-forming substrate desired to be vaporized.

Figure 3 is a perspective view of a first embodiment of an internal heater 105 for use with a cartridge like that shown in Figures 1 and 2. Internal heater 105 comprises a first electrical connection portion 301 at a first end of the internal heater and a second electrical connection portion 305 at a second end of the internal heater. There is provided a first electrical connection blade 303 for electrically connecting the first electrical connection portion 301 to an electrical power supply and a second electrical connection blade 307 for electrically connecting the second electrical connection portion 305 to an electrical power supply. A heating filament in the form of heating coil 309 extends between the first electrical connection portion 301 and the second electrical connection portion 305.

In the embodiment of Figure 3, the first 301 and second 305 electrical connection portions and the heating coil 309 are manufactured separately and are subsequently joined together, for example by welding. The first and second electrical connection portions are in the form of hollow tubes of electrically conducting material, although alternative shapes are possible. The heating coil 309 is in the form of a spiral of electrically resistive material, although alternative shapes are possible.

The cylindrical shape of the first 301 and second 305 electrical connection portions and the heating coil 309 define a cylindrical bore. When the heater is assembled, together with the porous tube, in the internal passageway of the container, an air flow route is defined through the cylindrical bore defined by the internal heater. The rigidity of the first 301 and second 305 electrical connection portions, in particular, assist in maintaining the shape of the internal passageway 103 and hence the air flow route through the aerosol generating device.

Preferably, the internal heater forms a snug fit inside the internal passageway 103 and porous tube 107. This prevents the internal heater and porous tube from falling out of the internal passageway, for example, when the aerosol generating device is shaken or inverted. In addition, preferably, the heating coil 309 is in contact with the porous tube when the heater and porous tube are assembled in the internal passageway of the container. This ensures a good transfer of heat to the liquid aerosol-forming substrate, which allows consistent formation of the aerosol. The length of the heating coil 309, and other dimensions of the internal heater 105, can be chosen as desired according to the required amount of heating.

NJOY Exhibit 1002.2164

Figure 4 is a perspective view of a second embodiment of an internal heater 105' for use with a cartridge like that shown in Figures 1 and 2. Internal heater 105' comprises a first electrical connection portion 401, a second electrical connection portion 405 and an electrical joining portion 409. The electrical joining portion 409 is at a first end of the internal heater and the first electrical connection portion 401 is at a second end of the internal heater. The first electrical connection portion 401 is joined to the electrical joining portion 409 via an elongate portion 411. The second electrical connection portion 405 is at the second end of the internal heater adjacent the first electrical connection portion 401 and is connected to the electrical joining portion 409 via a heating filament 413. Heating filament 413 extends between the electrical joining portion 409 and the second electrical connection portion 405. There is also provided a first electrical connection blade 403 for electrically connecting the first electrical connection portion 401 to an electrical power supply and a second electrical connection blade 407 for electrically connecting the second electrical connection portion 405 to an electrical power supply.

In the embodiment of Figure 4, the first 401 and second 405 electrical connection portions, the electrical joining portion 409 and the heating filament 413 are manufactured together from a single sheet of electrically resistive material. The sheet of electrically resistive material may have any suitable shape. The first 401 and second 405 electrical connection portions, the electrical joining portion 409 and the heating filament 413 may be cut from the sheet of electrically resistive material, for example, by a laser or by a chemical or electrical processor by high pressure water jet. Alternatively, the sheet of electrically resistive material may be pre-formed in the desired shape. Once the sheet has the appropriate shape, the sheet may be folded, rolled, curved or bent so as to form a cylindrical tube, as shown in Figure 4.

When the cut sheet of electrically resistive material is rolled to form the heater, the cylindrical shape of the first 401 and second 405 electrical connection portions, the electrical joining portion 409 and the heating filament 413 define a cylindrical bore. When the heater is assembled, together with the porous tube, in the internal passageway of the container, an air flow route is defined through the cylindrical bore defined by the internal heater. The shape of the internal heater assists in maintaining the shape of the internal passageway 103 and hence the air flow route through the aerosol generating device.

Preferably, the internal heater forms a snug fit inside the internal passageway 103 and porous tube 107. This prevents the internal heater and porous tube from falling out of the internal passageway, for example, when the aerosol generating device is shaken or inverted. In addition, preferably, the heating filament 413 is in contact with the porous tube when the heater and porous tube are assembled in the internal passageway of the container. This ensures a good transfer of heat to the liquid aerosol-forming substrate, which allows consistent formation

NJOY Exhibit 1002.2165

of the aerosol. In particular, the construction by rolling of the internal heater 105' may provide a spring or elastic effect, ensuring good contact between the heating filament 413 and the porous tube, when the heater and porous tube are assembled in the internal passageway. The length of the heating filament 413, and other dimensions of the internal heater 105, can be chosen as desired according to the required amount of heating.

In the embodiments of Figures 3 and 4, the air flow route is through the cylindrical bore defined by the internal heater. The air flows through the centre of the internal heater. That is to say, the size of the internal passageway and the internal heater defines the size of the air flow route. Thus, the internal passageway and cylindrical bore formed by the internal heater may act as an aerosol-forming chamber for assisting or facilitating generation of the aerosol. In addition, the size of the internal passageway and the internal heater may be used to assist with control of the aerosol. A small internal passageway and internal heater diameter may result in a high air flow rate through the aerosol generating device which may result in smaller droplets in the aerosol. A large internal passageway and internal heater diameter, on the other hand, may result in a low air flow rate through the aerosol generating device which may result in larger droplets. The droplet size in the aerosol may affect the user experience. The size of the internal passageway and internal heater is preferably pre-set according to the aerosol-forming substrate and the desired aerosol properties. Alternatively, however, the size of the internal passageway and internal heater may be variable by a user.

In one embodiment (not shown), there is provided a nozzle arranged to extend into the internal passageway of the container 101 when the cartridge is received in the aerosol generating device. The nozzle may form part of the aerosol generating device or part of the cartridge. The nozzle provides an air inlet into the internal passageway. If the internal heater defines a cylindrical bore which surrounds the air flow route, the nozzle may be arranged to extend into the cylindrical bore defined by the internal heater. The nozzle may allow the incoming air flow to be directed. For example, the nozzle may allow the incoming air flow to be directed directly onto the internal heater, directly onto the porous interface, across the surface of the internal heater, across the surface of the porous interface, or in any other desired direction. This may affect the aerosol formation which may, in turn affect the user experience. In addition, the nozzle may provide an air inlet or inlets having a small cross section, which will increase the air flow speed. This may also affect the aerosol formation by reducing the droplet size in the aerosol.

Thus, according to the invention, the aerosol generating device includes a storage portion having an internal passageway, a vaporizer at least partially contained in the internal passageway and a porous interface at least partially lining the internal passageway. This provides a number of advantages. Embodiments of the aerosol generating device have been

described with reference to Figures 1 and 2, and embodiments of the vaporizer have been described with reference to Figures 3 and 4. Features described in relation to one embodiment may also be applicable to another embodiment.

NJOY Exhibit 1002.2167

CLAIMS

1. An aerosol generating device comprising:

a storage portion for storing an aerosol-forming substrate, the storage portion having an outer housing and an internal passageway, the storage portion forming a reservoir for the aerosol-forming substrate between the outer housing and the internal passageway;

a vaporizer for heating the aerosol-forming substrate to form an aerosol, the vaporizer at least partially inside the internal passageway in the storage portion; and

a porous interface at least partially lining the internal passageway for conveying the aerosol-forming substrate from the storage portion towards the vaporizer.

2. An aerosol generating device according to claim 1, wherein the porous interface comprises a hollow tube of porous material, the outer dimension of the hollow tube being substantially equal to a diameter of the internal passageway of the storage portion.

3. An aerosol generating device according to any preceding claim, wherein the aerosol generating device is electrically operated and the vaporizer of the aerosol generating device comprises an electric heater for heating the aerosol-forming substrate.

4. An aerosol generating device according to claim 3, wherein the electric heater comprises:

a first electrical connection portion;

a second electrical connection portion; and

a heating filament between the first and second electrical connection portions.

5. An aerosol generating device according to claim 4, wherein the heating filament is in contact with the porous interface.

6. An aerosol generating device according to claim 4 or 5, wherein the first electrical connection portion is located at a first end of the internal passageway, the second electrical connection portion is located at a second end of the internal passageway, and the heating filament has a first end joined to the first electrical connection portion and a second end joined to the second electrical connection portion.

7. An aerosol generating device according to claim 4 or 5, wherein the electric heater comprises a sheet of electrically resistive material shaped to form the first electrical connection

portion, the second electrical connection portion and the heating filament.

8. An aerosol generating device according to any preceding claim, further comprising at least one air inlet and at least one air outlet, the air inlet and air outlet being arranged so as to define an air flow route from the air inlet to the air outlet via the internal passageway of the storage portion.

9. A cartridge comprising:

a storage portion for storing an aerosol-forming substrate, the storage portion having an outer housing and an internal passageway, the storage portion forming a reservoir for the aerosol-forming substrate between the outer housing and the internal passageway;

a vaporizer for heating the aerosol-forming substrate to form an aerosol, the vaporizer at least partially inside the internal passageway in the storage portion; and

a porous interface at least partially lining the internal passageway for conveying the aerosol-forming substrate from the storage portion towards the vaporizer.

10. A cartridge according to claim 9, wherein the porous interface comprises a hollow tube of porous material, the outer dimension of the hollow tube being substantially equal to the diameter of the internal passageway of the storage portion.

11. A cartridge according to claims 9 or 10, wherein the vaporizer comprises an electric heater for heating the aerosol-forming substrate, the electric heater being connectable to an electric power supply in an aerosol generating device.

12. A cartridge according to claim 11, wherein the electric heater comprises:

a first electrical connection portion;

a second electrical connection portion; and

a heating filament between the first and second electrical connection portions.

13. A cartridge according to claim 12, wherein the heating filament is in contact with the porous interface.

14. A cartridge according to claim 12 or 13, wherein the first electrical connection portion is located at a first end of the internal passageway, the second electrical connection portion is located at a second end of the internal passageway, and the heating filament has a first end joined to the first electrical connection portion and a second end joined to the second electrical

connection portion.

15. A cartridge according to claim 12 or 13, wherein the electric heater comprises a sheet of electrically resistive material shaped to form the first electrical connection portion, the second electrical connection portion and the heating filament.

16. A cartridge according to any of claims 9 to 15, wherein the cartridge comprises at least one air inlet and at least one air outlet, the air inlet and the air outlet being arranged to define an air flow route from the air inlet to the air outlet via the internal passageway of the storage portion.

17. An aerosol generating system comprising:

a cartridge and an aerosol generating device, the cartridge or the aerosol generating device comprising

a storage portion for storing an aerosol-forming substrate, the storage portion having an outer housing and an internal passageway, the storage portion forming a reservoir for the aerosol-forming substrate between the outer housing and the internal passageway;

a vaporizer for heating the aerosol-forming substrate to form an aerosol, the vaporizer at least partially inside the internal passageway in the storage portion; and

a porous interface at least partially lining the internal passageway for conveying the aerosol-forming substrate from the storage portion towards the vaporizer.

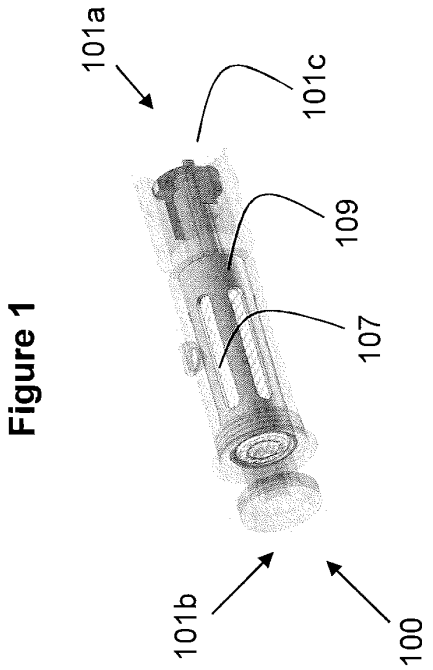


Figure 1

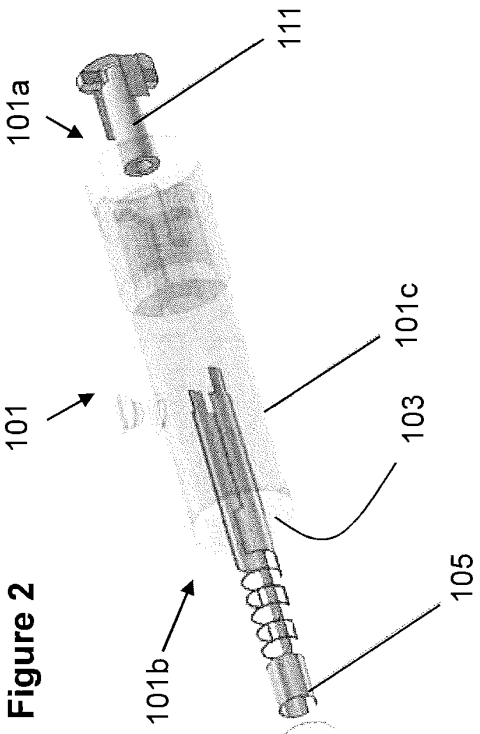
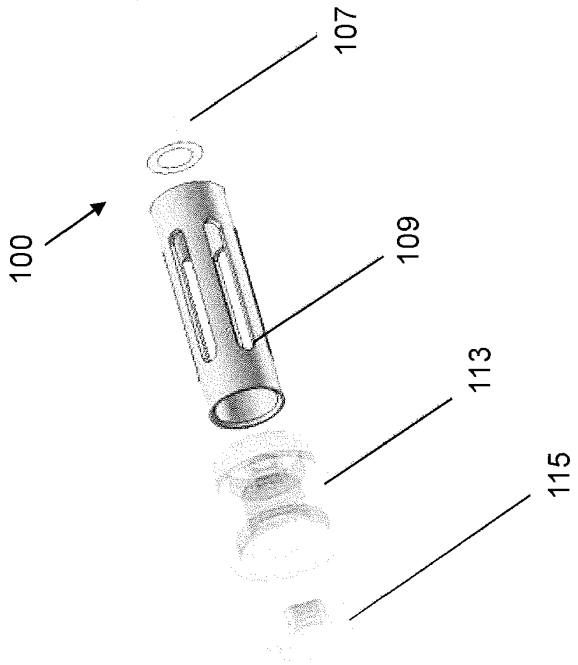


Figure 2



NJOY Exhibit 1002.2171

Figure 4

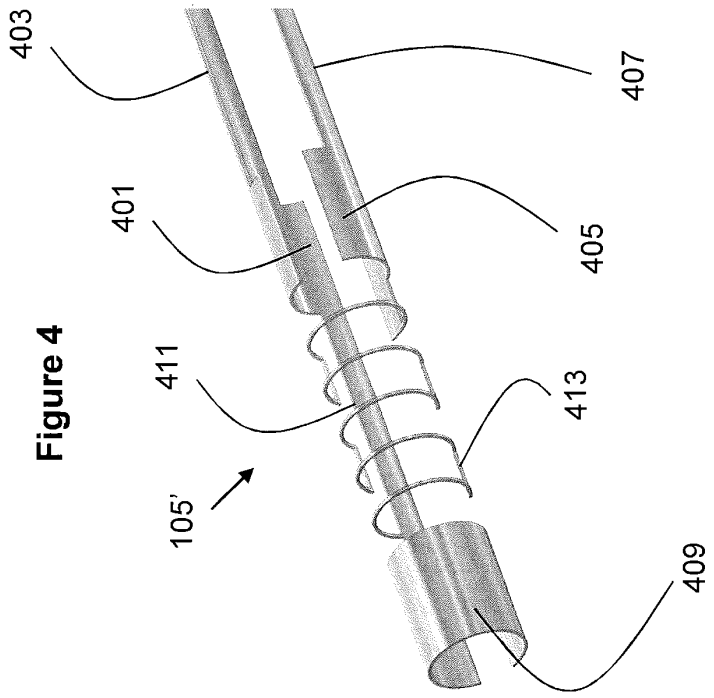
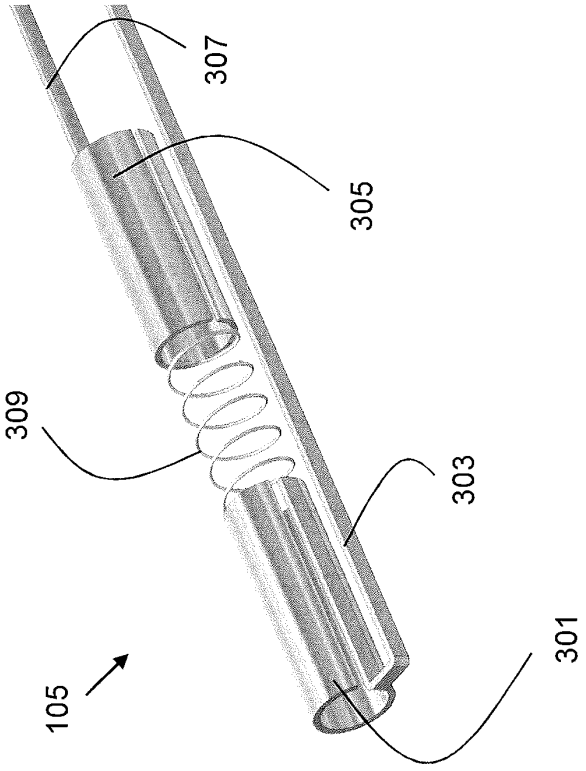


Figure 3



NJOY Exhibit 1002.2172

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/074510

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24F47/00 A61M15/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A24F A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 022 349 A1 (HAN LI [CN]) 11 February 2009 (2009-02-11) paragraph [0047] - paragraph [0048]; claims; figures	1-17
A	WO 2011/146174 A2 (TERRY NATHAN ANDREW [US]; MINSKOFF NOAH MARK [US]) 24 November 2011 (2011-11-24) paragraph [0131]; claims; figures	1-17
A	EP 2 316 286 A1 (PHILIP MORRIS PROD [CH]) 4 May 2011 (2011-05-04) paragraph [0056]; claims; figures	1-17
A	GB 2 469 850 A (BRITISH AMERICAN TOBACCO CO [GB]) 3 November 2010 (2010-11-03) figure 4	1-17

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 March 2013	22/03/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Marzano Monterosso

NJOY Exhibit 1002.2173

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/074510

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 340 730 A1 (PHILIP MORRIS PROD [CH]) 6 July 2011 (2011-07-06) paragraph [0006]; figures -----	1-17
A	EP 0 430 559 A2 (PHILIP MORRIS [US] PHILIP MORRIS PROD [US]) 5 June 1991 (1991-06-05) the whole document -----	1-17

NJOY Exhibit 1002.2174

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2012/074510

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2022349 A1	11-02-2009	AU 2007250367 A1	22-11-2007
		AU 2007250368 A1	22-11-2007
		BR PI0711395 A2	01-11-2011
		BR PI0711401 A2	01-11-2011
		CA 2647212 A1	22-11-2007
		CA 2647234 A1	22-11-2007
		CA 2768122 A1	22-11-2007
		CN 201067079 Y	04-06-2008
		CN 201079011 Y	02-07-2008
		EA 200802045 A1	27-02-2009
		EA 200802046 A1	27-02-2009
		EP 2022349 A1	11-02-2009
		EP 2022350 A1	11-02-2009
		EP 2359705 A1	24-08-2011
		JP 5103561 B2	19-12-2012
		JP 2009537119 A	29-10-2009
		JP 2009537120 A	29-10-2009
		JP 2012223190 A	15-11-2012
		KR 20090005139 A	12-01-2009
		KR 20090018039 A	19-02-2009
		KR 20110131320 A	06-12-2011
		KR 20120002555 A	05-01-2012
		NZ 572309 A	29-04-2011
		NZ 572310 A	29-10-2010
		US 2009095311 A1	16-04-2009
		US 2009126745 A1	21-05-2009
		US 2011209717 A1	01-09-2011
		WO 2007131449 A1	22-11-2007
		WO 2007131450 A1	22-11-2007
		ZA 200809062 A	25-11-2009
		ZA 200809063 A	25-11-2009
WO 2011146174 A2	24-11-2011	TW 201208722 A	01-03-2012
		TW 201208723 A	01-03-2012
		WO 2011146174 A2	24-11-2011
		WO 2011146175 A2	24-11-2011
		WO 2011146365 A2	24-11-2011
		WO 2011146369 A2	24-11-2011
		WO 2011146372 A2	24-11-2011
		WO 2011146375 A2	24-11-2011
EP 2316286 A1	04-05-2011	AU 2010311913 A1	07-06-2012
		CA 2778903 A1	05-05-2011
		CN 102595943 A	18-07-2012
		CO 6541612 A2	16-10-2012
		EA 201290240 A1	28-12-2012
		EP 2316286 A1	04-05-2011
		EP 2493342 A1	05-09-2012
		KR 20120101637 A	14-09-2012
		WO 2011050964 A1	05-05-2011
GB 2469850 A	03-11-2010	NONE	
EP 2340730 A1	06-07-2011	AU 2010338615 A1	26-07-2012
		CA 2785890 A1	07-07-2011
		CN 102781266 A	14-11-2012
		EA 201290581 A1	30-01-2013
		EP 2340730 A1	06-07-2011

NJOY Exhibit 1002.2175

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2012/074510

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EP 2519122 A1	07-11-2012
		KR 20120102131 A	17-09-2012
		SG 182312 A1	30-08-2012
		US 2011155718 A1	30-06-2011
		WO 2011079933 A1	07-07-2011
EP 0430559 A2	05-06-1991	AT 118992 T	15-03-1995
		AU 646415 B2	24-02-1994
		AU 6762090 A	06-06-1991
		CA 2031225 A1	02-06-1991
		DE 69017371 D1	06-04-1995
		DE 69017371 T2	12-10-1995
		DK 0430559 T3	01-05-1995
		EP 0430559 A2	05-06-1991
		ES 2069027 T3	01-05-1995
		JP 3232481 A	16-10-1991
		JP 3392138 B2	31-03-2003
		NO 905150 A	03-06-1991
		TR 25316 A	01-01-1993
		US 5144962 A	08-09-1992

NJOY Exhibit 1002.2176

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 June 2013 (13.06.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/083634 A1

(51) International Patent Classification:
A24F 47/00 (2006.01) *A61M 15/06* (2006.01)

(21) International Application Number:
PCT/EP2012/074513

(22) International Filing Date:
5 December 2012 (05.12.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11192697.8 8 December 2011 (08.12.2011) EP

(71) Applicant: **PHILIP MORRIS PRODUCTS S.A.** [CH/CH]; Quai Jeanrenaud 3, CH-2000 Neuchatel (CH).

(72) Inventor: **DUBIEF, Falvien**; Rue du Rocher 52, CH-2000 Neuchatel (CH).

(74) Agent: **PONDER, William**; Reddie & Grose LLP, 16 Theobalds Road, London Greater London WX1C 8PL (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(54) Title: AN AEROSOL GENERATING DEVICE WITH A CAPILLARY INTERFACE

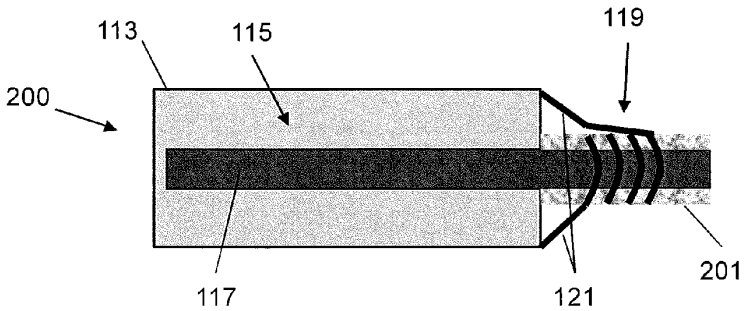


Figure 2

(57) Abstract: There is provided an aerosol generating device comprising a storage portion (113, 501) for storing aerosol-forming substrate (115, 505). The device comprises: a vaporizer (119, 509) for heating the aerosol-forming substrate (115, 505), a capillary material (117, 507) for conveying the liquid aerosol-forming substrate (115, 505) from the storage portion (113, 501) towards the vaporizer (119, 509) by capillary action, and a porous material (201, 301, 405, 511) between the capillary material (117, 507) and the vaporizer (119, 509).

WO 2013/083634 A1

NJOY Exhibit 1002.2177

AN AEROSOL GENERATING DEVICE WITH A CAPILLARY INTERFACE

The present invention relates to an aerosol generating device for heating an aerosol-forming substrate. Particularly, but not exclusively, the present invention relates to an electrically operated aerosol generating device for heating a liquid aerosol-forming substrate.

WO-A-2009/132793 discloses an electrically heated smoking system. A liquid is stored in a liquid storage portion, and a capillary wick has a first end which extends into the liquid storage portion for contact with the liquid therein, and a second end which extends out of the liquid storage portion. A heating element heats the second end of the capillary wick. The heating element is in the form of a spirally wound electric heating element in electrical connection with a power supply, and surrounding the second end of the capillary wick. In use, the heating element may be activated by the user to switch on the power supply. Suction on a mouthpiece by the user causes air to be drawn into the electrically heated smoking system over the capillary wick and heating element and subsequently into the mouth of the user.

It is an object of the present invention to improve the generation of aerosol in an aerosol generation device or system.

According to one aspect of the invention, there is provided an aerosol generating device comprising a storage portion for storing an aerosol-forming substrate; a vaporizer for heating the aerosol-forming substrate; a capillary material for conveying the aerosol-forming substrate from the storage portion towards the vaporizer by capillary action; and a porous material between the capillary material and the vaporizer.

According to another aspect of the invention, there is provided a cartridge comprising a storage portion for storing an aerosol-forming substrate; a vaporizer for heating the aerosol-forming substrate; a capillary material for conveying the aerosol-forming substrate from the storage portion towards the vaporizer by capillary action; and a porous material between the capillary material and the vaporizer.

The aerosol generating device and cartridge cooperate to provide an aerosol generating system for vaporizing the aerosol-forming substrate. The cartridge or device may comprise the storage portion for storing the aerosol-forming substrate. The vaporizer, the capillary material and the porous material may be contained in the aerosol generating device. The vaporizer, the capillary material and the porous material may also be contained in the cartridge.

According to another aspect of the invention, there is provided an aerosol generating system comprising: an aerosol generating device in cooperation with a cartridge, the cartridge or aerosol generating device comprising a storage portion for storing an aerosol-forming substrate; wherein the cartridge or aerosol generating device comprises a vaporizer for heating the aerosol-forming substrate to form an aerosol; wherein the cartridge or aerosol generating device comprises a capillary material for conveying the aerosol-forming substrate from the

NJOY Exhibit 1002.2178

storage portion towards the vaporizer by capillary action; and wherein the cartridge or aerosol generating device comprises a porous material between the capillary material and the vaporizer.

For all aspects of the invention, the storage portion may be a liquid storage portion. For all aspects of the invention, the aerosol forming substrate may be a liquid aerosol forming substrate.

The aerosol-forming substrate may alternatively be any other sort of substrate, for example, a gas substrate or a gel substrate, or any combination of the various types of substrate.

The aerosol generating device or system is arranged to vaporize an aerosol-forming substrate to form the aerosol. The cartridge or aerosol generating device may include the aerosol-forming substrate or may be adapted to receive the aerosol-forming substrate. As known to those skilled in the art, an aerosol is a suspension of solid particles or liquid droplets in a gas, such as air.

Preferably, the capillary material is arranged to be in contact with aerosol-forming substrate in the storage portion. In one embodiment, liquid in the capillary material is vaporized by the heater to form a supersaturated vapour. The supersaturated vapour is mixed with and carried in the air flow. During the flow, the vapour condenses to form the aerosol and the aerosol is carried towards the mouth of a user. The liquid aerosol-forming substrate has suitable physical properties, including surface tension and viscosity, which allow the liquid to be transported through the capillary material by capillary action.

The invention provides a number of advantages. First, the porous material may provide structural support for the capillary material, to prevent the capillary material from being damaged, for example, split, bent or flattened. This is particularly true if the capillary material is a flexible material and the porous material is a rigid material. If the capillary material is protected from damage, the aerosol formation is more likely to be consistent, even over multiple uses of the aerosol generating device. Second, manufacturing costs may be reduced because the capillary material may be a simple and relatively inexpensive material. The porous material may comprise a more robust and expensive material. Thus, the more expensive material need only be used for the small porous material, and the relatively inexpensive material can be used for the bulk of the device.

The capillary material may comprise any suitable material or combination of materials which is able to convey the aerosol-forming substrate towards the vaporizer. The capillary material is preferably a porous material, but this need not be the case. The capillary material may have a fibrous or spongy structure. The capillary material preferably comprises a bundle of capillaries. For example, the capillary material may comprise a plurality of fibres or threads or other fine bore tubes. Alternatively, the capillary material may comprise sponge-like or foam-like

NJOY Exhibit 1002.2179

material. The structure of the capillary material forms a plurality of small bores or tubes, through which the aerosol-forming substrate can be transported by capillary action from the storage portion towards the vaporizer. The particular preferred capillary material or materials will depend on the physical properties of the aerosol-forming substrate. Examples of suitable capillary materials include a sponge or foam material, ceramic- or graphite-based materials in the form of fibres or sintered powders, foamed metal or plastics material, a fibrous material, for example made of spun or extruded fibres, such as cellulose acetate, polyester, or bonded polyolefin, polyethylene, terylene or polypropylene fibres, nylon fibres or ceramic. The capillary material may have any suitable capillarity so as to be used with different liquid physical properties. The liquid has physical properties, including but not limited to viscosity, surface tension, density, thermal conductivity, boiling point and vapour pressure, which allow the liquid to be transported through the capillary material.

The porous material may comprise any suitable material or combination of materials which is permeable to the aerosol-forming substrate and allows the aerosol-forming substrate to migrate from the capillary material to the vaporizer. The material or combination of materials is also inert with respect to the aerosol-forming substrate. The porous material may or may not be a capillary material. The porous material may comprise a hydrophilic material to improve distribution and spread of the aerosol-forming substrate. This may assist with consistent aerosol formation. The particular preferred material or materials will depend on the physical properties of the aerosol-forming substrate. Examples of suitable materials are a capillary material, for example a sponge or foam material, ceramic- or graphite-based materials in the form of fibres or sintered powders, a foamed metal or plastics material, a fibrous material, for example made of spun or extruded fibres, such as cellulose acetate, polyester, or bonded polyolefin, polyethylene, terylene or polypropylene fibres, nylon fibres or ceramic. The porous material may have any suitable porosity so as to be used with different liquid physical properties.

The porous material and capillary material preferably comprise different materials. Preferably, the capillary material and the porous material are in contact, as this provides for good transfer of liquid.

The storage portion may protect the aerosol-forming substrate from ambient air (because air cannot generally enter the liquid storage portion). The storage portion may protect the aerosol-forming substrate from light, so that the risk of degradation of the aerosol-forming substrate is significantly reduced. Moreover, a high level of hygiene can be maintained. The storage portion may not be refillable. Thus, when the aerosol-forming substrate in the storage portion has been used up, the cartridge is replaced. Alternatively, the storage portion may be refillable. In that case, the cartridge may be replaced after a certain number of refills of the storage portion. Preferably, the storage portion is arranged to hold aerosol-forming substrate for a pre-determined number of puffs.

NJOY Exhibit 1002.2180

In a preferred embodiment, the aerosol generating device is electrically operated and the vaporizer comprises an electric heater for heating the aerosol-forming substrate.

The electric heater may comprise a single heating element. Alternatively, the electric heater may comprise more than one heating element for example two, or three, or four, or five, or six or more heating elements. The heating element or heating elements may be arranged appropriately so as to most effectively heat the aerosol-forming substrate.

The at least one electric heating element preferably comprises an electrically resistive material. Suitable electrically resistive materials include but are not limited to: semiconductors such as doped ceramics, electrically "conductive" ceramics (such as, for example, molybdenum disilicide), carbon, graphite, metals, metal alloys and composite materials made of a ceramic material and a metallic material. Such composite materials may comprise doped or undoped ceramics. Examples of suitable doped ceramics include doped silicon carbides. Examples of suitable metals include titanium, zirconium, tantalum and metals from the platinum group. Examples of suitable metal alloys include stainless steel, Constantan, nickel-, cobalt-, chromium-, aluminium- titanium- zirconium-, hafnium-, niobium-, molybdenum-, tantalum-, tungsten-, tin-, gallium-, manganese- and iron-containing alloys, and super-alloys based on nickel, iron, cobalt, stainless steel, Timetal®, iron-aluminium based alloys and iron-manganese-aluminium based alloys. Timetal® is a registered trade mark of Titanium Metals Corporation, 1999 Broadway Suite 4300, Denver Colorado. In composite materials, the electrically resistive material may optionally be embedded in, encapsulated or coated with an insulating material or vice-versa, depending on the kinetics of energy transfer and the external physicochemical properties required. The heating element may comprise a metallic etched foil insulated between two layers of an inert material. In that case, the inert material may comprise Kapton®, all-polyimide or mica foil. Kapton® is a registered trade mark of E.I. du Pont de Nemours and Company, 1007 Market Street, Wilmington, Delaware 19898, United States of America.

Alternatively, the at least one electric heating element may comprise an infra-red heating element, a photonic source or an inductive heating element.

The at least one electric heating element may take any suitable form. For example, the at least one electric heating element may take the form of a heating blade. Alternatively, the at least one electric heating element may take the form of a casing or substrate having different electro-conductive portions, or an electrically resistive metallic tube. Alternatively, the at least one electric heating element may be a disk (end) heater or a combination of a disk heater with heating needles or rods. Alternatively, the at least one electric heating element may comprise a flexible sheet of material. Other alternatives include a heating wire or filament, for example a Nickel-chromium, platinum, tungsten or alloy wire, or a heating plate. Optionally, the heating element may be deposited in or on a rigid carrier material.

The at least one electric heating element may comprise a heat sink, or heat reservoir

NJOY Exhibit 1002.2181

comprising a material capable of absorbing and storing heat and subsequently releasing the heat over time to heat the aerosol-forming substrate. The heat sink may be formed of any suitable material, such as a suitable metal or ceramic material. Preferably, the material has a high heat capacity (sensible heat storage material), or is a material capable of absorbing and subsequently releasing heat via a reversible process, such as a high temperature phase change. Suitable sensible heat storage materials include silica gel, alumina, carbon, glass mat, glass fibre, minerals, a metal or alloy such as aluminium, silver or lead, and a cellulose material. Other suitable materials which release heat via a reversible phase change include paraffin, sodium acetate, naphthalene, wax, polyethylene oxide, a metal, metal salt, a mixture of eutectic salts or an alloy.

The heat sink may be arranged such that it is directly in contact with the aerosol-forming substrate being conveyed from the storage portion and can transfer the stored heat directly to the aerosol-forming substrate. Alternatively, the heat stored in the heat sink or heat reservoir may be transferred to the aerosol-forming substrate by means of a heat conductor, such as a metallic tube.

The at least one heating element may heat the aerosol-forming substrate by means of conduction. The heating element may be at least partially in contact with the aerosol-forming substrate. Alternatively, the heat from the heating element may be conducted to the aerosol-forming substrate by means of a heat conductor.

Alternatively, the at least one heating element may transfer heat to the incoming ambient air that is drawn through the aerosol generating device during use, which in turn heats the aerosol-forming substrate by convection. The ambient air may be heated before passing through the aerosol-forming substrate. Alternatively, the ambient air may be first drawn through the aerosol-forming substrate and then heated.

However, the invention is not limited to heater vaporizers but may be used in aerosol generating devices and systems in which the vapour and resulting aerosol is generated by a mechanical vaporizer, for example but not limited to a piezo vaporizer or an atomizer using pressurized liquid.

If the vaporizer comprises an electric heater, preferably, the porous material comprises a heat-resistant material. Preferably, the electrical energy is supplied to the heating element or elements until the heating element or elements reach a temperature of between approximately 200 °C and 440 °C. This is in contrast to conventional cigarettes in which the combustion of tobacco and cigarette wrapper may reach 800 °C. Thus, the term “heat-resistant” in this specification refers to a material which is able to tolerate temperatures of more than approximately 200 °C, or more preferably more than approximately 250 °C, or even more preferably up to approximately 440 °C, without noticeably degrading. An example of a suitable material is ceramic.

NJOY Exhibit 1002.2182

Thus, a further advantage of this embodiment of the invention is that the porous material can prevent heat damage to the capillary material. The porous material may also provide an improved, even heat distribution. This may assist with consistent aerosol formation. Suitable heat-resistant materials may be expensive. But, the capillary material only needs to tolerate the temperatures at the capillary-porous interface, because the porous material provides a heat-resistant barrier between the capillary material and the electric heater. These temperatures are lower than those at the heating element or elements. Thus, a smaller amount of potentially expensive heat-resistant material can be used. This reduces manufacturing costs. The heat-resistant material provides insulation between the heater and the capillary material.

Preferably, the porous material comprises an electrically insulating material. If the vaporizer comprises an electric heater this prevents any short circuit of the heating elements.

In one embodiment, the porous material simply comprises a layer of porous material between the vaporizer and the capillary material. In an alternative embodiment, the porous material comprises a coating of porous material over the vaporizer. In an alternative embodiment, the vaporizer is situated within a porous member, the porous member comprising the porous material. Thus, the vaporizer is located inside the porous member, and the portion of the porous member between the vaporizer and the capillary material forms the porous material. The vaporizer and the porous member may be integrally formed. The term "integrally formed" refers to both the vaporizer and the porous member being manufactured together in one piece.

In a particularly preferred embodiment, the aerosol generating device is electrically operated, the vaporizer comprises an electric heater for heating the aerosol-forming substrate, and the electric heater and a porous member, including the porous material, are integrally formed. In one arrangement, the electric heater is located inside the porous member such that, when the porous member is adjacent the capillary material, the portion of the porous member between the electric heater and the capillary material forms the porous material. In that embodiment, the porous member comprises heat-resistant material.

In one embodiment, the capillary material comprises an elongate capillary body for conveying the liquid aerosol-forming substrate from the liquid storage portion towards the vaporizer, the capillary body having a first end extending into the liquid storage portion and a second end opposite the first end, wherein the vaporizer is arranged to vaporize the liquid aerosol-forming substrate in the second end of the capillary body.

In this embodiment, in use, liquid is transferred from the liquid storage portion by capillary action from the first end of the capillary body towards the second end of the capillary body. The porous material is provided between the second end of the capillary body and the vaporizer. Liquid in the second end of the capillary body and in the porous material is vaporized to form the supersaturated vapour. The capillary body may have the form of a wick. The capillary body may comprise fibres or threads generally aligned in the longitudinal direction of

NJOY Exhibit 1002.2183

the aerosol generating device or system. Alternatively, the capillary body may comprise sponge-like or foam-like material formed into a rod shape. The rod shape may extend along the longitudinal direction of the aerosol generating device or system.

In a preferred embodiment, the capillary material comprises an elongate capillary body for conveying the liquid aerosol-forming substrate from the liquid storage portion, the capillary body having a first end extending into the liquid storage portion and a second end opposite the first end, and the vaporizer comprises an electric heater arranged to heat the liquid aerosol-forming substrate in the second end of the capillary body. The porous material is provided between the second end of the capillary body and the electric heater. When the heater is activated, liquid at the second end of the capillary body and in the porous material is vaporized by the heater to form the supersaturated vapour.

In one embodiment, the porous material comprises a sleeve of porous material substantially surrounding the second end of the capillary body.

The sleeve of porous material may surround the second end of the capillary body sufficiently such that the capillary body is not in contact with the vaporizer. This is particularly important when the vaporizer comprises an electric heater, since the capillary material may not be heat-resistant. The sleeve of porous material may provide protection and support for the capillary body. The porous sleeve does not need to surround the entire capillary body, as long as the porous sleeve prevents any contact between the capillary body and the vaporizer which may damage the capillary body.

Alternatively, or additionally, the porous material may comprise a cap of porous material substantially covering the second end of the capillary body.

The cap of porous material may cover the second end of the capillary body sufficiently such that the capillary body is not in contact with the vaporizer. This is particularly important when the vaporizer comprises an electric heater, since the capillary material may not be heat-resistant. The cap of porous material may provide protection and support for the capillary body. For example, if the capillary body comprises a plurality of fibres or threads, the cap of porous material may reduce the likelihood of splitting or breaking of the capillary body. The porous cap does not need to cover the entire capillary body, as long as the porous cap prevents any contact between the capillary body and the vaporizer which may damage the capillary body.

In one particularly preferred embodiment, the cartridge comprises a mouthpiece; an electric power supply and electric circuitry are arranged in the device; the capillary material comprises an elongate capillary body for conveying the aerosol-forming substrate from the liquid storage portion, the capillary body having a first end extending into the storage portion and a second end opposite the first end; the vaporizer comprises an electric heater, connectable to the electric power supply, for heating the aerosol-forming substrate in the

NJOY Exhibit 1002.2184

second end of the capillary body; and the storage portion, capillary body and electric heater are arranged in the cartridge.

The storage portion, and optionally the capillary body and the heater, may be removable from the aerosol generating system as a single component.

In one embodiment, the storage portion includes an interior passageway, the vaporizer extends through at least part of the interior passageway in the storage portion, and the capillary material comprises a capillary interface at least partially lining the interior passageway.

In this embodiment, in use, liquid is transferred from the liquid storage portion by capillary action through the capillary interface lining the interior passageway. The inner face of the capillary interface is preferably in contact with the liquid aerosol-forming substrate in the liquid storage portion. The porous material is provided between the outer face of the capillary interface and the vaporizer. Liquid near the outer face of the capillary interface and in the porous material is vaporized to form the supersaturated vapour. The capillary interface may comprise any suitable capillary material formed into a tube shape. The tube of capillary material may extend along all of or part of the length of the interior passageway in the liquid storage portion.

In a preferred embodiment, the liquid storage portion has an interior passageway, the vaporizer comprises an electric heater extending through at least part of the interior passageway in the liquid storage portion and the capillary material comprises a capillary interface at least partially lining the interior passageway, wherein the electric heater is arranged to heat the liquid aerosol-forming substrate near an outer face of the capillary interface. The porous material is provided between the outer face of the capillary interface and the electric heater. When the heater is activated, the liquid near the outer face of the capillary interface is vaporized by the heater to form the supersaturated vapour.

In that embodiment, preferably, the porous material comprises a tube of porous material inside the capillary interface, lining or partially lining the interior passageway of the liquid storage portion.

The tube of porous material may be positioned such that the outer face of the capillary interface is not in contact with the vaporizer. This is particularly important when the vaporizer comprises an electric heater, since the capillary material of the capillary interface may not be heat-resistant. The porous material only needs to act as a barrier in the vicinity of the vaporizer.

In one particularly preferred embodiment, the cartridge comprises a mouthpiece; an electric power supply and electric circuitry are arranged in the device; the liquid storage portion has an interior passageway; the vaporizer comprises an electric heater for heating the liquid aerosol-forming substrate, connectable to the electric power supply and extending through at least part of the interior passageway in the liquid storage portion; the capillary material

comprises a capillary interface at least partially lining the interior passageway; and the liquid storage portion, capillary interface and electric heater are arranged in the cartridge.

The liquid storage portion, and optionally the capillary interface and the heater, may be removable from the aerosol generating system as a single component.

The liquid aerosol-forming substrate preferably has physical properties, for example boiling point and vapour pressure, suitable for use in the device, cartridge or system. If the boiling point is too high, it may not be possible to vaporize the liquid but, if the boiling point is too low, the liquid may vaporize too readily. The liquid preferably comprises a tobacco-containing material comprising volatile tobacco flavour compounds which are released from the liquid upon heating. Alternatively, or in addition, the liquid may comprise a non-tobacco material. The liquid may include aqueous solutions, non-aqueous solvents such as ethanol, plant extracts, nicotine, natural or artificial flavours or any combination of these. Preferably, the liquid further comprises an aerosol former. Examples of suitable aerosol formers are glycerine and propylene glycol.

The aerosol generating device or cartridge may comprise at least one air inlet. The aerosol generating device or cartridge may comprise at least one air outlet. The aerosol generating device or cartridge may comprise an aerosol forming chamber between the air inlet and air outlet so as to define an air flow route from the air inlet to the air outlet via the aerosol forming chamber, so as to convey the aerosol to the air outlet and into the mouth of a user. In embodiments in which the liquid storage portion comprises an interior passageway, preferably the air flow route from the air inlet to the air outlet passes through the interior passageway. The aerosol forming chamber simply assists or facilitates the generation of the aerosol.

The aerosol generating device may be electrically operated and may further comprise an electric power supply. The aerosol generating device may further comprise electric circuitry. In one embodiment, the electric circuitry comprises a sensor to detect air flow indicative of a user taking a puff. In that case, preferably, the electric circuitry is arranged to provide an electric current pulse to the vaporizer when the sensor senses a user taking a puff. Preferably, the time-period of the electric current pulse is pre-set, depending on the amount of liquid desired to be vaporized. The electric circuitry is preferably programmable for this purpose. Alternatively, the electric circuitry may comprise a manually operable switch for a user to initiate a puff. The time-period of the electric current pulse is preferably pre-set depending on the amount of liquid desired to be vaporized. The electric circuitry is preferably programmable for this purpose.

Preferably, the device or cartridge or system comprises a housing. Preferably, the housing is elongate. If the aerosol generating device or cartridge includes an elongate capillary body, the longitudinal axis of the capillary body and the longitudinal axis of the housing may be substantially parallel. In one embodiment, the housing includes a removable insert comprising the liquid storage portion, the capillary body and the heater. In that embodiment, those parts

NJOY Exhibit 1002.2186

may be removable from the housing as a single component. This may be useful for refilling or replacing the storage portion, for example.

The housing may comprise any suitable material or combination of materials. Examples of suitable materials include metals, alloys, plastics or composite materials containing one or more of those materials, or thermoplastics that are suitable for food or pharmaceutical applications, for example polypropylene, polyetheretherketone (PEEK) and polyethylene. Preferably, the material is light and non-brittle.

Preferably, the aerosol generating device and cartridge are portable, both individually and in cooperation. Preferably, the aerosol generating device is reusable by a user. Preferably, the cartridge is disposable by a user, for example when there is no more liquid contained in the liquid storage portion. The aerosol generating device and cartridge may cooperate to form an aerosol generating system which is a smoking system and which may have a size comparable to a conventional cigar or cigarette. The smoking system may have a total length between approximately 30 mm and approximately 150 mm. The smoking system may have an external diameter between approximately 5 mm and approximately 30 mm.

Preferably, the aerosol generating system is an electrically operated smoking system.

According to the invention, there is also provided an aerosol generating system comprising: a storage portion for storing an aerosol-forming substrate; a vaporizer for heating the aerosol-forming substrate to form an aerosol; a capillary material for conveying the aerosol-forming substrate from the storage portion towards the vaporizer by capillary action; and a porous material between the capillary material and the vaporizer. In this embodiment, the aerosol generating system does not comprise a separate device and cartridge.

In a particularly preferred embodiment, the capillary material comprises polypropylene and the porous material comprises a ceramic material, for example, alumina (aluminium oxide).

Features described in relation to one aspect of the invention may be applicable to another aspect of the invention.

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

Figure 1 shows one example of an aerosol generating system

Figure 2 is a schematic cross-sectional view of a first embodiment of a cartridge for use with an aerosol generating device to produce an aerosol generating system like that shown in Figure 1;

Figure 3 is a schematic cross-sectional view of a second embodiment of a cartridge for use with an aerosol generating device to produce an aerosol generating system like that shown in Figure 1;

Figure 4 is a schematic cross-sectional view of a third embodiment of a cartridge for use with an aerosol generating device to produce an aerosol generating system like that shown in Figure 1;

Figure 5 is a schematic cross-sectional view of a fourth embodiment of a cartridge for use with an aerosol generating device to produce an aerosol generating system like that shown in Figure 1; and

Figure 6 is a graph of heating time versus temperature for three configurations of aerosol generating system.

Figure 1 shows one example of an aerosol generating system. Although not explicitly shown in Figure 1, the aerosol generating system comprises an aerosol generating device, which is preferably reusable, in cooperation with a cartridge, which is preferably disposable. In Figure 1, the system is an electrically operated smoking system. The smoking system 100 of Figure 1 comprises a housing 101 having a first end which is the cartridge 103 and a second end which is the device 105. In the device, there is provided an electric power supply in the form of battery 107 and electric circuitry in the form of hardware 109 and puff detection system 111. In the cartridge, there is provided a storage portion 113 containing liquid 115, capillary material in the form of an elongate capillary body 117 and a vaporizer in the form of heater 119. Note that the heater is only shown schematically in Figure 1. In the exemplary embodiment shown in Figure 1, one end of capillary body 117 extends into liquid storage portion 113 and the other end of capillary body 117 is surrounded by the heater 119. The heater is connected to the electric circuitry via connections 121, which may pass along the outside of liquid storage portion 113 (not shown in Figure 1). The housing 101 also includes an air inlet 123, an air outlet 125 at the cartridge end, and an aerosol forming chamber 127.

In use, operation is as follows. Liquid 115 is conveyed by capillary action from the liquid storage portion 113 from the end of the capillary body 117 which extends into the liquid storage portion to the other end of the capillary body which is surrounded by heater 119. When a user draws on the air outlet 125, ambient air is drawn through air inlet 123. In the arrangement shown in Figure 1, the puff detection system 111 senses the puff and activates the heater 119. The battery 107 supplies electrical energy to the heater 119 to heat the end of the capillary body 117 surrounded by the heater. The liquid in that end of the capillary body 117 is vaporized by the heater 119 to create a supersaturated vapour. At the same time, the liquid being vaporized is replaced by further liquid moving along the capillary body 117 by capillary action. (This is sometimes referred to as "pumping action".) The supersaturated vapour created is mixed with and carried in the air flow from the air inlet 123. In the aerosol forming chamber 127, the vapour condenses to form an inhalable aerosol, which is carried towards the outlet 125 and into the mouth of the user.

In the embodiment shown in Figure 1, the hardware 109 and puff detection system 111 are preferably programmable. The hardware 109 and puff detection system 111 can be used to manage the aerosol generating operation.

Figure 1 shows one example of an aerosol generating system according to the present invention. Many other examples are possible, however. The aerosol generating system simply needs to include or receive a liquid aerosol-forming substrate contained in a storage portion, a vaporizer for heating the liquid aerosol-forming substrate, a capillary material for conveying the liquid aerosol-forming substrate towards the vaporizer and some sort of porous material (to be described below with reference to Figures 2 to 6) between the capillary material and the vaporizer. For example, the system need not be electrically operated. For example, the system need not be a smoking system. In addition, the system may not include a heater, in which case another device may be included to vaporize the liquid aerosol-forming substrate. For example, the configuration of the capillary material may be different. For example, a puff detection system need not be provided. Instead, the system could operate by manual activation, for example the user operating a switch when a puff is taken. For example, the overall shape and size of the housing could be altered.

As discussed above, according to the invention, there is provided a porous material between the capillary material and the vaporizer. Embodiments of the invention, including the porous material, will now be described with reference to Figures 2 to 6. The embodiments are based on the example shown in Figure 1, although are applicable to other embodiments. Note that Figures 1 to 5 are schematic in nature. In particular, the components shown are not necessarily to scale either individually or relative to one another.

Figure 2 is a schematic view of a first embodiment of a cartridge for use with an aerosol generating device to produce an aerosol generating system like that shown in Figure 1. The cartridge 200 includes a storage portion 113, capillary body 117 and heater 119. The liquid storage portion 113 contains liquid aerosol-forming substrate 115. In Figure 2, the heater 119 is in the form of a heating coil, connected to electric circuitry (not shown) via electrical connections 121. The heater 119 and electrical connections 121 are shown schematically in Figure 2 and the electrical connections may pass along the outside of liquid storage portion 113 although this is not shown in Figure 2. There is further provided a porous material in the form of porous sleeve 201 surrounding the end of the capillary body 117 which protrudes from the liquid storage portion 113.

The porous sleeve 201 provides structural support for the capillary body 117. Preferably, the porous sleeve 201 comprises a rigid material. Thus, the porous sleeve 201 prevents or reduces the likelihood of the capillary body 117 becoming damaged, for example split, bent or flattened. The porous sleeve 201 may be retained in position by slotting into the housing or another part of the aerosol generating device or cartridge, when the cartridge is assembled with

NJOY Exhibit 1002.2189

the aerosol generating device. The porous sleeve 201 preferably comprises a heat-resistant material which can protect the capillary body 117 from potential heat damage from the heater. Thus, the porous sleeve acts as a heat barrier. The porous sleeve 201 may also improve the heat distribution. The porous sleeve 201 may become more efficient at liquid transfer, as the aerosol generating system heats up. In Figure 2, the size of the porous sleeve 201 is small compared with the size of the capillary body 117. Thus, only a small amount of heat-resistant material may be required. Since the heat-resistant material may be expensive, this may reduce manufacturing costs. In this embodiment, the porous sleeve 201 comprises an electrically insulating material so as not to cause a short circuit across the heater coils.

In Figure 2, the porous sleeve 201 does not cover the terminal end of the capillary body 117. Although, in Figure 2, the porous sleeve 201 surrounds the entire end of the capillary body which protrudes from the liquid storage portion 113, the porous sleeve may simply cover the capillary body in the vicinity of the heater 119, so as to prevent heat damage to the capillary body 117. The required diameter of the porous sleeve 201 will depend on the size of the capillary body 117 and liquid storage portion 113. The required length of the porous sleeve 201 will depend on the size of the heater 119 which will, in turn, depend on the amount of liquid desired to be vaporized. The required thickness of the porous sleeve 201 will depend on the insulating properties and porosity required.

Figure 3 is a schematic view of a second embodiment of a cartridge for use with an aerosol generating device to produce an aerosol generating system like that shown in Figure 1. The cartridge 300 includes a storage portion 113, capillary body 117 and heater 119. The liquid storage portion 113 contains liquid aerosol-forming substrate 115. As in Figure 2, in Figure 3, the heater 119 is in the form of a heating coil, connected to electric circuitry (not shown) via electrical connections 121. The heater 119 and electrical connections 121 are shown schematically in Figure 3 and the electrical connections may pass along the outside of liquid storage portion 113 although this is not shown. There is further provided a porous material in the form of porous cap 301 surrounding the end of the capillary body 117 which protrudes from the liquid storage portion 113 and covering the terminal end of the capillary body 117.

The porous cap 301 provides structural support for the capillary body 117. Preferably, the porous cap 301 comprises a rigid material. Thus, the porous cap 301 prevents or reduces the likelihood of the capillary body 117 becoming damaged, for example split, bent or flattened. In particular, because the terminal end of the capillary body 117 is covered, the chance of the capillary material splitting is substantially reduced. The porous cap 301 may be retained in position by slotting into the housing or another part of the aerosol generating device or cartridge, when the cartridge is assembled with the aerosol generating device. The porous cap 301 preferably comprises a heat-resistant material which can protect the capillary body 117 from potential heat damage from the heater. Thus, the porous cap acts as a heat barrier. The

NJOY Exhibit 1002.2190

porous cap 301 may also improve the heat distribution. The porous cap 301 may become more efficient at liquid transfer, as the aerosol generating system heats up. In Figure 3, the size of the porous cap 301 is small compared with the size of the capillary body 117. Thus, only a small amount of heat-resistant material may be required. Since the heat-resistant material may be expensive, this may reduce manufacturing costs. In this embodiment, the porous cap 301 comprises an electrically insulating material so as not to cause a short circuit across the heater coils.

In Figure 3, the porous cap 301 surrounds the entire end of the capillary body which protrudes from the liquid storage portion 113 and also covers the terminal end of the capillary body 117. However, the porous cap may simply cover the capillary body in the vicinity of the heater 119, so as to prevent heat damage to the capillary body 117. The required diameter of the porous cap 301 will depend on the size of the capillary body 117 and liquid storage portion 113. The required length of the porous cap 301 will depend on the size of the heater 119 which will, in turn, depend on the amount of liquid desired to be vaporized. The required thickness of the porous cap 301 will depend on the insulating properties and porosity required.

Figure 4 is a schematic view of a third embodiment of a cartridge for use with an aerosol generating device to produce an aerosol generating system like that shown in Figure 1. The cartridge 400 includes liquid storage portion 113 and capillary body 117 and, as in Figures 2 and 3, the liquid storage portion 113 contains liquid aerosol-forming substrate 115. There is further provided a porous member 401 surrounding the end of the capillary body 117 which protrudes from the liquid storage portion 113. A heating blade or blades 403 are located within the porous member 401. The portion of the porous member 401 between the heater blade or blades 403 and the capillary body 117 forms a porous material 405. The heater blades 403 are connected to electric circuitry (not shown) via electrical connections 121. The heater blades 403 and electrical connections 121 are shown schematically in Figure 4 and the electrical connections may pass along the outside of liquid storage portion 113 although this is not shown.

The porous member 401 provides structural support for the capillary body 117. Preferably, the porous member 401 comprises a rigid material. Thus, the porous member 401 prevents or reduces the likelihood of the capillary body 117 becoming damaged, for example split, bent or flattened. The porous member 401 may be retained in position by slotting into the housing or another part of the aerosol generating device or cartridge, when the cartridge is assembled with the aerosol generating device. The porous member 401 preferably comprises a heat-resistant material which can protect the capillary body 117 from potential heat damage from the heater blade or blades 403. Thus, the portion 405 of the porous member 401 between the heater blades 403 and the capillary body 117 acts as a heat barrier. The porous member 401 may also improve the heat distribution. The porous member 401 may become more efficient at liquid transfer, as the aerosol generating system heats up. In Figure 4, the size of the

NJOY Exhibit 1002.2191

porous member 401 is small compared with the size of the capillary body 117. Thus, only a small amount of heat-resistant material may be required. Since the heat-resistant material may be expensive, this may reduce manufacturing costs. In this embodiment, the porous member 401 comprises an electrically insulating material so as not to cause a short circuit across the heater blade or blades.

In Figure 4, the porous member 401 surrounds the entire end of the capillary body which protrudes from the liquid storage portion 113. However, the porous member 401 may be shorter than the exposed portion of the capillary body. In Figure 4, the porous member 401 does not cover the terminal end of the capillary body 117, although it is possible for the porous member 401 to cover the terminal end of the capillary body, like the embodiment shown in Figure 3. The heating blades 403 may take any form suitable for heating the liquid aerosol-forming substrate in the capillary body 117 and the porous member 401. The required diameter of the porous member 401 will depend on the size of the capillary body 117 and liquid storage portion 113. The required length of the porous member 401 will depend on the size and shape of the heater blades, which will, in turn, depend on the amount of liquid desired to be vaporized. The required thickness of the porous member 401, in particular the porous material 405, will depend on the insulating properties and porosity required. Preferably, the heating blades 403 and the porous member 401 are integrally formed, that is, manufactured together in one piece. This simplifies manufacture.

Figure 5 is a schematic view of a fourth embodiment of a cartridge for use with an aerosol generating device to produce an aerosol generating system like that shown in Figure 1. However, the embodiment shown in Figure 5 has a very different form from the cartridges shown in Figures 1 to 4. In Figure 5, the cartridge 500 comprises a storage portion 501, which is in the form of a container having an interior passageway 503. In Figure 5, the liquid storage portion 501 contains liquid aerosol-forming substrate 505. Preferably, the cartridge cooperates snugly with the aerosol generating device, and the interior passageway 503 forms part of the air flow route for air flowing into the air inlet or inlets 123 (see Figure 1) towards the air outlet 125 (see Figure 1). The interior passageway 503 is lined or partially lined with capillary material in the form of a capillary interface 507. A heater 509 extends through the interior passageway 503. In Figure 5, the heater 509 is in the form of a heating coil. The heating coil is connected to electric circuitry (not shown) via electrical connections (also not shown). There is further provided a porous material in the form of porous tube 511 lining or partially lining the interior passageway 503 and providing a barrier between the heater 509 and the capillary interface 507. Preferably, the heater 509 is in contact with the porous tube 511 and preferably the porous tube 511 is in contact with the capillary interface 507. This ensures good transfer of the liquid aerosol-forming substrate from the liquid storage portion 501 towards the heater 509.

Operation of the embodiment shown in Figure 5 is similar to operation of the embodiments shown in Figures 1 to 4. In use, liquid aerosol-forming substrate 505 is conveyed by capillary action from the liquid storage portion 501 from the side of the capillary interface 507 in contact with the liquid to the side of the capillary interface 507 in contact with the porous tube 511. When a user draws on the air outlet, ambient air is drawn through the interior passageway 503 and the heater 509 is activated. The heater 509 heats the liquid aerosol-forming substrate 505 in the capillary interface 507 and in the porous tube 511, and the porous tube 511 protects the capillary interface 507 from heat damage. The liquid is vaporized by the heater to form a supersaturated vapour and, at the same time, the liquid being vaporized is replaced by further liquid moving through the capillary interface 507 and into the porous tube 511. The supersaturated vapour is mixed with and carried in the air flow through the interior passageway and into the mouth of the user.

The porous tube 511 provides structural support for the capillary interface 507. Preferably, the porous tube 511 comprises a rigid material. Thus the porous tube 511 prevents or reduces the likelihood of the capillary interface 507 becoming damaged, for example, split or deformed. The porous tube 511 may also help to ensure that the capillary interface 507 stays in position lining the interior passageway 503. The porous tube 511 preferably comprises a heat-resistant material which can protect the capillary interface 507 from potential heat damage from the heater 509. Thus, the porous tube 511 acts as a heat barrier. The porous tube 511 may also improve the heat distribution. The porous tube 511 may become more efficient at liquid transfer, as the aerosol generating system heats up. In Figure 5, the length of the porous tube 511 is small compared with the length of the capillary interface 507. Thus, only a small amount of heat-resistant material may be required. Since the heat-resistant material may be expensive, this may reduce manufacturing costs. In this embodiment, the porous tube 511 may comprise an electrically insulating material so as not to cause a short circuit across the heater coils.

In Figure 5, the porous tube 511 does not extend along the length of the liquid storage portion 501 and capillary interface 507, although this is possible. The porous tube 511 may extend along any length of the liquid storage portion 501 and capillary interface 507 as long as it provides a barrier for the capillary interface 507 in the vicinity of the heater 509. The required diameter of the porous tube 511 will depend on the size of the interior passageway 503 of the liquid storage portion 501. The required length of the porous tube 511 will depend on the size of the heater 509 which will, in turn, depend on the amount of liquid desired to be vaporized. The required thickness of the porous tube 511 will depend on the insulating properties and porosity required.

The embodiments illustrated in Figures 2 to 5 include a capillary material and a porous material. The capillary material may comprise any suitable material or combination of materials which is able to convey the liquid aerosol-forming substrate towards the heater. Examples of

NJOY Exhibit 1002.2193

suitable capillary materials include a sponge or foam material, ceramic- or graphite-based materials in the form of fibres or sintered powders, foamed metal or plastics material, a fibrous material, for example made of spun or extruded fibres, such as cellulose acetate, polyester, or bonded polyolefin, polyethylene, terylene or polypropylene fibres, nylon fibres or ceramic. The capillary material may have any suitable capillarity so as to be used with different liquid physical properties.

The porous material may comprise any suitable material or combination of materials which is permeable to the liquid aerosol-forming substrate and allows the liquid aerosol-forming substrate to migrate from the capillary material to the heater. The porous material may comprise a material which is inherently porous, for example a ceramic material such as alumina (aluminium oxide). Alternatively, the porous material may comprise a material with a plurality of manufactured small holes, to allow migration of the liquid aerosol-forming substrate to the vaporizer. The porous material may comprise a hydrophilic material to improve distribution and spread of the liquid aerosol-forming substrate. The particular preferred material or materials will depend on the physical properties of the liquid aerosol-forming substrate. Examples of suitable materials are a capillary material, for example a sponge or foam material, ceramic- or graphite-based materials in the form of fibres or sintered powders, a foamed metal or plastics material, a fibrous material, for example made of spun or extruded fibres, such as cellulose acetate, polyester, or bonded polyolefin, polyethylene, terylene or polypropylene fibres, nylon fibres or ceramic. The porous material may have any suitable porosity so as to be used with different liquid physical properties. In the embodiments illustrated in Figures 2 to 5, the porous material is a separate component. However, other forms for the porous material may be envisaged. For example, the porous material may comprise a porous coating over the heater or part of the heater. Other embodiments are also possible.

Figures 2 to 5 show examples of cartridges for use with an aerosol generating device according to the present invention. Other examples are possible. Preferably, the cartridge is disposable and is arranged to cooperate with an aerosol generating device which may be reusable. The cartridge may be refilled or replaced when the liquid is used. Thus, when the liquid aerosol-forming substrate in the cartridge has been used up, the cartridge may be disposed of and replaced with a new cartridge, or the empty cartridge may be refilled. However, the aerosol generating device may not be designed to operate in conjunction with a separate cartridge. Instead, the aerosol generating device may include or receive a liquid aerosol-forming substrate in a storage portion and comprise the vaporizer for heating the liquid aerosol-forming substrate, the capillary material for conveying the liquid aerosol-forming substrate towards the vaporizer and the porous material between the vaporizer and the capillary material. That is to say, the aerosol generating device may comprise all the components described in relation to the cartridge. Additionally, the aerosol generating device may comprise an electric power supply

NJOY Exhibit 1002.2194

and electric circuitry.

In Figures 1 to 5, the vaporizer comprises an electric heater and the porous material protects the capillary material from heat damage. The porous material also improves heat distribution which results in more consistent aerosol formation. In one preferred embodiment, the capillary material comprises polypropylene and the porous material comprises ceramic. The inventors of the present invention have compared the heat distribution patterns across the polypropylene capillary material and ceramic barrier with the heat distribution patterns in arrangements without a porous material. If the capillary material is polypropylene, and no porous material is provided, it has been found that, after only 2 s of heating, the temperatures in the capillary material exceed the melting temperature of polypropylene. The temperatures are not homogeneous, with steep temperature gradients and hot spots. Thus, even though polypropylene would be a convenient (and relatively inexpensive) material to use for the capillary material, it cannot be used (without a porous material) since the polypropylene would melt. On the other hand, if the capillary material is ceramic, and no porous material is provided, it has been found that, after only 2 s of heating, the temperatures in the capillary material do not exceed the melting temperature of the ceramic (which is much higher than that of polypropylene). Thus, ceramic would be an ideal material for the capillary material, but it is relatively expensive. According to one embodiment of the invention, the capillary material comprises polypropylene, and a ceramic porous material is provided. In that embodiment, it has been found that the temperature in the polypropylene capillary material is considerably lower than that found with a polypropylene capillary material alone, because the ceramic barrier protects the capillary material. The temperatures have also been found to be reasonably homogeneous. Thus, the bulk of the required material can be the (relatively inexpensive) polypropylene, but the polypropylene can be protected from temperatures above its melting point by the ceramic barrier.

Figure 6 is a graph of heating time (s) versus temperature (°C) for each of the three configurations described above. Figure 6 shows the maximum temperature reached after 2 s of heating. Curve 601 is the heating curve for the configuration including a polypropylene capillary material and no porous material. The temperature reached in the capillary material after 2 s of heating is nearly 400 °C. Curve 603 is the heating curve for the configuration including a ceramic capillary material and no porous material. The temperature reached in the capillary material after 2s of heating is less than 100 °C. Curve 605 is the heating curve for the embodiment of the invention including a polypropylene capillary material together with a ceramic barrier. The temperature reached in the capillary material is only approximately 150 °C. Thus, the embodiment of the invention has significantly reduced the maximum temperature reached in the capillary material, whilst avoiding the need for large amounts of expensive ceramic material.

NJOY Exhibit 1002.2195

Thus, according to the invention, the aerosol generating device or cartridge or system includes a porous material between the capillary material and the vaporizer. The porous material provides structural support to the capillary material, may reduce manufacturing costs and, if the vaporizer comprises a heater, may protect the capillary material from heat damage. Embodiments of the porous material have been described with reference to Figures 2 to 6. Features described in relation to one embodiment may also be applicable to another embodiment.

NJOY Exhibit 1002.2196

CLAIMS

1. An aerosol generating device comprising

a storage portion for storing an aerosol-forming substrate;

a vaporizer for heating the aerosol-forming substrate;

a capillary material for conveying the aerosol-forming substrate from the storage portion towards the vaporizer by capillary action; and

a porous material between the capillary material and the vaporizer.

2. An aerosol generating device according to claim 1, wherein the aerosol generating device is electrically operated and the vaporizer comprises an electric heater for heating the aerosol-forming substrate.

3. An aerosol generating device according to claim 1 or 2, wherein the porous material comprises a heat-resistant material.

4. An aerosol generating device according to any preceding claim, wherein the vaporizer is situated within a porous member, the porous member comprising the porous material.

5. An aerosol generating device according to any preceding claim, wherein the capillary material comprises an elongate capillary body for conveying the aerosol-forming substrate from the storage portion towards the vaporizer, the capillary body having a first end extending into the storage portion and a second end opposite the first end, wherein the vaporizer is arranged to vaporize the aerosol-forming substrate in the second end of the capillary body.

6. An aerosol generating device according to claim 5, wherein the porous material comprises a sleeve of porous material substantially surrounding the second end of the capillary body.

7. An aerosol generating device according to claim 5 or claim 6, wherein the porous material comprises a cap of porous material substantially covering the second end of the capillary body.

8. An aerosol generating device according to any of claims 1 to 4, wherein the storage portion includes an interior passageway, the vaporizer extends through at least part of the interior passageway in the storage portion, and the capillary material comprises a capillary interface at least partially lining the interior passageway.

NJOY Exhibit 1002.2197

9. A cartridge comprising:

a storage portion for storing an aerosol-forming substrate;

a vaporizer for heating the aerosol-forming substrate;

a capillary material for conveying the aerosol-forming substrate from the storage portion towards the vaporizer by capillary action; and

a porous material between the capillary material and the vaporizer.

10. A cartridge according to claim 9, wherein the aerosol generating device is electrically operated and the vaporizer comprises an electric heater for heating the aerosol-forming substrate, the electric heater being connectable to an electric power supply in the aerosol generating device.

11. A cartridge according to claim 9 or 10, wherein the porous material comprises a heat-resistant material.

12. A cartridge according to claim 10 or claim 11, wherein the vaporizer is situated within a porous member, the porous member comprising the porous material.

13. A cartridge according to any of claims 9 to 12, wherein the capillary material comprises an elongate capillary body for conveying the aerosol-forming substrate from the container towards the vaporizer, the capillary body having a first end extending into the container and a second end opposite the first end, wherein the vaporizer is arranged to vaporize the aerosol-forming substrate in the second end of the capillary body.

14. A cartridge according to any of claims 9 to 12, wherein the container includes an interior passageway, the vaporizer extends through at least part of the interior passageway in the container, and the capillary material comprises a capillary interface at least partially lining the interior passageway.

15. An aerosol generating system comprising:

an aerosol generating device in cooperation with a cartridge, the cartridge or aerosol generating device comprising a storage portion for storing an aerosol-forming substrate;

wherein the cartridge or aerosol generating device comprises a vaporizer for heating the aerosol-forming substrate to form an aerosol;

NJOY Exhibit 1002.2198

wherein the cartridge or aerosol generating device comprises a capillary material for conveying the aerosol-forming substrate from the storage portion towards the vaporizer by capillary action; and

wherein the cartridge or aerosol generating device comprises a porous material between the capillary material and the vaporizer.

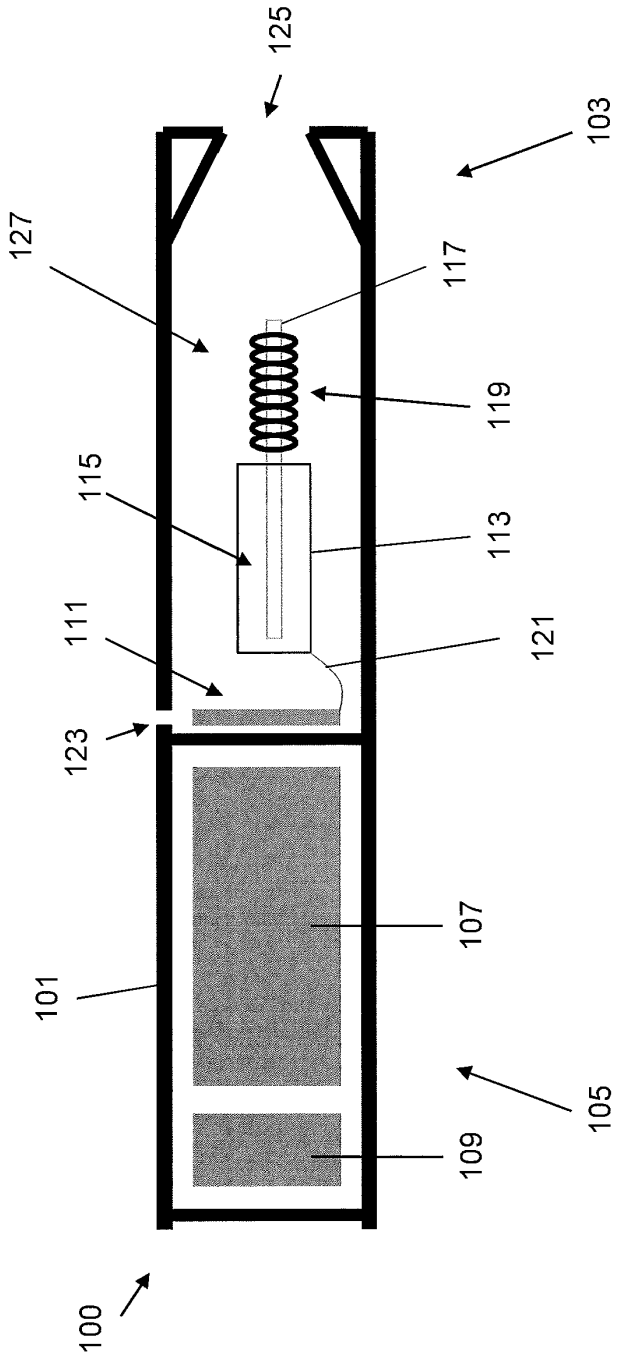


Figure 1

NJOY Exhibit 1002.2200

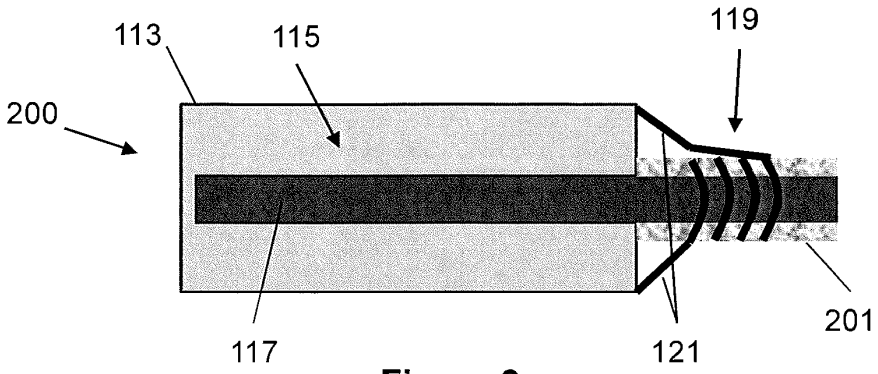


Figure 2

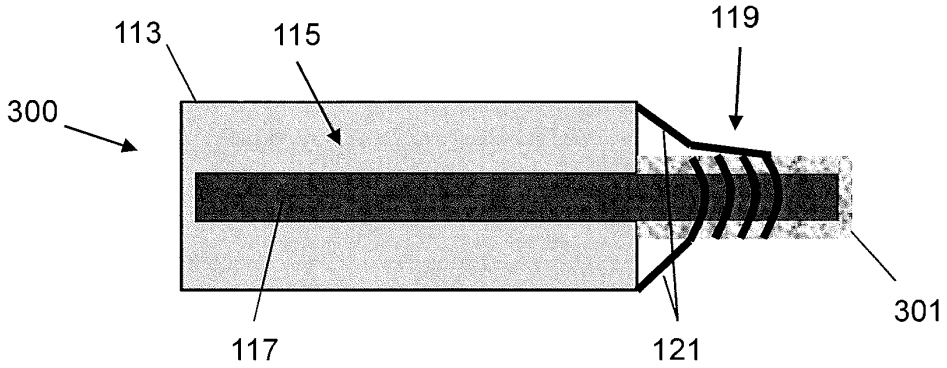


Figure 3

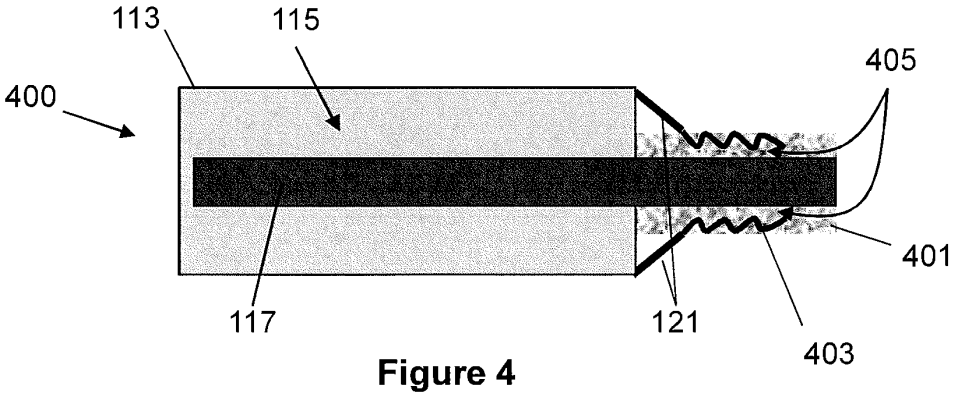


Figure 4

NJOY Exhibit 1002.2201

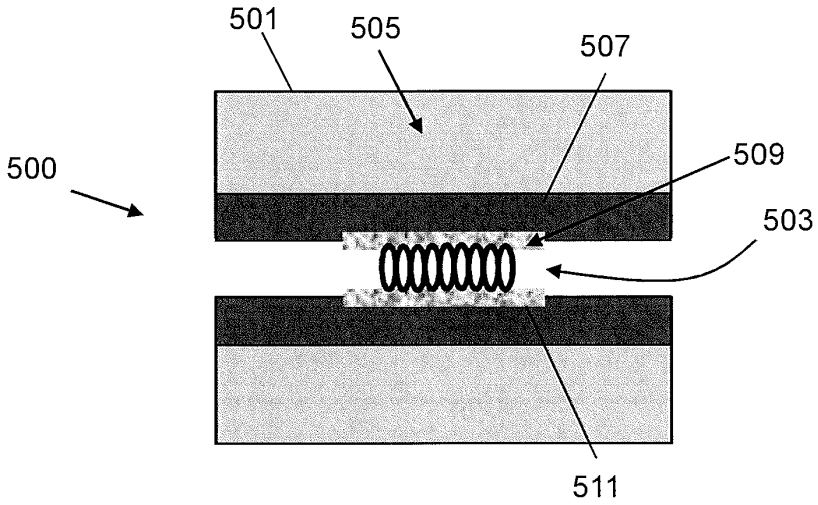


Figure 5

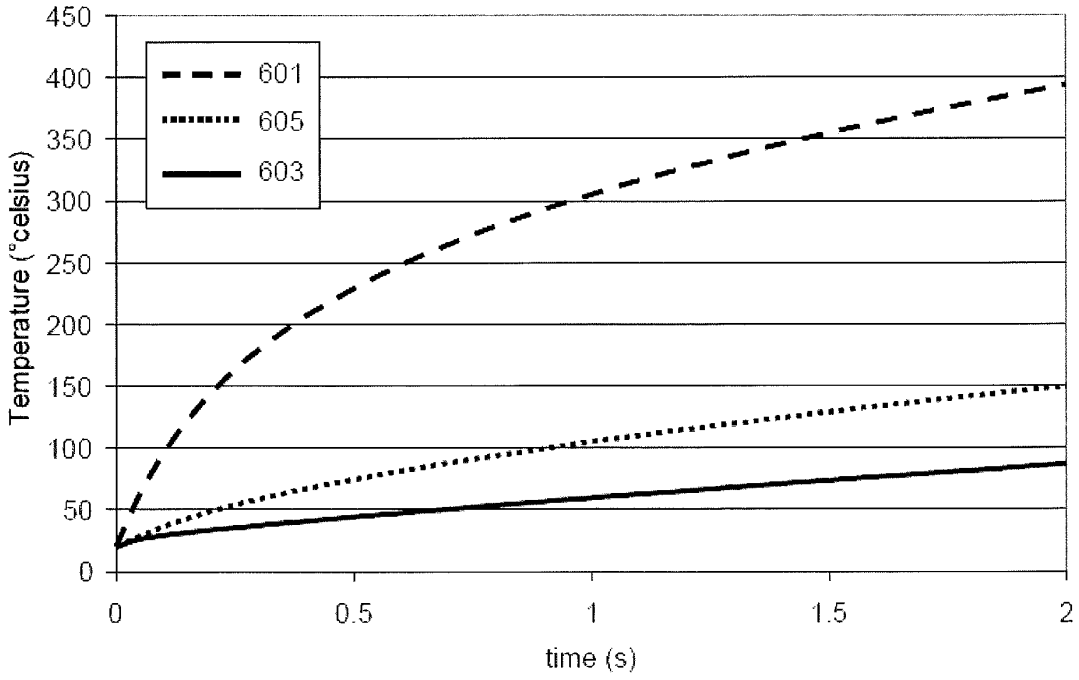


Figure 6

NJOY Exhibit 1002.2202

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/074513

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24F47/00 A61M15/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A24F A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 340 729 A1 (PHILIP MORRIS PROD [CH]) 6 July 2011 (2011-07-06) paragraph [0057] - paragraph [0060]; figures paragraph [0023] -----	1-15
X	EP 2 022 349 A1 (HAN LI [CN]) 11 February 2009 (2009-02-11) paragraph [0043] - paragraph [0048]; claims; figures -----	1-5,8-15
X	WO 2011/146174 A2 (TERRY NATHAN ANDREW [US]; MINSKOFF NOAH MARK [US]) 24 November 2011 (2011-11-24) paragraph [0092] - paragraph [0102]; claims; figures paragraph [0122] - paragraph [0131] ----- -/--	1-5,8-15

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 April 2013	26/04/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Marzano Monterosso

NJOY Exhibit 1002.2203

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/074513

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2009/132793 A1 (PHILIP MORRIS PROD [CH]) 5 November 2009 (2009-11-05) cited in the application page 7, line 13 - page 8, line 32; figures page 2, line 26 - page 3, line 4	1-5,7, 9-15
X	EP 2 110 033 A1 (PHILIP MORRIS PROD [CH]) 21 October 2009 (2009-10-21) paragraph [0018] - paragraph [0022]; figures	1,9,15
A	WO 03/034847 A1 (BRITISH AMERICAN TOBACCO CO [GB]) 1 May 2003 (2003-05-01) the whole document	1-15

NJOY Exhibit 1002.2204

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2012/074513

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2340729 A1	06-07-2011	AU 2010338614 A1	26-07-2012
		CA 2785698 A1	07-07-2011
		CN 102753047 A	24-10-2012
		CO 6561793 A2	15-11-2012
		EA 201290586 A1	28-12-2012
		EP 2340729 A1	06-07-2011
		EP 2519121 A1	07-11-2012
		KR 20120101118 A	12-09-2012
		SG 182313 A1	30-08-2012
		US 2011155153 A1	30-06-2011
		WO 2011079932 A1	07-07-2011
EP 2022349 A1	11-02-2009	AU 2007250367 A1	22-11-2007
		AU 2007250368 A1	22-11-2007
		BR PI0711395 A2	01-11-2011
		BR PI0711401 A2	01-11-2011
		CA 2647212 A1	22-11-2007
		CA 2647234 A1	22-11-2007
		CA 2768122 A1	22-11-2007
		CN 201067079 Y	04-06-2008
		CN 201079011 Y	02-07-2008
		EA 200802045 A1	27-02-2009
		EA 200802046 A1	27-02-2009
		EP 2022349 A1	11-02-2009
		EP 2022350 A1	11-02-2009
		EP 2359705 A1	24-08-2011
		JP 5103561 B2	19-12-2012
		JP 2009537119 A	29-10-2009
		JP 2009537120 A	29-10-2009
		JP 2012223190 A	15-11-2012
		KR 20090005139 A	12-01-2009
		KR 20090018039 A	19-02-2009
		KR 20110131320 A	06-12-2011
		KR 20120002555 A	05-01-2012
		NZ 572309 A	29-04-2011
		NZ 572310 A	29-10-2010
		US 2009095311 A1	16-04-2009
		US 2009126745 A1	21-05-2009
		US 2011209717 A1	01-09-2011
		WO 2007131449 A1	22-11-2007
		WO 2007131450 A1	22-11-2007
		ZA 200809062 A	25-11-2009
		ZA 200809063 A	25-11-2009
WO 2011146174 A2	24-11-2011	TW 201208722 A	01-03-2012
		TW 201208723 A	01-03-2012
		WO 2011146174 A2	24-11-2011
		WO 2011146175 A2	24-11-2011
		WO 2011146365 A2	24-11-2011
		WO 2011146369 A2	24-11-2011
		WO 2011146372 A2	24-11-2011
		WO 2011146375 A2	24-11-2011
WO 2009132793 A1	05-11-2009	AR 072355 A1	25-08-2010
		AU 2009242409 A1	05-11-2009
		CA 2720293 A1	05-11-2009
		CN 102014677 A	13-04-2011
		CO 6321203 A2	20-09-2011

NJOY Exhibit 1002.2205

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2012/074513

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EP 2113178 A1	04-11-2009
		EP 2282649 A1	16-02-2011
		JP 2011518567 A	30-06-2011
		KR 20100135865 A	27-12-2010
		RU 2010148832 A	10-06-2012
		TW 201012400 A	01-04-2010
		US 2009272379 A1	05-11-2009
		WO 2009132793 A1	05-11-2009
EP 2110033 A1	21-10-2009	AR 071040 A1	19-05-2010
		AU 2009228423 A1	01-10-2009
		CA 2718739 A1	01-10-2009
		CN 101977522 A	16-02-2011
		CN 102551217 A	11-07-2012
		CO 6300915 A2	21-07-2011
		DK 2257195 T3	24-09-2012
		EP 2110033 A1	21-10-2009
		EP 2257195 A1	08-12-2010
		EP 2471392 A1	04-07-2012
		ES 2389924 T3	05-11-2012
		JP 2011515093 A	19-05-2011
		KR 20100127817 A	06-12-2010
		NZ 587825 A	29-06-2012
		PL 2257195 T3	30-11-2012
		PT 2257195 E	25-09-2012
		RU 2010143417 A	27-04-2012
		TW 201002226 A	16-01-2010
		WO 2009118085 A1	01-10-2009
WO 03034847 A1	01-05-2003	AR 038794 A1	26-01-2005
		AT 346515 T	15-12-2006
		AU 2002337298 B2	16-02-2006
		BR 0213508 A	19-10-2004
		CA 2464226 A1	01-05-2003
		CA 2637802 A1	01-05-2003
		CN 1575135 A	02-02-2005
		DE 60216492 T2	31-05-2007
		EP 1441607 A1	04-08-2004
		ES 2275915 T3	16-06-2007
		JP 4547150 B2	22-09-2010
		JP 2005506080 A	03-03-2005
		MX PA04003881 A	16-07-2004
		MY 131497 A	30-08-2007
		RU 2297781 C2	27-04-2007
		TW 592641 B	21-06-2004
		US 2003075188 A1	24-04-2003
		WO 03034847 A1	01-05-2003
		ZA 200402979 A	19-07-2005

NJOY Exhibit 1002.2206

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 June 2013 (13.06.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/083635 A1

(51) International Patent Classification:
A24F 47/00 (2006.01) *A61M 15/06* (2006.01)

(21) International Application Number:
PCT/EP2012/074514

(22) International Filing Date:
5 December 2012 (05.12.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11192453.6 7 December 2011 (07.12.2011) EP

(71) Applicant: **PHILIP MORRIS PRODUCTS S.A.** [CH/CH]; Quai Jeanrenaud 3, CH-2000 Neuchatel (CH).

(72) Inventors: **DUBIEF, Flavien**; Rue du Rocher 52, CH-2000 Neuchatel (CH). **KUCZAJ, Arkadiusz**; Chemin de la Scierie 6, CH-2013 Colombier (CH).

(74) Agent: **REDDIE & GROSE LLP**; 16 Theobalds Road, London, Greater London WC1X 8PL (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

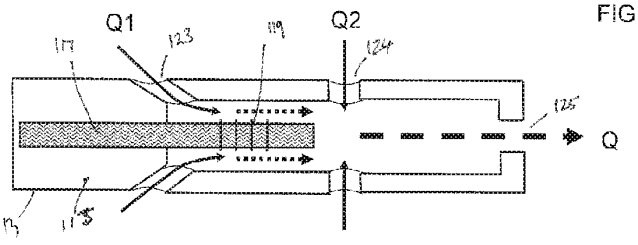
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) Title: AN AEROSOL GENERATING DEVICE HAVING AIRFLOW INLETS

FIG 2



(57) Abstract: There is provided an aerosol generating device comprising: a housing having a first air inlet (123) and an air outlet (125), the housing defining an air flow channel between the first air inlet (123) and the air outlet (125), and a heater (119) configured to heat an aerosol-forming substrate (117) positioned within or adjacent to the air flow channel, wherein the housing further comprises a second air inlet (124), the second air inlet (124) positioned between the heater (119) and the air outlet (125), the second air inlet (124) configured to allow air into the air flow channel, and wherein the second air inlet (124) is larger than the first air inlet (123).

WO 2013/083635 A1

NJOY Exhibit 1002.2207

AN AEROSOL GENERATING DEVICE HAVING AIRFLOW INLETS

The present invention relates to an aerosol generating device for heating an aerosol-forming substrate. Particularly, but not exclusively, the present invention relates to an electrically operated aerosol generating device for heating a liquid aerosol-forming substrate.

WO-A-2009/132793 discloses an electrically heated smoking system. A liquid is stored in a liquid storage portion, and a capillary wick has a first end which extends into the liquid storage portion for contact with the liquid therein, and a second end which extends out of the liquid storage portion. A heating element heats the second end of the capillary wick. The heating element is in the form of a spirally wound electric heating element in electrical connection with a power supply, and surrounding the second end of the capillary wick. In use, the heating element may be activated by the user to switch on the power supply. Suction on a mouthpiece by the user causes air to be drawn into the electrically heated smoking device over the capillary wick and heating element and subsequently into the mouth of the user.

It is an objective of the present invention to improve the generation of aerosol in such an electrically heated aerosol generating system.

The generation of aerosol in an aerosol generating device requires two processes. First, the aerosol forming substrate must be vaporized. Then, the resulting vapour must condense to form the droplets of the aerosol. Typically, in aerosol generating devices such as electric smoking devices, only a single air inlet is provided upstream of the heater to allow air into the device, flow past a heater (or other substrate vaporizing element) to pick up the vapour and then out of an air outlet of the device, such as a mouthpiece. In this context "upstream" and "downstream" refer to the air flow through the device from air inlet to air outlet. Condensation of the vaporized substrate occurs around and downstream of the heater (that is, between the heater and the air outlet in the direction of airflow), within the device. There is only a limited ability to control the condensation process in such devices in order to optimise the aerosol quantity and aerosol properties.

According to one aspect of the invention, there is provided an aerosol generating device comprising: a housing having a first air inlet and an air outlet, the housing defining an air flow channel between the first air inlet and the air outlet; and a heater configured to heat an aerosol-forming substrate positioned within or adjacent to the air flow channel; wherein the housing further comprises a second air inlet, the second air inlet positioned between the heater and the air outlet, the second air inlet configured to allow ambient air into the air flow channel, and wherein the second air inlet is larger than the first air inlet.

The provision of a second air inlet between the heater and the air outlet, in accordance with the present invention, allows a vaporized substrate to be rapidly cooled before it leaves the device through the air outlet. This cooling through the provision of the second air inlet allows the

NJOY Exhibit 1002.2208

outlet temperature to be controlled. The cooling process through the provision of the second air inlet also allows the optimal conversion of vapour into aerosol.

The second air inlet is larger than the first air inlet (that is, allows in more air). A larger inlet in this context means that for a given suction on the air outlet a greater flow of air is drawn through that inlet. So, for a given suction on the air outlet a greater flow of air is drawn through the second air inlet than the first air inlet. Preferably, the second air inlet allows an air flow at least five times larger than the air flow provided by the first air inlet. That is, for a given suction on the air outlet at least five times more air is drawn through the second air inlet than the first air inlet. This could be accomplished by forming the second air inlet from a greater number of apertures. This could also be accomplished by making apertures that make up the second air inlet larger than apertures that make up the first air inlet. This could also be acheived by a combination of more apertures that make up the second air inlet and larger apertures that make up the second air inlet. More preferably, the second air inlet is more than eight times larger than the first air inlet and may be fourteen times larger than the first air inlet.

The airflow past the heater or substrate need only be sufficient to move the vaporized substrate towards the second air inlet. The first air inlet and the air flow channel are preferably configured to provide for substantially laminar air flow between the first air inlet and the second air inlet when suction is applied to the air inlet. This provides efficient transport of vaporized substrate away from the heater. The second air inlet provides cooling air into the device to cool the vapour and control the condensation of the vapour. The second air inlet and the air flow channel are preferably configured to provide for turbulent air flow between the second air inlet and the air output in order to efficiently cool the air and condense the vapour.

The relative dimensions of the first and second air inlets can be selected to optimise the properties of the aerosol delivered to the user, or the total mass flow rate through the outlet. The mass flow rate is the mass flow rate through the first inlet and the mass flow rate through the second inlet. The total mass flow rate directly depends on the relative number and sizes of the apertures forming the first and second air inlets and can be altered to optimise the delivered aerosol for a given demanded temperature at the outlet. The number and sizes of the apertures forming the first and second air inlets can be found to maximise aerosol mass flow rate. The number and sizes of the apertures forming the first and second air inlets depends on the substrate composition. Different geometries will also exhibit different behaviours. The device may be configured to automatically alter the size of the first air inlet or second air inlet based on the composition of the aerosol-forming substrate, the temperature of the heater or a detected flow rate through a portion of the device

The device may comprise a main body part and a cartridge. The cartridge may contain the aerosol forming substrate. The consumable cartridge may be replaced when the supply of aerosol-forming substrate is exhausted. A portion of the housing of the device is preferably

NJOY Exhibit 1002.2209

formed by the consumable cartridge and includes the second air inlet or the first air inlet, or both the first and second air inlets. The heater may also be part of the cartridge. Preferably the capillary wick is also part of the cartridge. The consumable cartridge may also include a mouthpiece. An aerosol generating device, wherein the device comprises a cartridge, the cartridge comprising the aerosol forming substrate and wherein a portion of the housing is formed by the cartridge and includes the second air inlet or the first air inlet, or both the first and second air inlets.

The device housing may include a mouthpiece portion surrounding the air outlet, the device being configured such that suction by a user on the mouthpiece portion draws air through the first and second air inlets into the air flow channel. The device is preferably passive with respect to air flow, and so includes no fan or blower. However, it is possible to include a fan or other active airflow management component in the device if desired.

Preferably, the housing of the device is elongate. The housing may comprise any suitable material or combination of materials. Examples of suitable materials include metals, alloys, plastics or composite materials containing one or more of those materials, or thermoplastics that are suitable for food or pharmaceutical applications, for example polypropylene, polyetheretherketone (PEEK) and polyethylene. Preferably, the material is light and non-brittle.

The first air inlet may comprise a plurality of first apertures in the housing. The second air inlet may comprise a plurality of second apertures in the housing. The plurality of first and second apertures can be symmetrically disposed around the airflow channel. Preferably there are between one and five first apertures and between one and five second air apertures. More preferably there are between two and four first air inlets and between two and four second air inlets. Even more preferably, there are three first air inlets and three second air inlets. However, there may be 10 or more first and second air inlets and there may be an equal or unequal number of first air inlets and second air inlets, in any combination of numbers. .

The airflow channel may be configured in a number of ways. For example a heater may form part of a wall of the airflow channel. The airflow channel may surround the heater or may be formed only on one side of the heater. The airflow channel may not include a heater, but the wall or walls of the airflow channel could be the aerosol forming substrate. The airflow channel may have a substantially circular cross-section, or may have a substantially oval or substantially elliptical cross-section.

The vaporiser may be a heater. The heater may heat the aerosol-forming substrate means by one or more of conduction, convection and radiation. The heater may be an electric heater powered by an electric power supply. The heater may alternatively be powered by a non-electric power supply, such as a combustible fuel: for example, the heater may comprise a thermally conductive element that is heated by combustion of a gas fuel.

NJOY Exhibit 1002.2210

The heater is preferably an electric heater. The electric heater may comprise a single heating element. Alternatively, the electric heater may comprise more than one heating element for example two, or three, or four, or five, or six or more heating elements. The heating element or heating elements may be arranged appropriately so as to most effectively heat the aerosol-forming substrate.

The at least one electric heating element preferably comprises an electrically resistive material. Suitable electrically resistive materials include but are not limited to: semiconductors such as doped ceramics, electrically "conductive" ceramics (such as, for example, molybdenum disilicide), carbon, graphite, metals, metal alloys and composite materials made of a ceramic material and a metallic material. Such composite materials may comprise doped or undoped ceramics. Examples of suitable doped ceramics include doped silicon carbides. Examples of suitable metals include titanium, zirconium, tantalum and metals from the platinum group. Examples of suitable metal alloys include stainless steel, Constantan, nickel-, cobalt-, chromium-, aluminium- titanium- zirconium-, hafnium-, niobium-, molybdenum-, tantalum-, tungsten-, tin-, gallium-, manganese- and iron-containing alloys, and super-alloys based on nickel, iron, cobalt, stainless steel, Timetal®, iron-aluminium based alloys and iron-manganese-aluminium based alloys. Timetal® is a registered trade mark of Titanium Metals Corporation, 1999 Broadway Suite 4300, Denver Colorado. In composite materials, the electrically resistive material may optionally be embedded in, encapsulated or coated with an insulating material or vice-versa, depending on the kinetics of energy transfer and the external physicochemical properties required. The heating element may comprise a metallic etched foil insulated between two layers of an inert material. In that case, the inert material may comprise Kapton®, all-polyimide or mica foil. Kapton® is a registered trade mark of E.I. du Pont de Nemours and Company, 1007 Market Street, Wilmington, Delaware 19898, United States of America.

Alternatively, the at least one electric heating element may comprise an infra-red heating element, a photonic source or an inductive heating element.

The at least one electric heating element may take any suitable form. For example, the at least one electric heating element may take the form of a heating blade. Alternatively, the at least one electric heating element may take the form of a casing or substrate having different electro-conductive portions, or an electrically resistive metallic tube. The liquid storage portion may incorporate a disposable heating element. Alternatively, if the aerosol-forming substrate is liquid, one or more heating needles or rods that run through the liquid aerosol-forming substrate may also be suitable. Alternatively, the at least one electric heating element may be a disk (end) heater or a combination of a disk heater with heating needles or rods. Alternatively, the at least one electric heating element may comprise a flexible sheet of material. Other alternatives include a heating wire or filament, for example a nickel-chromium (Ni-Cr), platinum, tungsten or alloy wire, or a heating plate. Optionally, the heating element may be deposited in or on a rigid

NJOY Exhibit 1002.2211

carrier material.

The at least one electric heating element may comprise a heat sink, or heat reservoir comprising a material capable of absorbing and storing heat and subsequently releasing the heat over time to heat the aerosol-forming substrate. The heat sink may be formed of any suitable material, such as a suitable metal or ceramic material. Preferably, the material has a high heat capacity (sensible heat storage material), or is a material capable of absorbing and subsequently releasing heat via a reversible process, such as a high temperature phase change. Suitable sensible heat storage materials include, for example, silica gel, alumina, carbon, glass mat, glass fibre, minerals, a metal or alloy such as aluminium, silver or lead, and a cellulose material. Other suitable materials which release heat via a reversible phase change include paraffin, sodium acetate, naphthalene, wax, polyethylene oxide, a metal, metal salt, a mixture of eutectic salts or an alloy.

The heat sink may be arranged such that it is directly in contact with the aerosol-forming substrate and can transfer the stored heat directly to the substrate. Alternatively, the heat stored in the heat sink or heat reservoir may be transferred to the aerosol-forming substrate by means of a heat conductor, such as a metallic tube.

The at least one heating element may heat the aerosol-forming substrate by means of conduction. The heating element may be at least partially in contact with the substrate. Alternatively, the heat from the heating element may be conducted to the substrate by means of a heat conductor.

In addition, or alternatively, the at least one heating element may transfer heat to the incoming ambient air that is drawn through the aerosol generating device during use, which in turn heats the aerosol-forming substrate by convection. The ambient air may be heated before passing through the aerosol-forming substrate. Alternatively, the ambient air may be first drawn through the liquid substrate and then heated.

The aerosol-forming substrate may be a solid aerosol-forming substrate. The aerosol-forming substrate preferably comprises a tobacco material comprising volatile tobacco flavour compounds which are released from the substrate upon heating. The aerosol-forming substrate may comprise a non-tobacco material. The aerosol-forming substrate may comprise tobacco material and non-tobacco containing material. Preferably, the aerosol-forming substrate further comprises an aerosol former that facilitates the formation of a dense and stable aerosol. Examples of suitable aerosol formers are glycerine and propylene glycol.

However, in a preferred embodiment, the aerosol-forming substrate is a liquid aerosol-forming substrate. The liquid aerosol-forming substrate preferably has physical properties, for example boiling point and vapour pressure, suitable for use in the aerosol generating device. If the boiling point is too high, it may not be possible to vaporize the liquid but, if the boiling point is too low, the liquid may vaporize too readily. The liquid preferably comprises a tobacco

NJOY Exhibit 1002.2212

material comprising volatile tobacco flavour compounds which are released from the liquid upon heating. Alternatively, or in addition, the liquid may comprise a non-tobacco material. The liquid may include aqueous solutions, non-aqueous solvents such as ethanol, plant extracts, nicotine, natural or artificial flavours or any combination of these. Preferably, the liquid further comprises an aerosol former. Examples of suitable aerosol formers are glycerine and propylene glycol.

If the aerosol-forming substrate is a liquid substrate, the aerosol generating device may further comprise a liquid storage portion for storing the liquid aerosol-forming substrate. An advantage of providing a liquid storage portion is that the liquid in the liquid storage portion is protected from ambient air (because air cannot generally enter the liquid storage portion). It can also be protected from light. By protecting the liquid from air and light, the risk of degradation of the liquid is significantly reduced. Moreover, a high level of hygiene can be maintained. The liquid storage portion may not be refillable. Thus, when the liquid in the liquid storage portion has been used up, the aerosol generating device is replaced. Alternatively, the liquid storage portion may be refillable. In that case, the aerosol generating device may be replaced after a certain number of refills of the liquid storage portion. Preferably, the liquid storage portion is arranged to hold liquid for a pre-determined number of puffs. If the aerosol generating device comprises a first portion having a mouthpiece and a second portion opposite the first portion, the liquid storage portion may be contained in the first portion or in the second portion.

The aerosol-forming substrate may alternatively be any other sort of substrate, for example, a gas substrate, or any combination of the various types of substrate.

If the aerosol-forming substrate is a liquid aerosol-forming substrate, the heater of the aerosol generating device may comprise a capillary wick for conveying the liquid aerosol-forming substrate by capillary action. Preferably, the capillary wick is arranged to be in contact with liquid in the liquid storage portion. Preferably, the capillary wick extends into the liquid storage portion. In that case, in use, liquid is transferred from the liquid storage portion by capillary action in the capillary wick. In one embodiment, liquid in one end of the capillary wick is vaporized to form a supersaturated vapour. The supersaturated vapour is mixed with and carried in the air flow. During the flow, the vapour condenses to form the aerosol and the aerosol is carried towards the mouth of a user. The liquid aerosol-forming substrate has physical properties, including surface tension and viscosity, which allow the liquid to be transported through the capillary wick by capillary action.

The capillary wick may have a fibrous or spongy structure. The capillary wick preferably comprises a bundle of capillaries. For example, the capillary wick may comprise a plurality of fibres or threads or other fine bore tubes. The fibres or threads may be generally aligned in the longitudinal direction of the aerosol generating device. Alternatively, the capillary wick may comprise sponge-like or foam-like material formed into a rod shape. The rod shape may extend along the longitudinal direction of the aerosol generating device. The structure of the wick forms

NJOY Exhibit 1002.2213

a plurality of small bores or tubes, through which the liquid can be transported by capillary action. The capillary wick may comprise any suitable material or combination of materials. Examples of suitable materials are capillary materials, for example a sponge or foam material, ceramic- or graphite-based materials in the form of fibres or sintered powders, foamed metal or plastics material, a fibrous material, for example made of spun or extruded fibres, such as cellulose acetate, polyester, or bonded polyolefin, polyethylene, terylene or polypropylene fibres, nylon fibres or ceramic. The capillary wick may have any suitable capillarity and porosity so as to be used with different liquid physical properties. The liquid has physical properties, including but not limited to viscosity, surface tension, density, thermal conductivity, boiling point and vapour pressure, which allow the liquid to be transported through the capillary system by capillary action. The capillary wick must be suitable so that the required amount of liquid can be delivered to the heater.

Alternatively, instead of a capillary wick, the aerosol generating device may comprise any suitable capillary or porous interface between the liquid aerosol-forming substrate and the heater, for conveying the desired amount of liquid to the heater.

The liquid storage portion is preferably a container. The liquid storage portion may not be refillable. Thus, when the liquid in the liquid storage portion has been used up, the aerosol generating device is replaced. Alternatively, the liquid storage portion may be refillable. In that case, the aerosol generating device may be replaced after a certain number of refills of the liquid storage portion. Preferably, the liquid storage portion is arranged to hold liquid for a pre-determined number of puffs.

In one preferred embodiment, the aerosol-forming substrate is a liquid aerosol-forming substrate, the aerosol generating device comprises a liquid storage portion for storing the liquid aerosol-forming substrate, an electric heater and a capillary wick. In that embodiment, preferably the capillary wick is arranged to be in contact with liquid in the liquid storage portion. In use, liquid is transferred from the liquid storage portion towards the electric heater by capillary action in the capillary wick. In one embodiment, the capillary wick has a first end and a second end, the first end extending into or next to the liquid storage portion for contact with liquid therein and the electric heater being arranged to heat liquid in the second end. When the heater is activated, the liquid at the second end of the capillary wick is vaporized by the heater to form the supersaturated vapour. The supersaturated vapour is mixed with and carried in the air flow. Air from the second air inlet then mixes with the vapour and the vapour condenses to form the aerosol and the aerosol is carried towards the mouth of a user.

In another aspect of the invention, there is provided a cartridge comprising:

an aerosol-forming substrate;

a heater configured to heat the aerosol-forming substrate, the heater positioned within or adjacent to an air flow channel through the cartridge;

NJOY Exhibit 1002.2214

the air flow channel terminating at an outlet through which, in use, aerosol is delivered to a user;

and an air inlet in an external surface of the cartridge, the air inlet configured to allow air into the air flow channel at a position between the heater and the outlet, wherein the air inlet and the air flow channel are configured to give rise to turbulent air flow through the air flow channel when suction is applied to the outlet.

The cartridge may include a mouthpiece. The cartridge may be configured to be connected to a main body of an aerosol generating device comprising a power source for providing power to the heater. The cartridge may also include a further air inlet or set of air inlets upstream of the air inlet.

Preferably, the device further includes means for dynamically controlling air flow rate through either the first air inlet or the second air inlet by changing the size of either first or second air inlet. This may comprise means for partially blocking the first or second inlet, such as a mechanical shutter element. The partial blocking may take the form of completely blocking some of a plurality of apertures that comprise either the first or second inlet. It may be desirable to dynamically control the flow rate of air through the first air inlet or second air inlet based on, for example, the composition of the aerosol-forming substrate, the temperature of the heater or a detected flow rate through a portion of the device. It may be feasible to impact the mass air flow rate with a restrictor valve.

The aerosol generating device may be electrically operated and may further comprise an electric power supply. If the aerosol generating device comprises a consumable cartridge and a main body, the electric power supply may be contained in the cartridge or the main body. Preferably, the electric power supply is contained in the main body.

The aerosol generating device may further comprise electric circuitry. In one embodiment, the electric circuitry comprises a sensor to detect air flow indicative of a user taking a puff on the air outlet. In that case, preferably, the electric circuitry is arranged to provide an electric current pulse to the electric heater when the sensor senses a user taking a puff. Preferably, the time-period of the electric current pulse is pre-set, depending on the amount of liquid desired to be vaporized. The electric circuitry is preferably programmable for this purpose. Alternatively, the electric circuitry may comprise a manually operable switch for a user to initiate a puff. The time-period of the electric current pulse is preferably pre-set depending on the amount of liquid desired to be vaporized. The electric circuitry is preferably programmable for this purpose. If the aerosol generating device comprises a consumable cartridge and a main body, the electric circuitry may be contained in the cartridge or the main body. Preferably, the electric circuitry is contained in the main body.

Preferably, the aerosol generating device is portable. The aerosol generating device may be a smoking device. The aerosol generation device may have a size comparable to a

NJOY Exhibit 1002.2215

conventional cigar or cigarette. The smoking device may have a total length between approximately 30 mm and approximately 150 mm. The smoking device may have an external diameter between approximately 5 mm and approximately 30 mm.

Preferably, the aerosol generating device is an electrically operated smoking device.

In a further aspect of the invention, there is provided a method of delivering an aerosol from an aerosol-forming substrate comprising the steps of:

vaporizing the aerosol-forming substrate in a first chamber through which air is flowing towards a second chamber,

condensing the vaporized substrate in the second chamber, including the step of supplying ambient air to the second chamber through an ambient air inlet, to generate an aerosol; and

delivering the aerosol from the second chamber through an outlet in the second chamber. The rate of supply of ambient air may be selected to provide a maximum aerosol mass flow rate from the second chamber.

Features described in relation to one aspect of the invention may be applicable to another aspect of the invention. In particular, features described in relation to the aerosol generating device may also be applicable to the cartridge.

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

Figure 1 shows an embodiment of an aerosol generating device according to the invention;

Figure 2 is a schematic illustration of the air flow paths in a device of the type shown in Figure 1;

Figure 3 is a schematic illustration of the air flow paths in an alternative design in accordance with the invention; and

Figure 4 is a plot of the mass of aerosol delivered to a user versus A, a parameter relating the size of the first and second inlets.

Figure 1 is a schematic illustration of one example of an aerosol generating device according to the invention. In Figure 1, the device is an electrically operated smoking device having a liquid storage portion. The smoking device 100 of Figure 1 comprises a first end which is the mouthpiece end 103 and a second end which is the body end 105. In the body end 105, there is provided an electric power supply in the form of battery 107 and electric circuitry in the form of hardware 109 and puff detection system 111. In the mouthpiece end 103, there is provided a liquid storage portion in the form of cartridge 113 containing liquid 115, a capillary wick 117 and a heater 119. Note that the heater is only shown schematically in Figure 1. In the exemplary embodiment shown in Figure 1, one end of capillary wick 117 extends into liquid storage portion 113 and the other end of capillary wick 117 is surrounded by the heater 119.

NJOY Exhibit 1002.2216

The heater is connected to the electric circuitry via connections 121, which may pass along the outside of liquid storage portion 113 (not shown in Figure 1). The housing is formed in two parts with the portion of the housing including the mouthpiece end and the liquid storage portion 113 being a consumable cartridge and the body end of the housing being a reusable main body portion of the device. The position of the join between the cartridge and the main body of the device is not shown in Figure 1 and may be selected by the designer. The housing 101 includes two air inlets 123 and 124 and an air outlet 125. In use, air flow through the device is provided by a user inhaling at the air outlet to draw air through the first and second inlets. The first air inlet 123 is positioned upstream of the heater, that is with the heater positioned between the first inlet and the air outlet 125. The second air inlet is positioned downstream of the heater i.e. between the heater and the air outlet.

In use, operation is as follows. Liquid 115 is conveyed by capillary action from the cartridge 113 from the end of the wick 117 which extends into the cartridge to the other end of the wick which is surrounded by heater 119. When a user draws on the aerosol generating device at the air outlet 125, ambient air is drawn through air inlet 123. In the arrangement shown in Figure 1, the puff detection system 111 senses the puff and activates the heater 119. The battery 107 supplies electrical energy to the heater 119 to heat the end of the wick 117 surrounded by the heater. The liquid in that end of the wick 117 is vaporized by the heater 119 to create a supersaturated vapour. At the same time, the liquid being vaporized is replaced by further liquid moving along the wick 117 by capillary action. The supersaturated vapour created is mixed with and carried in the air flow from the air inlet 123 towards the outlet 125. In the aerosol forming chamber 127, the vapour condenses to form an inhalable aerosol, which is carried towards the outlet 125 and into the mouth of the user. Ambient air is drawn into the aerosol forming chamber 127 through the second air inlet 124 when a user inhales. This ambient air mixes with the vapour to cool it and accelerate condensation. This cooling air provides aerosol with a desirable droplet size and density as well as ensuring a desirable temperature for the air aerosol entering the user's mouth.

In the embodiment shown in Figure 1, the hardware 109 and puff detection system 111 are preferably programmable. The hardware 109 and puff detection system 111 can be used to manage the aerosol generating device operation.

Figure 1 shows one example of an aerosol generating device according to the present invention. Many other examples are possible, however. The aerosol generating device simply needs to include a heater for vaporizing the aerosol-forming substrate, at least one air outlet, and at least two air inlets, one of which is between the heater and the outlet. For example, the device need not be electrically operated. For example, the device need not be a smoking device. For example, the aerosol-forming substrate need not be a liquid aerosol-forming substrate. Moreover, even if the aerosol-forming substrate is a liquid aerosol-forming substrate,

NJOY Exhibit 1002.2217

the device may not include a capillary wick. In that case, the device may include another mechanism for delivering liquid for vaporization. For example, a puff detection system need not be provided. Instead, the device could operate by manual activation, for example the user operating a switch when a puff is taken. For example, the overall shape and size of the aerosol generating device could be altered. For example, the consumable cartridge may comprise only internal elements or only the liquid storage portion 113 and may form no part of the housing 101. Alternatively there may be no consumable cartridge and the device may be refillable or non-refillable.

As discussed above, according to the invention, the aerosol generating device includes at least two air inlets, one of which is positioned between the heater and the outlet in the direction of gas flow through the device. An embodiment of the invention will now be described with reference to Figure 2. The embodiment is based on the example shown in Figure 1, although is applicable to other embodiments of aerosol generating devices. Note that Figures 1, 2 and 3 are schematic in nature. In particular, the components shown are not necessarily to scale either individually or relative to one another.

Figure 2 is an illustration of the air flow paths in a device of the type shown in Figure 1. Figure 2 illustrates a liquid storage portion 113 containing liquid aerosol-forming substrate 115. A wick 117 delivers the liquid to heater 119. Air is drawn into the housing through first apertures forming the first inlet 123 when a user inhales at outlet 125. The first air apertures 123 are configured to provide a laminar flow of air past the heater to transport vaporized substrate away from the vicinity of the heater towards the outlet and are arranged symmetrically around the housing. The first apertures and the air flow channel are shaped to encourage laminar air flow past the heaters. Ambient air is also drawn into the housing through second air apertures forming second air inlet 124 provided downstream of the heater 119. The ambient air is cooler that the mixture of air and vapour that has been heated by the heater and so the ambient air from the second air inlets cool the air and vapour travelling towards the outlet. Second air apertures are configured to provide an air flow that mixes with the air and vapours travelling towards the outlet and to create a turbulent flow in order to maximise the cooling effect. In Figure 2, they are shown as defining second air inlet channels transverse to the laminar flow of air past the heater.

The cooling effect of the air from the second air inlet means that the vaporized substrate condenses more rapidly than it would in the absence of the second air inlets. The design of the first air inlets and second air inlets, in particular both their absolute and relative sizes, affects the properties and amount of aerosol delivered to the user at the outlet 125. The more ambient air that is drawn through the second air inlets, the more of the vaporized aerosol is condensed and an aerosol with better physical attributes can be provided to the user.

NJOY Exhibit 1002.2218

Figure 3 shows an alternative design for the air flow through the device. In Figure 3 the substrate 115 is provided within the housing 301 in a hollow cylindrical carrier material that surrounds the air flow channel. The heater 119 is provided within the airflow channel. The first air inlet 323 is positioned upstream of the heater and the second air inlets 324 positioned downstream of the heater closer to the outlet 325. Again the second air inlet provides an incoming flow of air transverse to the flow of air past the heater in order to ensure good mixing. It should be clear that many alternative geometries are possible using the same separation of an initial air flow to transport vapour and a second air flow to provide cooling.

The relative dimensions of the first and second air inlets can be selected to optimise the properties of the aerosol delivered to the user. As shown in Figures 2 and 3 the total mass flow rate through the outlet 125 is Q. The mass flow rate through the first inlet is Q_1 and the mass flow rate through the second inlet 124 is Q_2. The relationship between the flow rates is:

$$Q = Q_1 + Q_2 = AQ + (1-A)Q$$

The parameter A directly depends on the relative number and sizes of the apertures forming the first and second air inlets and can be altered to optimise the delivered aerosol for a given demanded temperature at the outlet. Figure 4 is a plot of the mass flow rate versus A for three different substrate materials, water, glycerine (G) and propylene glycol (PG) flowing through a device with a diameter of 8.4 mm at a velocity of 0.5m/s with a room temperature of 20 °C and an outlet temperature of 40°C. It can be clearly seen that a value of A can be found to maximise aerosol mass flow rate and that that value depends on the substrate composition. Different geometries will also exhibit different behaviours.

It can also be seen that the maximum aerosol mass flow rate is found when the second air inlets are larger than the first air inlet. In the case of glycerine, the second air inlet needs to be about 10 times larger than the first air inlet. This can be understood by considering that the airflow past the heater and/or substrate from the first inlet need only be sufficient to move the vaporized substrate towards the second air inlet. If the first air inlet and air flow channel is configured to provide for substantially laminar air flow between the first air inlet and the second air inlet, the air flow required to efficiently transport vaporized substrate away from the heater is very small. In contrast, the second air inlet provides cooling air into the device to control the condensation of the vapour and for rapid cooling requires relatively large flow rate through the second air inlet. The second air inlet and air flow channel is preferably configured to provide for turbulent air flow between the second air inlet and the air output in order to efficiently cool the air and condense the vapour.

If the device allows for cartridges containing different substrate compositions to be used, then the cartridges can be designed to include either or both of the first and second air inlets, optimised for the particular composition that they contain.

NJOY Exhibit 1002.2219

It is also possible to include a mechanically movable shutter or sleeve to selectively block one or more apertures forming the first or second air inlet, so as to alter the parameter Alpha. This alteration may be achieved manually or automatically under the control of the electric circuitry. Furthermore, the geometry of the airflow channel and of the first and second air inlets may take many forms. The optimal geometry for a particular device and application may be determined empirically or theoretically.

NJOY Exhibit 1002.2220

CLAIMS

1. An aerosol generating device comprising:

a housing having a first air inlet and an air outlet, the housing defining an air flow channel between the first air inlet and the air outlet; and

a heater configured to heat an aerosol-forming substrate positioned within or adjacent to the air flow channel;

wherein the housing further comprises a second air inlet, the second air inlet positioned between the heater and the air outlet, the second air inlet configured to allow air into the air flow channel and wherein the second air inlet is larger than the first air inlet.

2. An aerosol generating device according to claim 1, wherein the second air inlet is at least five times larger than the first inlet.

3. An aerosol generating element according to claim 1 or 2 wherein the second air inlet and the air channel are configured to give rise to turbulent air flow through the air flow channel between the second air inlet and the air outlet when suction is applied to the air outlet.

4. An aerosol generating device according to any preceding claim, wherein the second air inlet comprises a plurality of second apertures in the housing.

5. An aerosol generating device according to any preceding claim, wherein the first air inlet comprises a plurality of first apertures in the housing.

6. An aerosol generating device according to any preceding claim, wherein the housing comprises a mouthpiece portion surrounding the air outlet, such that suction on the mouthpiece draws air into the air flow channel through the first and second air inlets.

7. An aerosol generating device according to any preceding claim, wherein the device comprises a cartridge, the cartridge comprising the aerosol forming substrate and wherein a portion of the housing is formed by the cartridge and includes the second air inlet or the first air inlet, or both the first and second air inlets.

8. An aerosol generating element according to any preceding claim wherein the first air inlet and the air channel are configured to give rise to laminar air flow through the air flow channel when suction is applied to the air outlet.

NJOY Exhibit 1002.2221

9. An aerosol generating device according to any preceding claim wherein the aerosol-forming substrate is a liquid substrate.

10. An aerosol generating device according to any preceding claim further including means for altering the size of either the first air inlet or the second air inlet.

11. An aerosol generating device according to claim 10 wherein the device is configured to automatically alter the size of the first air inlet or second air inlet based on the composition of the aerosol-forming substrate, the temperature of the heater or a detected flow rate through a portion of the device.

12. An aerosol generating device according to any preceding claim wherein the device is an electrically operated smoking device.

13. A cartridge comprising:

an aerosol-forming substrate;

a heater configured to heat the aerosol-forming substrate, the heater positioned within or adjacent to an air flow channel through the cartridge;

the air flow channel terminating at an outlet through which, in use, aerosol is delivered to a user; and

an air inlet in an external surface of the cartridge, the air inlet configured to allow air into the air flow channel at a position between the heater and the outlet, wherein the air inlet and the air flow channel are configured to give rise to turbulent air flow through the air flow channel when suction is applied to the outlet.

14. A consumable cartridge according to claim 13, wherein the cartridge is configured to be connected to a main body of an aerosol generating device comprising a power source for providing power to the heater.

15. A method of delivering an aerosol from an aerosol-forming substrate comprising the steps of:

vaporizing the aerosol-forming substrate in a first chamber through which air is flowing towards a second chamber,

condensing the vaporized substrate in the second chamber, including the step of supplying ambient air to the second chamber through an ambient air inlet, to generate an aerosol, at a rate selected to provide a maximum aerosol mass flow rate from the second chamber, and

NJOY Exhibit 1002.2222

delivering the aerosol from the second chamber through an outlet in the second chamber.

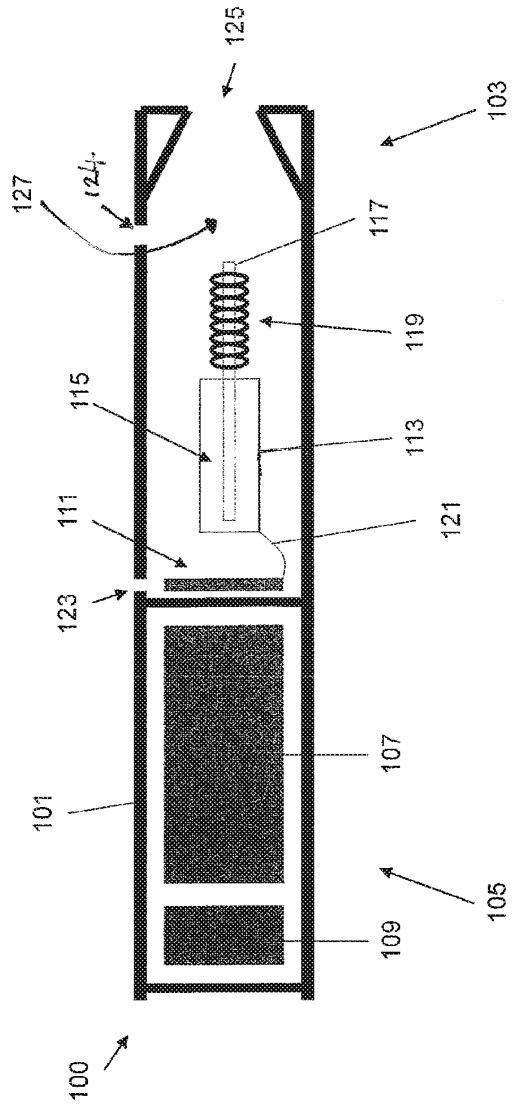
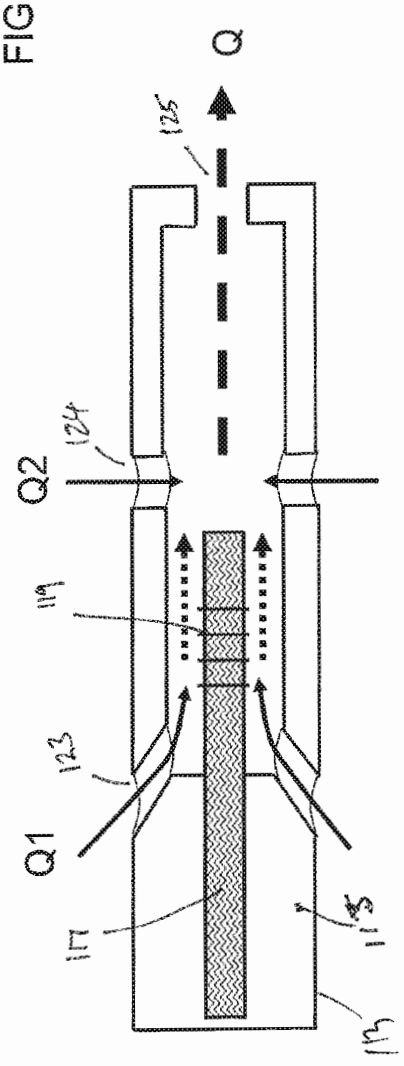


Figure 1

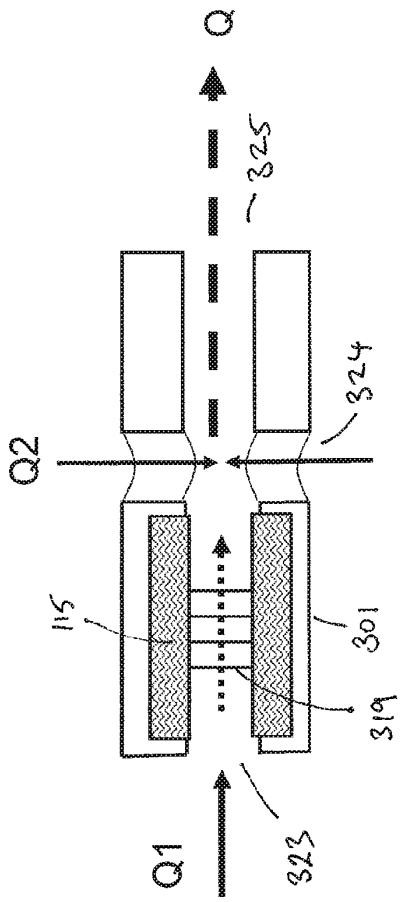
NJOY Exhibit 1002.2224

FIG 2



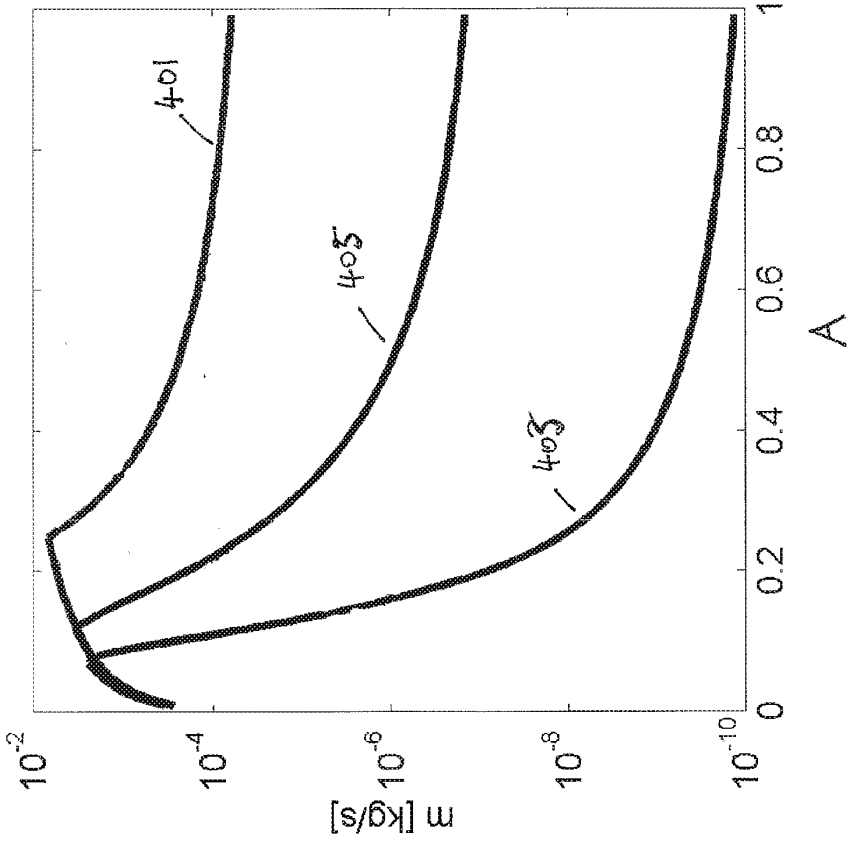
NJOY Exhibit 1002.2225

FIG 3



NJOY Exhibit 1002.2226

FIG 4



NJOY Exhibit 1002.2227

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/074514

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24F47/00 A61M15/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A24F A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 845 220 A1 (JAPAN TOBACCO INC [JP]) 3 June 1998 (1998-06-03) column 5, line 31 - column 8, line 28; figures	1-15
X	WO 2007/098337 A2 (BRENNEISE JAKE [US]) 30 August 2007 (2007-08-30) page 5, line 6 - page 12, line 20; claims; figures	13-15
A	EP 0 430 559 A2 (PHILIP MORRIS [US] PHILIP MORRIS PROD [US]) 5 June 1991 (1991-06-05) figure 6	1-15
A	WO 99/63844 A1 (REYNOLDS TOBACCO CO R [US]; WHITE JACKIE LEE [US]) 16 December 1999 (1999-12-16) page 14, line 4 - page 17, line 2; figures	1-15

-/--

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 March 2013	22/03/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Marzano Monterosso

1

Form PCT/ISA/210 (second sheet) (April 2005)

NJOY Exhibit 1002.2228

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 198 54 012 A1 (REEMTSMA H F & PH [DE]) 18 May 2000 (2000-05-18) the whole document	1-15
A	GB 2 468 512 A (BRITISH AMERICAN TOBACCO CO [GB]) 15 September 2010 (2010-09-15) the whole document	1-15

NJOY Exhibit 1002.2229

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2012/074514

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0845220 A1	03-06-1998	CN 1196660 A	21-10-1998
		DE 69724559 D1	09-10-2003
		DE 69724559 T2	15-07-2004
		EP 0845220 A1	03-06-1998
		JP 3325028 B2	17-09-2002
		KR 100264617 B1	01-09-2000
		WO 9748293 A1	24-12-1997
WO 2007098337 A2	30-08-2007	US 2011120482 A1	26-05-2011
		WO 2007098337 A2	30-08-2007
EP 0430559 A2	05-06-1991	AT 118992 T	15-03-1995
		AU 646415 B2	24-02-1994
		AU 6762090 A	06-06-1991
		CA 2031225 A1	02-06-1991
		DE 69017371 D1	06-04-1995
		DE 69017371 T2	12-10-1995
		DK 0430559 T3	01-05-1995
		EP 0430559 A2	05-06-1991
		ES 2069027 T3	01-05-1995
		JP 3232481 A	16-10-1991
		JP 3392138 B2	31-03-2003
		NO 905150 A	03-06-1991
		TR 25316 A	01-01-1993
		US 5144962 A	08-09-1992
WO 9963844 A1	16-12-1999	AU 4544899 A	30-12-1999
		US 6164287 A	26-12-2000
		WO 9963844 A1	16-12-1999
DE 19854012 A1	18-05-2000	AU 1551000 A	05-06-2000
		DE 19854012 A1	18-05-2000
		EP 1128742 A1	05-09-2001
		WO 0028844 A1	25-05-2000
GB 2468512 A	15-09-2010	NONE	

NJOY Exhibit 1002.2230

(12) 특허협력조약에 의하여 공개된 국제출원

(19) 세계지식재산권기구
국제사무국

(43) 국제공개일
2013 년 6 월 20 일 (20.06.2013)

WIPO | PCT

(10) 국제공개번호
WO 2013/089358 A1

(51) 국제특허분류:
A24F 47/00 (2006.01) *A24D 1/14* (2006.01)
A61M 15/06 (2006.01)

(21) 국제출원번호: PCT/KR2012/009780

(22) 국제출원일: 2012 년 11 월 19 일 (19.11.2012)

(25) 출원언어: 한국어

(26) 공개언어: 한국어

(30) 우선권정보:
10-2011-0133404 2011 년 12 월 13 일 (13.12.2011) KR

(72) 발명자; 겸
(71) 출원인 : 최상진 (CHOI, Sang Jin) [KR/KR]; 604-757 부산시 사하구 다대로 429 번길 20 201 동 503 호(다대동, 삼환아파트), Busan (KR).

(74) 대리인: 김석계 (KIM, Seok Kea); 621-040 경상남도 김해시 봉황동 461-3 김석계특허법률사무소, Gyeongsangnam-do (KR).

(81) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 국내 권리의 보호를 위하여): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

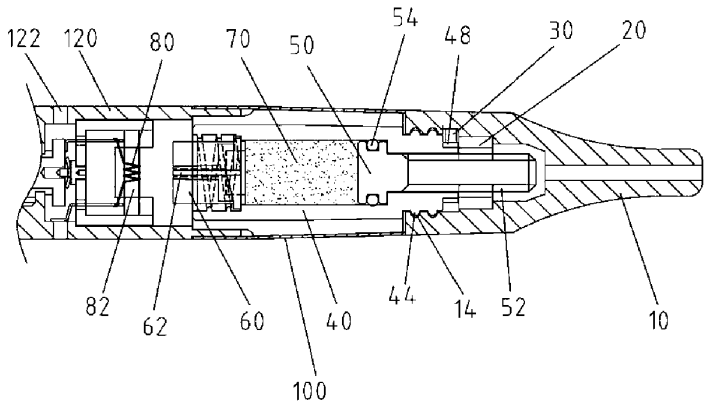
(84) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 역내 권리의 보호를 위하여): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), 유라시아 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 유럽 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

공개:

— 국제조사보고서와 함께 (조약 제 21 조(3))

(54) Title: ELECTRONIC CIGARETTE

(54) 발명의 명칭 : 전자담배



(57) Abstract: An electronic cigarette, according to the present invention, comprises inside a case a cartridge (40) a vaporizing means (80) and a battery (90), so that a liquid agent (70) that is inside the cartridge is vaporized by the vaporizing means, which is actuated by receiving power supplied by the battery, thereby allowing air containing the liquid agent that is vaporized to be aspirated through an aspiration pipe (10), wherein the cartridge (40) is comprised in the shape of a syringe provided with a nozzle (60) on one side and a piston (50) on the other side, wherein the piston (50) is comprised so as to enter the cartridge by means of a moving means and spray the liquid agent (70) that is inside the cartridge through a nozzle spray hole (62), wherein the vaporizing means (80), which is installed on a position that is a predetermined distance away from the front of the nozzle (60), receives the liquid agent that is sprayed through the nozzle spray hole and vaporizes same, thereby significantly extending the lifespan of the cartridge by allowing only a very small amount of natural evaporation.

(57) 요약서:

[다음 쪽 계속]

NJOY Exhibit 1002.2231

WO 2013/089358 A1

본 발명의 전자 담배는, 케이스 내에 카트리지(40)와 기화수단(80) 및 배터리(90)가 내장되어 상기 배터리의 전원을 공급받아 작동하는 기화수단에 의하여 카트리지 내에 담겨있는 액제(70)를 기화시켜 케이스 일측에 결합되어 있는 흡입파이프(10)를 통하여 기화된 액제를 포함하고 있는 공기를 흡입할 수 있게 구성된 전자담배에 있어서; 상기 카트리지(40)는 일측에 노즐(60)이 설치되고 타측에는 피스톤(50)이 설치된 주사기 형태로 구성되고, 상기 피스톤(50)은 피스톤 이동수단에 의하여 카트리지 내로 진입되어 카트리지 내에 담겨있는 액제(70)를 노즐 분사구멍(62)을 통하여 분사할 수 있게 구성되며, 상기 노즐(60)의 앞쪽에 일정거리 떨어진 위치에 설치된 기화수단(80)이 노즐 분사구멍을 통하여 분사된 액제를 공급받아 기화시킬 수 있게 구성된 것이 특징인 전자담배로서, 노즐구멍을 통한 매우 적은 양의 자연증발만 이루어지므로 카트리지 사용기간이 크게 증가하는 효과가 있다

NJOY Exhibit 1002.2232

명세서

발명의 명칭: 전자담배

기술분야

[1] 본 발명은 전자담배에 관한 것으로, 보다 상세하게는, 케이스 내에 카트리지와 기화수단 및 배터리가 내장되어 상기 배터리의 전원을 공급받아 작동하는 기화수단에 의하여 카트리지 내에 담겨있는 액제를 기화시켜 케이스 일측에 결합되어 있는 흡입파이프를 통하여 기화된 액제를 포함하고 있는 공기를 흡입할 수 있게 구성된 전자담배에 있어서; 상기 카트리지는 일측에 노즐이 설치되고 타측에는 피스톤이 설치된 주사기 형태로 구성되고, 상기 피스톤은 피스톤 이동수단에 의하여 카트리지 내로 진입되어 카트리지 내에 담겨있는 액제를 노즐의 분사구멍을 통하여 분사할 수 있게 구성되며, 상기 기화수단은 노즐의 앞쪽에 일정거리 떨어진 위치에 설치되어 노즐 분사구멍을 통하여 분사된 액제를 공급받아 기화시킬 수 있게 구성된 것이 특징인 전자담배에 관한 것이다.

배경기술

[2] 담배는 기호품이기는 하나 인체에 여러 가지 질병을 초래함은 익히 잘 알려져 있다.

[3] 따라서, 금연운동이 사회적으로 널리 전개되고 있으나 이미 흡연을 하고 있는 애연가들은 그 중독성과 습관성 때문에 쉽사리 끊지 못하고 있어서 큰 실효를 거두고 있지 못하는 실정이다.

[4] 최근에는 담배를 끊을 수 있도록 도와주는 전자 담배가 개발되어 사용되고 있는 데, 상기 전자담배는 니코틴 등을 포함한 액제를 기화시켜 연기를 생성하므로 흡연욕구를 충족시킬 수 있을 뿐만 아니라, 일반 흡연식 담배와 달리 타르 등의 유해물질을 배출하지 않고 불쾌한 냄새가 나지 않는 장점이 있다.

[5] 전자담배에 관한 종래의 기술로서, 전자 금연 담배(등록번호 10-0860566, 등록일자 2008년09월22일)에는, "내부 수용공간을 갖으며 일측에 흡입구가 형성된 흡입수단; 상기 수용공간에 수용되어 전원을 공급하는 전원공급수단; 및 상기 전원공급수단에서 공급되는 전원에 의해 구동되고, 내부에 액체가 충진된 상태의 섬유 부재가 수용된 필터 부재 및 상기 섬유 부재에 충진된 액체가 기체로 변환되도록 초음파를 발생시키는 초음파발생 부재를 구비한 기체변환수단을 포함하는 것을 특징으로 하는 전자 금연 담배"가 개시되어 있다.

[6] 또 다른 전자담배에 관한 종래의 기술로서, 금연 보조기구(등록번호 10-0846401, 등록일자 2008년07월09일)에는, "담배를 줄이거나 끊을 수 있도록 담배 대용품으로 사용할 수 있는 금연 보조기구를 구성함에 있어서, 관체 형상으로 되어 선단 및 후단 내측에 암나사부가 형성된 동체;와, 상기 동체 선단 내경에 건전지가 삽입되는 공간상의 내측벽면에 장착되는 얇은 박판형태의

NJOY Exhibit 1002.2233

도체; 상기 도체의 일측 하단에 위치하며 후술하는 빨대 흡입시 흡입공기에 의해 온오프되는 스위치; 저면에 도전판이 부착형성되고 외주면에 외기유입통로가 1~다수개 형성되며 투명 또는 반투명 합성수지나 유리로 형성된 램프커버; 상기 램프커버의 도전판과 도체가 접촉 설치되며 빨대 흡입시 흡입되는 공기에 의해 스위치가 접속될 때 마치 담배불처럼 빨갛게 켜지도록 된 엘이디로 구비되는 발광램프;와, 상기 동체의 내부 중앙 부위에 장착고정되며 다수의 미세구멍을 가진 케이스 내부에 솜 또는 스폰지로 이루어진 흡수부재가 충진됨과 동시에 상기 흡수부재 중앙부에 후단에 발열체가 장착 구성된 약제 유도관을 삽입설치하되, 상기 약제유도관 후단부에는 상기 발열체와 망커버를 씌워서 된 연기발생장치;와, 상기 동체의 후미에 체결 결합되는 빨대와, 상기 빨대의 선단에 결합되며 담배의 냄새와 맛과 냄새를 가지면서 니코친과 타르가 전혀없는 약제를 흡수한 솜 또는 스폰지로 이루어진 흡수재가 내장되고 빨대에 결합시켰을 때 빨대와 통공이 형성됨과 동시에 약제가 함유된 흡수재가 망커버에 밀착된 상태이기에 평상시에 약재가 망커버를 통하여 흡수부재에 흡입되는 상태가 되도록 유도하는 약제통;으로 이루어짐을 특징으로 하는 금연보조기구"가 개시되어 있다.

[7] 그러나, 상기한 바와 같은 종래의 전자담배는 카트리지 내의 용액을 기화수단에 공급하기 위하여 필터부재나 흡수부재를 사용함으로써 사용시나 보관시에 카트리지 내의 용액이 필터부재나 흡수부재를 통하여 카트리지 외부로 흘러나와 내장된 부품들을 오염시키는 문제가 있었으며, 또한 필터부재 또는 흡수부재의 노출된 표면에서 지속적으로 발생하는 휘발성분의 자연증발로 카트리지 내의 용액 농도가 증가하는 문제와 더불어 카트리지 사용기간이 짧아지는 문제가 있었다.

발명의 상세한 설명

기술적 과제

[8] 따라서, 본 발명의 전자담배는, 종래 기술의 필터부재나 흡수부재와 같은 카트리지 내의 액제를 기화수단에 공급하는 매개체에 없이 기화수단과 일정거리 떨어진 위치에 설치된 카트리지에서 액제를 필요에 따라 적정량 분사하여 기화수단에 액제를 공급하는 전자담배를 제공하여, 액제의 불필요한 자연증발을 방지하고 카트리지의 사용기간 증대 효과 함께 카트리지 내의 액제가 새어나와 내장된 부품들을 오염시킬 염려가 없는 전자담배를 제공하고자 하는 것이다.

과제 해결 수단

[9] 본 발명의 전자 담배는, 케이스 내에 카트리지와 기화수단 및 배터리가 내장되어 상기 배터리의 전원을 공급받아 작동하는 기화수단에 의하여 카트리지 내에 담겨있는 액제를 기화시켜 케이스 일측에 결합되어 있는 흡입파이프를 통하여 기화된 액제를 포함하고 있는 공기를 흡입할 수 있게

NJOY Exhibit 1002.2234

구성된 전자담배에 있어서; 상기 카트리지는 일측에 노즐이 설치되고 타측에는 피스톤이 설치된 주사기 형태로 구성되고, 상기 피스톤은 피스톤 이동수단에 의하여 카트리지 내로 진입되어 카트리지 내에 담겨있는 액제를 노즐 분사구멍을 통하여 분사할 수 있게 구성되며, 상기 기화수단은 노즐의 앞쪽에 일정거리 떨어진 위치에 설치되어 노즐 분사구멍을 통하여 분사된 액제를 공급받아 기화시킬 수 있게 구성된 것이 특징인 전자담배이다.

발명의 효과

[10] 상기와 같이 구성된 본 발명의 전자담배는, 카트리지 내에 담겨있는 액제가 노즐 분사구멍을 제외하고 카트리지 용기에 의하여 외부와 차단되어 노즐구멍을 통한 매우 적은 양의 자연증발만 이루어지므로 카트리지 사용기간이 보다 증가하는 효과가 있으며, 또한 표면장력에 때문에 노즐 분사구멍을 통하여 액제가 임의로 흘러내리지 않으므로 내장된 부품들을 오염시킬 염려가 없는 매우 큰 효과가 있다.

도면의 간단한 설명

[11] 도 1은 본 발명의 전자담배의 실시예를 나타낸 도면

[12] 도 2는 본 발명의 전자담배의 요부를 나타낸 상세도

[13] 도 3은 본 발명에 있어서, 카트리지의 실시예를 나타낸 도면

[14] 도 4는 본 발명에 있어서, 흡입파이프의 실시예를 나타낸 도면

[15] 도 5는 본 발명에 있어서, 너트의 실시예를 나타낸 도면

[16] 도 6은 본 발명에 있어서, 판스프링의 실시예를 나타낸 도면

[17] 도 7은 본 발명의 전자담배의 다른 실시예를 나타낸 도면

[18] <도면의 주요 부분에 대한 부호의 설명>

[19] 10 : 흡입파이프 12 : 흡입구멍

[20] 14 : 걸림홈 16 : 공기흡입홈

[21] 20 : 너트 22 : 홈

[22] 30 : 판스프링 32 : 볼록부

[23] 40 : 카트리지 42 : 돌출부

[24] 44 : 걸림돌기 46 : 노즐결합부

[25] 48 : 돌부 50 : 피스톤

[26] 52 : 수나사부 54 : O-링

[27] 60 : 노즐 62 : 분사구멍

[28] 70 : 액제 80 : 기화수단

[29] 82 : 심지 90 : 배터리

[30] 100 : 카트리지 케이스 110 : 전원스위치

[31] 120 : 기화수단 케이스 122 : 외부공기유입구멍

[32] 130 : 배터리잔량 표시창 132 : 배터리잔량표시용 LED

[33] 134 : 인쇄회로기판

NJOY Exhibit 1002.2235

발명의 실시를 위한 형태

[34] 이하, 본 발명의 전자담배를 실시하기 위한 구체적인 내용을 제시된 도면과 함께 설명한다.

[35] 일반적으로, 전자담배는 니코틴 등을 포함한 액제를 기화시켜 연기를 생성하여 흡연욕구를 충족시킬 수 있게 구성된 것으로서, 그 기본적인 구성은 전자담배 케이스와, 케이스 내에 내장되는 배터리와, 액제 저장수단인 카트리지와, 배터리의 전원으로 작동되고 카트리지에 저장되어 있는 액제를 공급받아 기체로 기화시키는 기화수단 및 케이스 일측에 결합되고 기화된 액제를 포함하고 있는 공기를 흡입할 수 있게 흡입구가 형성되어 있는 흡입파이프로 구성된다.

[36] 전자담배에 관한 종래의 기술로서, 전자 금연 담배(등록번호 10-0860566, 등록일자 2008년09월22일)에는, "내부 수용공간을 갖으며 일측에 흡입구가 형성된 흡입수단; 상기 수용공간에 수용되어 전원을 공급하는 전원공급수단; 및 상기 전원공급수단에서 공급되는 전원에 의해 구동되고, 내부에 액체가 충진된 상태의 섬유 부재가 수용된 필터 부재 및 상기 섬유 부재에 충진된 액체가 기체로 변환되도록 초음파를 발생시키는 초음파발생 부재를 구비한 기체변환수단을 포함하는 것을 특징으로 하는 전자 금연 담배"가 개시되어 있다.

[37] 또 다른 전자담배에 관한 종래의 기술로서, 금연 보조기구(등록번호 10-0846401, 등록일자 2008년07월09일)에는, "담배를 줄이거나 끊을 수 있도록 담배 대용품으로 사용할 수 있는 금연 보조기구를 구성함에 있어서, 관체 형상으로 되어 선단 및 후단 내측에 암나사부가 형성된 동체;와, 상기 동체 선단 내경에 건전지가 삽입되는 공간상의 내측벽면에 장착되는 얇은 박판형태의 도체; 상기 도체의 일측 하단에 위치하며 후술하는 빨대 흡입시 흡입공기에 의해 온오프되는 스위치; 저면에 도전판이 부착형성되고 외주면에 외기유입통로가 1~다수개 형성되며 투명 또는 반투명 합성수지나 유리로 형성된 램프커버; 상기 램프커버의 도전판과 도체가 접촉 설치되며 빨대 흡입시 흡입되는 공기에 의해 스위치가 접속될 때 마치 담배불처럼 빨갛게 켜지도록 된 엘이디로 구비되는 발광램프;와, 상기 동체의 내부 중앙 부위에 장착고정되며 다수의 미세구멍을 가진 케이스 내부에 솜 또는 스폰지로 이루어진 흡수부재가 충진됨과 동시에 상기 흡수부재 중앙부에 후단에 발열체가 장착 구성된 약제 유도관을 삽입설치하되, 상기 약제유도관 후단부에는 상기 발열체와 망커버를 씌워서 된 연기발생장치;와, 상기 동체의 후미에 체결 결합되는 빨대와, 상기 빨대의 선단에 결합되며 담배의 냄새와 맛과 냄새를 가지면서 니코친과 타르가 전혀없는 약제를 흡수한 솜 또는 스폰지로 이루어진 흡수재가 내장되고 빨대에 결합시켰을 때 빨대와 통공이 형성됨과 동시에 약제가 함유된 흡수재가 망커버에 밀착된 상태이기에 평상시에 약재가 망커버를 통하여 흡수부재에 흡입되는 상태가 되도록 유도하는 약제통;으로 이루어짐을 특징으로 하는

NJOY Exhibit 1002.2236

금연보조기구"가 개시되어 있다.

[38] 그러나, 상기한 바와 같은 종래의 전자담배는, 카트리지 내의 용액을 기화수단에 공급하기 위하여 양측이 각각 카트리지 내의 용액과 기화수단에 접촉된 필터부재나 흡수부재를 사용함으로써 사용시나 보관시에 카트리지 내의 용액이 필터부재나 흡수부재를 통하여 카트리지 외부로 흘러나와 내장된 부품들을 오염시키는 문제가 있었으며, 또한 필터부재 또는 흡수부재의 노출된 표면에서 지속적으로 발생하는 휘발성분의 자연증발로 카트리지 내의 용액 농도가 증가하는 문제와 더불어 카트리지 사용기간이 짧아지는 문제가 있었다.

[39] 따라서, 본 발명의 전자담배는, 종래 기술의 전자담배에서 카트리지 내의 액제를 기화수단에 공급하기 위하여 필터부재나 흡수부재와 같은 카트리지 내의 액제를 흡수하여 기화수단으로 전달해주는 매개체로 인하여 발생하는 문제, 즉 전자담배를 사용하지 않을 때도 매개체가 카트리지 내의 액제를 흡수하여 항상 젖어있는 상태에 있음으로 발생하는 매개체 표면에서 일어나는 자연증발현상에 따른 문제점과 매개체와 부품의 접촉면을 따라 액제가 흘러내려 케이스 내의 부품들을 오염시키는 문제점을 해결하고자 안출된 것이다.

[40] 본 발명의 전자 담배는, 케이스 내에 카트리지(40)와 기화수단(80) 및 배터리(90)가 내장되어 상기 배터리의 전원을 공급받아 작동하는 기화수단에 의하여 카트리지 내에 담겨있는 액제(70)를 기화시켜 케이스 일측에 결합되어 있는 흡입파이프(10)를 통하여 기화된 액제를 포함하고 있는 공기를 흡입할 수 있게 구성된 전자담배에 있어서; 상기 카트리지(40)는 일측에 노즐(60)이 설치되고 타측에는 피스톤(50)이 설치된 주사기 형태로 구성되고, 상기 피스톤(50)은 피스톤 이동수단에 의하여 카트리지 내로 진입되어 카트리지 내에 담겨있는 액제(70)를 노즐 분사구멍(62)을 통하여 분사할 수 있게 구성되며, 상기 기화수단(80)은 노즐(60)의 앞쪽에 일정거리 떨어진 위치에 설치되어 노즐 분사구멍을 통하여 분사된 액제를 공급받아 기화시킬 수 있게 구성된 것이 특징인 전자담배이다.

[41] 본 발명의 전자담배의 주요 요지는 액제저장용 카트리지의 일측에 노즐을 설치하고 타측에는 피스톤을 설치하여 피스톤을 카트리지 내로 진입시켜 카트리지 내에 담겨있는 액제를 노즐의 분사구멍을 통하여 분사시켜 노즐 앞쪽에 일정거리 떨어진 위치에 설치된 기화수단에 액제를 공급하는 것이다. 따라서, 전자담배의 케이스 내에 내장되는 배터리와 기화수단 및 전원스위치 등과 관련된 기술 내용은 당업자에 의하여 다양하게 변형 실시될 수 있는 공지의 기술 내용에 따라 실시되는 것이므로 자세한 설명은 생략하며, 도 1과 도 7에 본 발명의 전자담배의 구체적 실시예를 도시하였다.

[42] 본 발명의 전자담배의 구체적 실시예로서, 도 1에 도시된 바와 같이, 사용자가 입으로 기화된 액제를 흡입할 수 있게 중심부에 흡입구멍이 형성되어 있는 흡입파이프의 앞쪽에 카트리지가 설치되고, 상기 카트리지의 앞쪽에는

NJOY Exhibit 1002.2237

기화수단이 일정거리 떨어진 위치에 설치되며, 상기 기화수단의 앞쪽에 전원스위치와 배터리를 포함한 전원공급부가 설치되는 형태로 실시된다.

[43] 상기 노즐 분사구멍의 내경은 0.1~1.2 mm 로 형성되는 데, 이는 분사구멍의 내경이 0.1 mm 이하일 경우에는 필요한 양의 액제가 분사되는 시간이 오래 걸리고 분사구멍이 막힐 우려가 있기 때문이며, 1.2 mm 이상일 경우에는 분사구멍을 통하여 액제가 흘러내릴 우려가 있기 때문이다.

[44] 상기 피스톤 헤드의 외주면에는 실링기능을 가진 O-링이 설치될 수 있다.

[45] 상기 기화수단은 노즐과 1~5 mm 이격되게 설치되는 데, 상기 노즐과 기화수단의 간격이 1 mm 이하일 경우에는 카트리지 내의 액제가 기화수단의 열에 의하여 영향을 받을 수 있기 때문이며 5 mm 이상일 경우에는 분사된 액제가 기화수단의 원하는 위치에 분사되지 않을 우려가 있기 때문이다.

[46] 상기 기화수단은 전자담배와 관련된 기술분야에서 공공연히 실시되고 있는 기술 내용이며, 구체적인 예로서 열선이나 초음파발생부재가 있다.

[47] 상기 열선의 중심부에는 일반적으로 액제 흡수기능을 지닌 심지가 구성된다.

[48] 상기 초음파발생부재는 배터리의 전원으로 작동되는 진동자에서 초음파를 발생시켜 액제를 기화시키는 것으로서 진동자의 둘레에 액제 흡수기능 지닌 필터부재가 구성 것이 있다.

[49] 상기 피스톤 이동수단은, 피스톤 로드의 외주면에 수나사부(52)가 형성되어 흡입파이프의 내주면에 설치된 너트(20)와 나사결합되게 구성되고, 상기 흡입파이프의 흡입구멍 내주면에 원형의 걸림홈(14)이 형성되어 상기 케이스 후방에 노출된 카트리지 돌출부(42)의 외주면에 형성된 원형의 걸림돌기(44)와 회전가능하게 결합되어, 상기 흡입파이프(10)를 사용자가 회전시키면 흡입파이프(10)와 카트리지(40)가 걸림홈 및 걸림돌기에 의하여 결합된 상태에서 제자리에서 회전됨에 따라 흡입파이프의 흡입구멍 내주면에 설치된 너트(20)와 나사결합되어 있는 피스톤(50) 로드의 나사운동에 의하여 피스톤(50) 헤드가 카트리지(40) 내로 진입되어 카트리지 내의 액제(70)가 노즐의 분사구멍(62)을 통하여 분사되게 구성된다.

[50] 또한, 상기 카트리지의 돌출부(42) 외주면에는 방사상으로 다수의 돌부(48)가 형성되고, 상기 흡입파이프의 흡입구멍(12) 내주면에는 그 모양이 원호형이되 중간부위에 볼록부(32)가 중심방향으로 형성되어 있는 판스프링(30)이 설치되고, 상기 판스프링의 볼록부는 설치상태에서 돌부(46) 사이에 일부가 삽입되게 구성되어, 흡입파이프(10)의 회전각도 대신에 흡입파이프(10)의 회전운동에 따라 판스프링의 볼록부(32)가 돌부(48)를 지나칠 때 발생하는 소리 또는 접촉느낌을 사용자가 수치로 헤아려서 액제 분사량을 조절할 수 있게 구성될 수 있다.

[51] 상기 판스프링은 흡입파이프의 흡입구멍 내주면에 판스프링 안치홈을 형성하여 설치된다.

[52] 도 2는 본 발명의 전자담배의 주요 요부를 나타낸 상세도면이며, 도 3 내지 도

NJOY Exhibit 1002.2238

6은 각각 본 발명의 주요 구성품인 카트리지와 흡입파이프와 너트 및 판스링의 실시예를 나타낸 도면이다.

[53] 본 발명에 있어서, 상기 흡입파이프의 흡입구멍 내주면에 설치되는 너트는, 도 5에 도시된 바와 같이, 너트의 외주면에 적어도 하나 이상의 홈이 형성되는 데, 이는 흡입구멍의 내주면에 너트가 설치된 상태에서 공기 흡입 통로를 확보하기 위하여 형성되는 것이다.

[54] 본 발명의 전자담배의 흡입 방법을 살펴보면, 먼저 사용자는 흡입파이프를 회전시킴으로서 피스톤을 카트리지 내로 이동시켜 원하는 양의 액제를 카트리지에서 기화수단으로 분사시켜 공급한 다음에, 흡입파이프를 입에 물고 전원스위치를 눌러 배터리의 전원으로 기화수단을 작동시켜 액제를 기화시킨 후, 흡입파이프로 흡입하면 기화된 액제가 외부공기유입구멍을 통하여 유입된 외부공기와 혼합된 상태로 흡입되는 것이다.

NJOY Exhibit 1002.2239

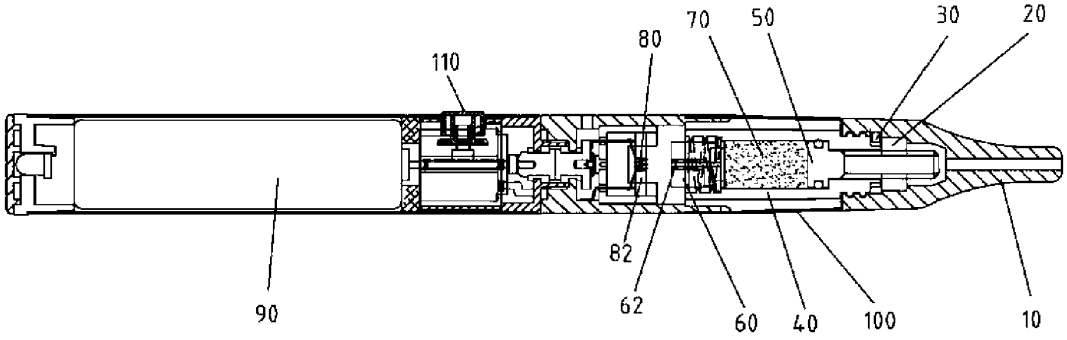
청구범위

[청구항 1] 케이스 내에 카트리지(40)와 기화수단(80) 및 배터리(90)가 내장되어 상기 배터리의 전원을 공급받아 작동하는 기화수단에 의하여 카트리지 내에 담겨있는 액제(70)를 기화시켜 케이스 일측에 결합되어 있는 흡입파이프(10)를 통하여 기화된 액제를 포함하고 있는 공기를 흡입할 수 있게 구성된 전자담배에 있어서;
상기 카트리지(40)는 일측에 노즐(60)이 설치되고 타측에는 피스톤(50)이 설치된 주사기 형태로 구성되고, 상기 피스톤(50)은 피스톤 이동수단에 의하여 카트리지 내로 진입되어 카트리지 내에 담겨있는 액제(70)를 노즐 분사구멍(62)을 통하여 분사할 수 있게 구성되며, 상기 기화수단(80)은 노즐(60)의 앞쪽에 일정거리 떨어진 위치에 설치되어 노즐 분사구멍을 통하여 분사된 액제를 공급받아 기화시킬 수 있게 구성되되,
상기 피스톤 이동수단은, 피스톤 로드의 외주면에 수나사부(52)가 형성되어 흡입파이프의 내주면에 설치된 너트(20)와 나사결합되게 구성되고, 상기 흡입파이프의 흡입구멍 내주면에 원형의 걸림홈(14)이 형성되어 상기 케이스 후방에 노출된 카트리지 돌출부(42)의 외주면에 형성된 원형의 걸림돌기(44)와 회전가능하게 결합되어, 상기 흡입파이프(10)를 사용자가 회전시키면 흡입파이프(10)와 카트리지(40)가 걸림홈 및 걸림돌기에 의하여 결합된 상태에서 제자리에서 회전됨에 따라 흡입파이프의 흡입구멍 내주면에 설치된 너트(20)와 나사결합되어 있는 피스톤(50) 로드의 나사운동에 의하여 피스톤(50) 헤드가 카트리지(40) 내로 진입되어 카트리지 내의 액제(70)가 노즐의 분사구멍(62)을 통하여 분사되게 구성된 피스톤 이동수단인 것이 특징인 전자담배.

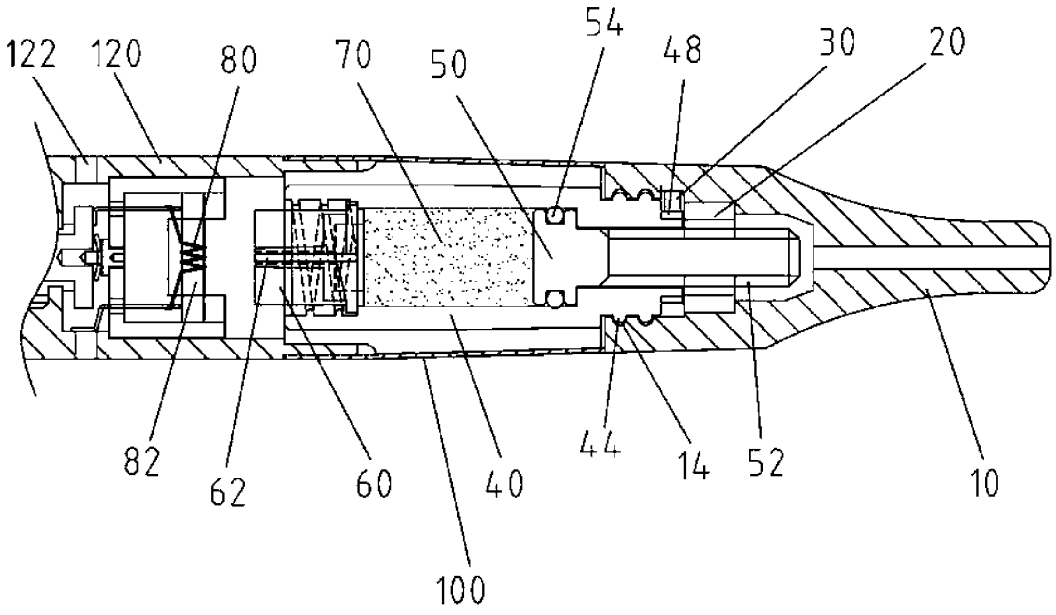
[청구항 2] 제 1항에 있어서, 상기 카트리지의 돌출부(42) 외주면에는 방사상으로 다수의 돌부(48)가 형성되고, 상기 흡입파이프의 흡입구멍(12) 내주면에는 그 모양이 원호형이되 중간부위에 볼록부(32)가 중심방향으로 형성되어 있는 판스프링(30)이 설치되고, 상기 판스프링의 볼록부는 설치상태에서 돌부(46) 사이에 일부가 삽입되게 구성되어, 흡입파이프(10)의 회전각도 대신에 흡입파이프(10)의 회전운동에 따라 판스프링의 볼록부(32)가 돌부(48)를 지나칠 때 발생하는 소리 또는 접촉느낌을 사용자가 수치로 헤아려서 액제 분사량을 조절할 수 있게 구성된 것이 특징인 전자담배.

NJOY Exhibit 1002.2240

[Fig. 1]

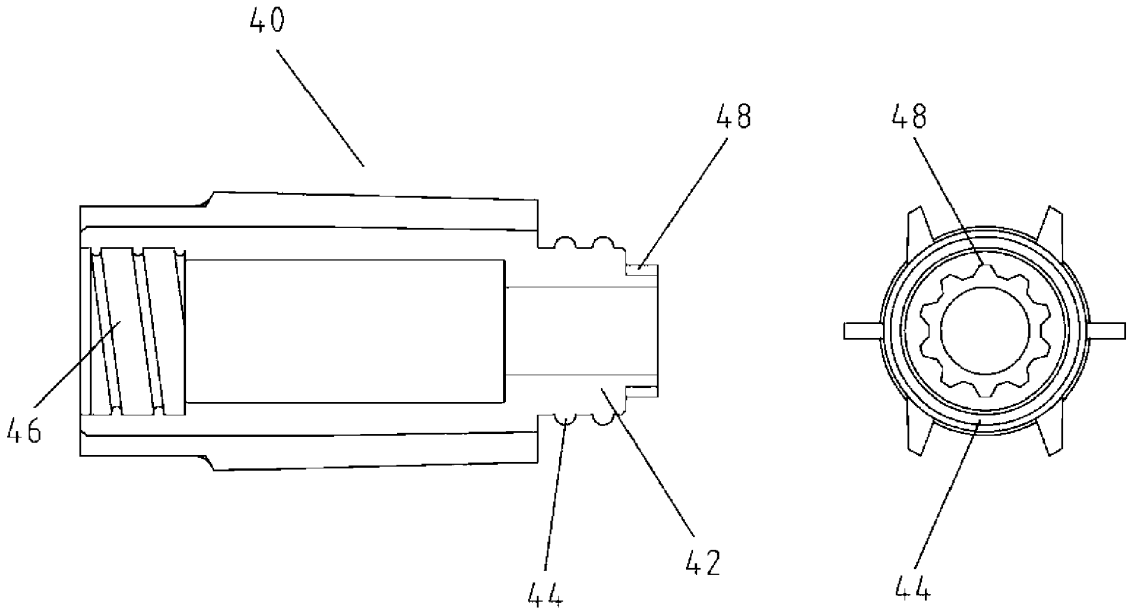


[Fig. 2]

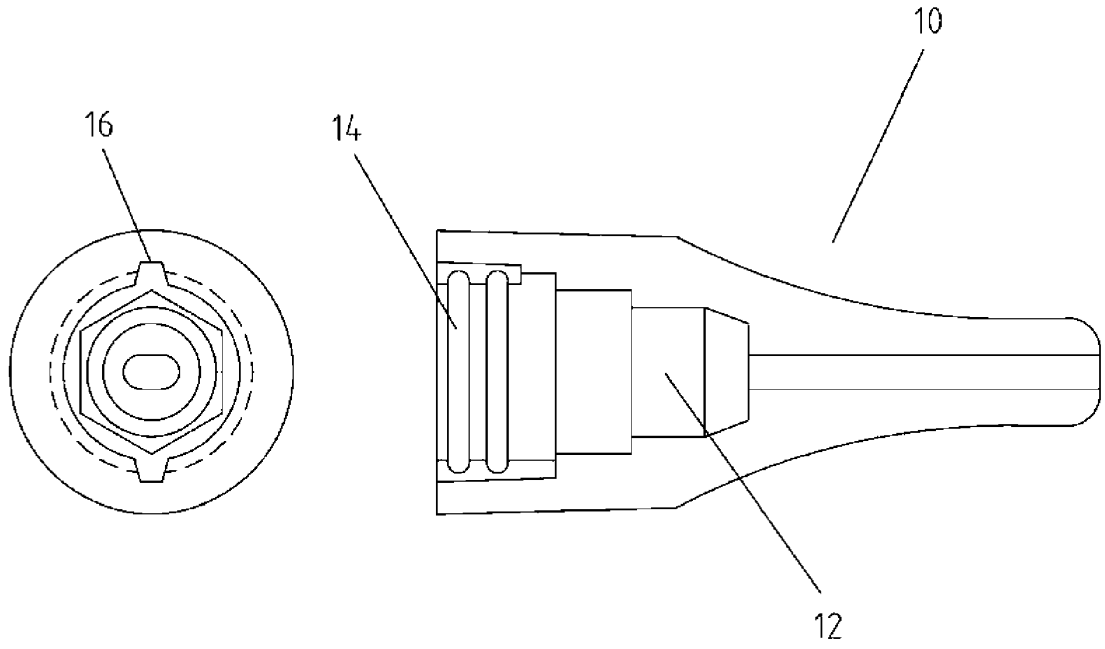


NJOY Exhibit 1002.2241

[Fig. 3]

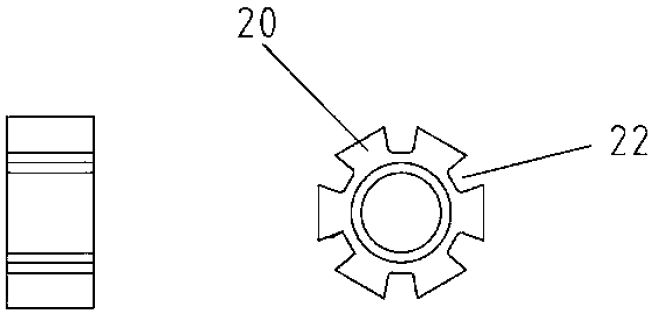


[Fig. 4]

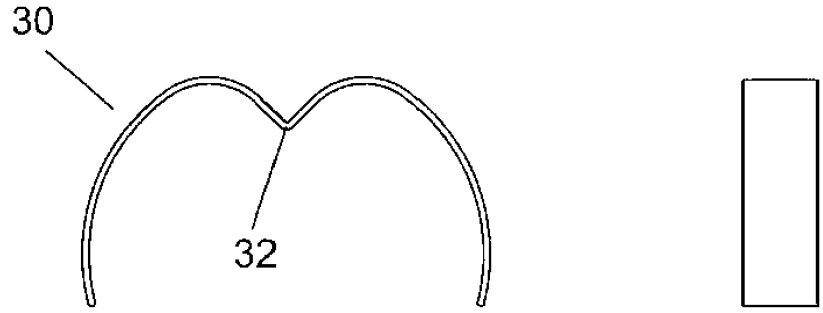


NJOY Exhibit 1002.2242

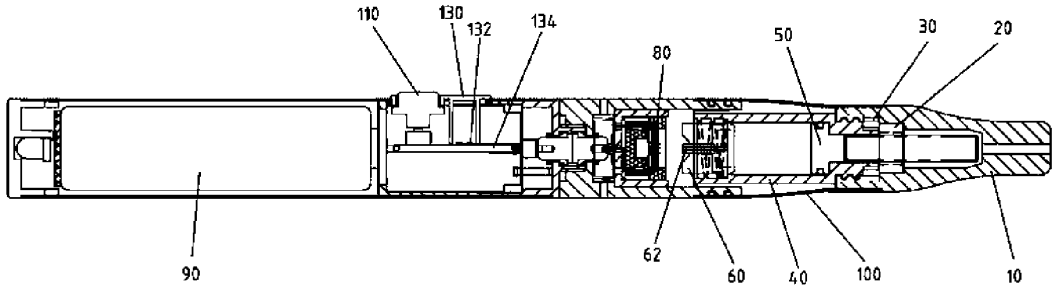
[Fig. 5]



[Fig. 6]



[Fig. 7]



NJOY Exhibit 1002.2243

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2012/009780

A. CLASSIFICATION OF SUBJECT MATTER

A24F 47/00(2006.01)i, A61M 15/06(2006.01)i, A24D 1/14(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24F 47/00; A61M 15/06; A24F 1/00; A24D 1/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & Keywords: electronic cigarette, nozzle, piston, cartridge, liquid medicine, nozzle injection hole, evaporation means, tabacco, smoke, nozzle, spray, aerosol, piston, syringe, evaporate

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 20-2009-0009075 U (SEOK, IN SUN) 09 September 2009 See abstract, claims 1-3, paragraphs 0010-0020 and figures 2,3.	1-2
A	KR 20-0292960 Y1 (WOO, JONG WON) 25 October 2002 See abstract, claims 1-2, page 2 and figures 2-4.	1-2
A	KR 10-2011-0084388 A (SONEN) 22 July 2011 See abstract, claims 1-4, paragraphs 0018-0058 and figures 1-6.	1-2
A	JP 2006-524494 A (LIK HON) 02 November 2006 See abstract, claims 1-4 and figures 1,7-9.	1-2

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published 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
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 MARCH 2013 (19.03.2013)	**20 MARCH 2013 (20.03.2013)**

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea

Authorized officer

NJOY Exhibit 1002.2244

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2012/009780

Patent document cited in search report	Publication date	Patent family member	Publication date
KR 20-2009-0009075 U	09.09.2009	NONE	
KR 20-0292960 Y1	25.10.2002	NONE	
KR 10-2011-0084388 A	22.07.2011	NONE	
JP 2006-524494 A	02.11.2006	AT 415831 T	15.12.2008
		AU 2004-234199 A1	11.11.2004
		AU 2004-234199 B2	02.09.2010
		AU 2004-234199 B2	02.09.2010
		BR PI0407944A	07.03.2006
		CA 2518174 A1	11.11.2004
		CA 2518174 C	01.11.2011
		CA 2752134 A1	11.11.2004
		CN 100381083 C	16.04.2008
		CN 1541577 A	03.11.2004
		DE 602004018125 D1	15.01.2009
		DK1618803T3	16.03.2009
		EA009532B1	28.02.2008
		EP 1618803 A1	25.01.2006
		EP 1618803 A4	05.09.2007
		EP 1618803 B1	03.12.2008
		ES 2316969 T3	16.04.2009
		HK 1070791 A1	05.06.2009
		JP 2006-524494 T	02.11.2006
		JP 2006-524494 T	02.11.2006
		KR 10-0971178 B1	20.07.2010
		KR 10-0971178 B1	20.07.2010
		KR20070087265A	28.08.2007
		KR20070087265A	28.08.2007
		MX PA05009191A	10.03.2006
		MY138404A	29.05.2009
		PL 379020 A1	26.06.2006
		PT1618803E	29.12.2008
		RU 2005115958 A	10.11.2005
		RU 2336001 C2	20.10.2008
		SI1618803T1	30.04.2009
		US 2006-0196518 A1	07.09.2006
		US 2012-0090630 A1	19.04.2012
		US 2012-0273589 A1	01.11.2012
		WO 2004-095955 A1	11.11.2004
		WO 2004-095955 A8	17.02.2005

NJOY Exhibit 1002.2245

국 제 조 사 보 고 서

국제출원번호
PCT/KR2012/009780

A. 발명이 속하는 기술분류(국제특허분류(IPC))

A24F 47/00(2006.01)i, A61M 15/06(2006.01)i, A24D 1/14(2006.01)i

B. 조사된 분야

조사된 최소문헌(국제특허분류를 기재)
A24F 47/00; A61M 15/06; A24F 1/00; A24D 1/14

조사된 기술분야에 속하는 최소문헌 이외의 문헌
한국등록실용신안공보 및 한국공개실용신안공보: 조사된 최소문헌란에 기재된 IPC
일본등록실용신안공보 및 일본공개실용신안공보: 조사된 최소문헌란에 기재된 IPC

국제조사에 이용된 전산 데이터베이스(데이터베이스의 명칭 및 검색어(해당하는 경우))
eKOMPASS(특허청 내부 검색시스템) & 키워드:전자담배,노즐,피스톤,카트리지,액제,노즐분사구멍,기화수단,tabacco,smoke,nozzle,spray,aerosol,piston,syringe,evaporate

C. 관련 문헌

카테고리*	인용문헌명 및 관련 구절(해당하는 경우)의 기재	관련 청구항
A	KR 20-2009-0009075 U (석인선) 2009.09.09 요약, 청구항 1-3, 단락 0010-0020 및 도면 2,3 참조.	1-2
A	KR 20-0292960 Y1 (우종원) 2002.10.25 요약, 청구항 1-2, 페이지 2 및 도면 2-4 참조.	1-2
A	KR 10-2011-0084388 A (주식회사 손엔) 2011.07.22 요약, 청구항 1-4, 단락 0018-0058 및 도면 1-6 참조.	1-2
A	JP 2006-524494 A (LIK HON) 2006.11.02 요약, 청구항 1-4 및 도면 1,7-9 참조.	1-2

☐ 추가 문헌이 C(계속)에 기재되어 있습니다.

☒ 대응특허에 관한 별지를 참조하십시오.

* 인용된 문헌의 특별 카테고리:

"A" 특별히 관련이 없는 것으로 보이는 일반적인 기술수준을 정의한 문헌

"E" 국제출원일보다 빠른 출원일 또는 우선일을 가지나 국제출원일 이후에 공개된 선출원 또는 특허 문헌

"L" 우선권 주장에 의문을 제기하는 문헌 또는 다른 인용문헌의 공개일 또는 다른 특별한 이유(이유를 명시)를 밝히기 위하여 인용된 문헌

"O" 구두 개시, 사용, 전시 또는 기타 수단을 언급하고 있는 문헌

"P" 우선일 이후에 공개되었으나 국제출원일 이전에 공개된 문헌

"T" 국제출원일 또는 우선일 후에 공개된 문헌으로, 출원과 상충하지 않으며 발명의 기초가 되는 원리나 이론을 이해하기 위해 인용된 문헌

"X" 특별한 관련이 있는 문헌. 해당 문헌 하나만으로 청구된 발명의 신규성 또는 진보성이 없는 것으로 본다.

"Y" 특별한 관련이 있는 문헌. 해당 문헌이 하나 이상의 다른 문헌과 조합하는 경우로 그 조합이 당업자에게 자명한 경우 청구된 발명은 진보성이 없는 것으로 본다.

"&" 동일한 대응특허문헌에 속하는 문헌

국제조사의 실제 완료일	국제조사보고서 발송일
2013년 03월 19일 (19.03.2013)	**2013년 03월 20일 (20.03.2013)**

ISA/KR의 명칭 및 우편주소
대한민국 특허청
(302-701) 대전광역시 서구 청사로 189,
4동 (둔산동, 정부대전청사)
팩스 번호 82-42-472-7140

심사관
장낙용
전화번호 82-42-481-8151

NJOY Exhibit 1002.2246

국제조사보고서
대응특허에 관한 정보

국제출원번호
PCT/KR2012/009780

국제조사보고서에서 인용된 특허문헌	공개일	대응특허문헌	공개일
KR 20-2009-0009075 U	2009.09.09	없음	
KR 20-0292960 Y1	2002.10.25	없음	
KR 10-2011-0084388 A	2011.07.22	없음	
JP 2006-524494 A	2006.11.02	AT 415831 T	2008.12.15
		AU 2004-234199 A1	2004.11.11
		AU 2004-234199 B2	2010.09.02
		AU 2004-234199 B2	2010.09.02
		BR PI0407944A	2006.03.07
		CA 2518174 A1	2004.11.11
		CA 2518174 C	2011.11.01
		CA 2752134 A1	2004.11.11
		CN 100381083 C	2008.04.16
		CN 1541577 A	2004.11.03
		DE 602004018125 D1	2009.01.15
		DK1618803T3	2009.03.16
		EA009532B1	2008.02.28
		EP 1618803 A1	2006.01.25
		EP 1618803 A4	2007.09.05
		EP 1618803 B1	2008.12.03
		ES 2316969 T3	2009.04.16
		HK 1070791 A1	2009.06.05
		JP 2006-524494 T	2006.11.02
		JP 2006-524494 T	2006.11.02
		KR 10-0971178 B1	2010.07.20
		KR 10-0971178 B1	2010.07.20
		KR20070087265A	2007.08.28
		KR20070087265A	2007.08.28
		MX PA05009191A	2006.03.10
		MY138404A	2009.05.29
		PL 379020 A1	2006.06.26
		PT1618803E	2008.12.29
		RU 2005115958 A	2005.11.10
		RU 2336001 C2	2008.10.20
		SI1618803T1	2009.04.30
		US 2006-0196518 A1	2006.09.07
		US 2012-0090630 A1	2012.04.19
		US 2012-0273589 A1	2012.11.01
		WO 2004-095955 A1	2004.11.11
		WO 2004-095955 A8	2005.02.17

NJOY Exhibit 1002.2247

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
27 June 2013 (27.06.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/093695 A1

(51) International Patent Classification:
A24F 47/00 (2006.01)

(21) International Application Number:
PCT/IB2012/057108

(22) International Filing Date:
9 December 2012 (09.12.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/577,024 18 December 2011 (18.12.2011) US

(71) Applicant: **SIS RESOURCES LTD.** [IL/IL]; P.O. Box 674, 99000 Beit Shemesh (IL).

(72) Inventors: **WEIGENSBERG, Aaron Arye**; 53/43 Yigal Yadin Street, 71720 Modiin (IL). **GAVRIELOV, Shmuel**; 14/20 Agasi Street, 93877 Jerusalem (IL). **CAPUANO, Sammy**; 1/11 Nachal Uriya Street, 99095 Beit Shemesh (IL).

(74) Agent: **D. KLIGLER I.P. SERVICES LTD.**; P.O. Box 57651, 61576 Tel Aviv (IL).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(54) **Title**: CHARGING ELECTRONIC CIGARETTE

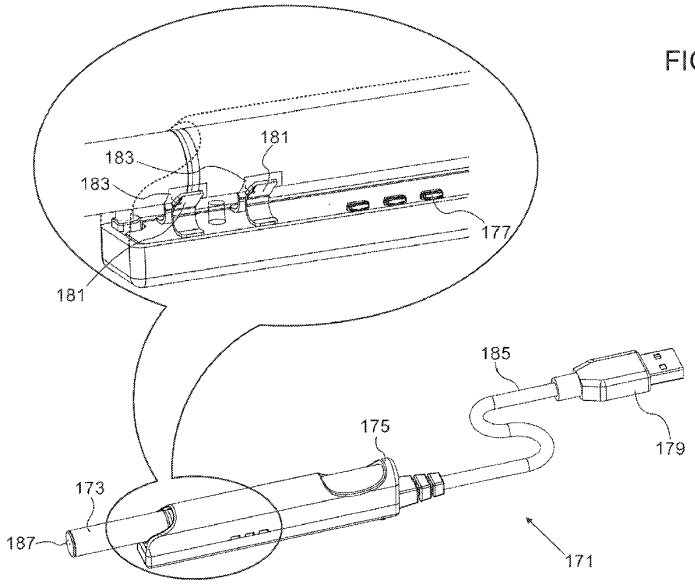


FIG. 19

(57) **Abstract**: An electronic cigarette charging system includes a rechargeable electronic cigarette (173) having first and second electrical contacts (183), a cradle (175) that is connectable to a battery charger and a receiving element adapted to receive the end of the electronic cigarette (173). The receiving element has electrically conductive first and second contacts (181), which have first and second contact surfaces for contacting the first and second electrical con- tacts (183) of the electronic cigarette (175), respectively to thereby establish an electrical connection with the battery charger.

WO 2013/093695 A1

NJOY Exhibit 1002.2248

CHARGING ELECTRONIC CIGARETTE

CROSS-REFERENCE TO RELATED APPLICATIONS

This Application claims the benefit of U.S. Provisional Application No. 61/577,024, which is herein incorporated by reference.

FIELD OF THE INVENTION

This invention relates to tobacco product avoidance. More particularly, this invention relates to a charger for a battery-operated electronic cigarette for limiting exposure to tobacco fumes.

BACKGROUND OF THE INVENTION

Tobacco-containing smoking devices are known. For example, U.S. Patent No. 7,726,320, which is herein incorporated by reference, proposes a cigarette incorporated within an electrically powered aerosol generating device that acts as a holder for that cigarette. The smoking device possesses at least one form of tobacco. The smoking device also possesses a mouth-end piece that is used by the smoker to inhale components of tobacco that are generated by the action of heat upon components of the cigarette. A representative smoking device possesses an outer housing incorporating a source of electrical power (e.g., a battery), a sensing mechanism for powering the device at least during periods of draw, and a heating device (e.g., at least one electrical resistance heating element) for forming a thermally generated aerosol that incorporates components of tobacco. During use, the cigarette is positioned within the device, and after use, the used cigarette is removed from the device and replaced with another cigarette.

European patent document EP 1 736 065, herein incorporated by reference, proposes an electronic cigarette containing nicotine without tar, which includes a shell and a suction nozzle. On the exterior wall of the shell, there is an air orifice, while there are an electronic circuit board, a constant pressure cavity, a sensor, a gas liquid separator, an atomizer, and a supplying bottle orderly located in the interior of the shell, wherein the electronic circuit board consists of an electronic switching circuit and a high-frequency generator. At one side of the sensor there is an air duct. A negative pressure cavity is located in the sensor. The atomizer connects with the supplying bottle, and there is an atomizing cavity located in the atomizer.

Devices of this sort are referred to herein for convenience as “electronic cigarettes”. Conventionally the atomizer of an electronic cigarette includes a heating element, which is

NJOY Exhibit 1002.2249

typically a wire having high electrical resistance. Rechargeable batteries housed within the electronic cigarette are generally used to power the atomizer. Thus, during use it becomes necessary to recharge the batteries from time to time. Accomplishing this may require some disassembly of the electronic cigarette in order to connect an external charging device. It is impractical to smoke using the electronic cigarette while charging the device without actually replacing the battery. To do so, it would be necessary to repeatedly disconnect the charger, reassemble the electronic cigarette, puff, and then reverse the procedure to continue the charging process.

SUMMARY OF THE INVENTION

The present invention, in certain embodiments thereof, seeks to provide an improved electronic cigarette, which is connectable to a battery charger without disassembly of the cigarette.

There is provided according to embodiments of the invention an electronic cigarette charging system, including a rechargeable electronic cigarette having first and second electrical contacts, a cradle that is connectable to a battery charger and includes a receiving element adapted to receive the end of the electronic cigarette. The receiving element has electrically conductive first and second contacts, which have first and second contact surfaces for contacting the first and second electrical contacts of the electronic cigarette, respectively to thereby establish an electrical connection with the battery charger.

According to a further aspect of the system, the first and second electrical contacts of the electronic cigarette are magnetically attractive to the first and second contact surfaces of the receiving element, respectively.

According to yet another aspect of the system, at least one of the first and second contact surfaces of the receiving element is a magnet.

According to still another aspect of the system, at least one of the first and second contacts of the electronic cigarette is a magnet.

According to an aspect of the system, the end of the electronic cigarette includes an adaptor, which has an orifice formed therethrough and an inset for receiving a conductive flange. The orifice is disposed such that an extension of the flange is placed in contact with one of the first and second contacts of the receiving element when the electronic cigarette is in the cradle. The adaptor includes at least one side groove for receiving a contact pin to contact another of the first and second contacts of the receiving element.

NJOY Exhibit 1002.2250

According to a further aspect of the system, the adaptor has vents formed therein to permit ambient air to enter an interior of the electronic cigarette.

According to still another aspect of the system, the end of the electronic cigarette includes an adaptor having a sensor unit housed in an interior chamber thereof, and has a perforation extending from the interior chamber to an exterior of the electronic cigarette to place the interior chamber in fluid communication with ambient atmosphere.

According to still another aspect of the system, the end of the electronic cigarette includes an adaptor, the adaptor has a cap. A lip and a conductive flange on the cap are adapted for contacting one of the first and second contact surfaces of the receiving element. A conductive coaxial member on the adaptor has an extension, and an insert attached to the lip, wherein the insert has an orifice formed therethrough for receiving the extension of the coaxial member. The orifice is disposed such that the extension of the coaxial member is placed in contact with another of the first and second contacts of the receiving element when the electronic cigarette is in the cradle.

According to one aspect of the system, the adaptor has vents formed therein to permit ambient air to enter an interior of the electronic cigarette.

According to an additional aspect of the system, the insert has a translucency and diffusing property sufficient to prevent recognition of structures and shadows within the electronic cigarette when the insert is illuminated from by a light source disposed within the electronic cigarette.

There is further provided according to embodiments of the invention an electronic cigarette charging system, including an electronic cigarette having a first set of electrical contacts, an atomizer and a rechargeable battery for powering the atomizer. An electrode assembly connectable to a power source has a second set of electrical contacts that are arranged to mate with the first set of electrical contacts, whereupon the electronic cigarette receives power via the electrode assembly for recharging the battery while remaining operational for use by a smoker. Electrical circuitry is connected to the first set of electrical contacts, the electrical circuitry including a first circuit for supplying battery power to the atomizer and a second circuit for providing power from a battery charger to the battery for recharging thereof. The first circuit is cooperative with the second circuit to disable power flow via the electrode assembly to the battery when the atomizer is activated and to resume the power flow when the atomizer ceases to be activated.

According to one aspect of the system, the second set of electrical contacts includes respective ferromagnetic disks that are bonded to lead wires that are connectable to the battery charger, and magnets held by magnetic attraction in contact with the disks.

According to an aspect of the system, the first set of electrical contacts are disposed at an end of the electronic cigarette.

According to a further aspect of the system, the first set of electrical contacts are disposed at a side portal of the electronic cigarette.

Still another aspect of the system includes a cradle receiving the electronic cigarette and has the second set of electrical contacts disposed therein.

An additional aspect of the system includes a universal serial bus adaptor linked to the second set of electrical contacts for connection to the power source.

According to yet another aspect of the system, the electrical circuitry includes a pressure sensor, a transistor coupled to the battery and the first set of electrical contacts, a microprocessor, and electronic logic, wherein the microprocessor is responsive to the sensor and the electronic logic to regulate the transistor to enable and disable power flow to the battery via the first set of electrical contacts.

There is provided according to embodiments of the invention an electronic cigarette, including an atomizer, a rechargeable battery for powering the atomizer, and an adaptor that has a first set of electrical contacts connectable to a battery charger. The adaptor is disposed at an end of the electronic cigarette and includes an outer metallic band having an extension that is exposed to an interior space of the electronic cigarette, an inner metallic plug exposed to the interior space of the electronic cigarette, and an electrically nonconductive intermediate member separating the band from the plug and has a channel formed therein that extends from an exterior of the electronic cigarette to the interior space thereof that allows ambient air to enter the interior space.

According to one aspect of the electronic cigarette, the intermediate member has a translucency and diffusing property sufficient to prevent recognition of structures and shadows within to the electronic cigarette when the adaptor is illuminated from within the electronic cigarette.

There is further provided according to embodiments of the invention an electronic cigarette, including a first set of electrical contacts, an atomizer and a rechargeable battery for powering the atomizer, wherein the first set of electrical contacts is connectable to an electrode assembly that has a second set of electrical contacts, whereupon the electronic cigarette receives power via the electrode assembly for recharging the battery while being smoked by a

smoker, and electrical circuitry connected to the first set of electrical contacts. The electrical circuitry includes a first circuit for supplying battery power to the atomizer and a second circuit for providing power from a battery charger to the battery for recharging thereof.

According to still another aspect of the electronic cigarette, the first set of electrical contacts are disposed at an end of the electronic cigarette.

According to yet another aspect of the electronic cigarette, the first set of electrical contacts are disposed at a side portal of the electronic cigarette.

According to a further aspect of the electronic cigarette, the electrical circuitry includes a pressure sensor, a transistor coupled to the battery and the first set of electrical contacts, a microprocessor, and electronic logic, wherein the microprocessor is responsive to the sensor and the electronic logic to regulate the transistor to enable and disable power flow to the battery via the first set of electrical contacts.

There is further provided according to embodiments of the invention an electronic cigarette, including an atomizer, a battery for powering the atomizer, and a tip adaptor disposed at an end of the electronic cigarette. The tip adaptor has a sensor unit housed in an interior chamber thereof, and has a perforation extending from the interior chamber to an exterior of the electronic cigarette to place the interior chamber in fluid communication with ambient atmosphere.

According to an additional aspect of the electronic cigarette, the electrical circuitry is configured for selective operation in a first mode, wherein power flow to the battery is disabled when the atomizer is activated by a user drawing on the electronic cigarette and is enabled when the atomizer is not activated and in a second mode, wherein power flow to the battery is enabled when the atomizer is activated by the user drawing on the electronic cigarette and when the atomizer is not activated.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference is made to the detailed description of embodiments, by way of example, which is to be read in conjunction with the following drawings, wherein like elements are given like reference numerals, and wherein:

Fig. 1 is a semi-schematic exploded view of an electronic cigarette in accordance with an embodiment of the invention;

Fig. 2 is an elevation of a tip charge adaptor, shown in slight perspective, in accordance with an embodiment of the invention;

Fig. 3 is another perspective view of the adaptor shown in Fig. 2 in accordance with an embodiment of the invention;

Fig. 4 is a cutaway view of the adaptor shown in Fig. 2 shown in side elevation in accordance with an embodiment of the invention;

Fig. 5 is a sectional view of the adaptor shown in Fig. 2 in accordance with an embodiment of the invention;

Fig. 6 is a cutaway view of the adaptor shown in Fig. 2 in accordance with an embodiment of the invention;

Fig. 7 is an elevation of a cradle for connection to a battery charging device in accordance with an embodiment of the invention;

Fig. 8 is an elevation of shows the cradle shown in Fig. 7 with an electrical contact subassembly in accordance with an embodiment of the invention;

Fig. 9 is a side elevation of the cradle shown in Fig. 7 in accordance with an embodiment of the invention;

Fig. 10 is a top view of the cradle shown in Fig. 7 in accordance with an embodiment of the invention;

Fig. 11 is an elevation illustrating magnets of the cradle shown in Fig. 7 in accordance with an embodiment of the invention;

Fig. 12 is an exploded view of an adaptor shown in slight perspective in the smoking device of Fig. 1 in accordance with an alternate embodiment of the invention;

Fig. 13 is a schematic diagram of electrical circuitry in an electronic cigarette adapted to a battery charger in accordance with an embodiment of the invention;

Fig. 14 is a schematic diagram of electrical circuitry in an electronic cigarette adapted to a battery charger in accordance with an alternate embodiment of the invention;

Fig. 15 is a schematic diagram of electrical circuitry in an electronic cigarette adapted to a battery charger in accordance with an alternate embodiment of the invention;

Fig. 16 is a side elevation of a cradle for connection to a battery charging device in accordance with an alternate embodiment of the invention;

Fig. 17 is a top view of the cradle shown in Fig. 16;

Fig. 18 is a sectional view through the cradle shown in Fig. 16;

Fig. 19 is a partially cut-away view of an electronic cigarette charging system, which is constructed and operative in accordance with an alternate embodiment of the invention;

NJOY Exhibit 1002.2254

Fig. 20, Fig. 21 and Fig. 22 are, respectively, an elevation and two cutaway views of a tip of an electronic cigarette that is constructed and operative to engage a battery charger in accordance with an alternate embodiment of the invention;

Fig. 23 is a cut-away view of a portion of an electronic cigarette having a LED cap, in accordance with an alternate embodiment of the invention;

Fig. 24 is a partial sectional view of the electronic cigarette as shown in Fig. 23; and

Fig. 25 is a block diagram of electrical circuitry for charging an electronic cigarette, in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS

In the following description, numerous specific details are set forth in order to provide a thorough understanding of the various principles of the present invention. It will be apparent to one skilled in the art, however, that not all these details are necessarily always needed for practicing the present invention. In this instance, well-known circuits, control logic, and the details of computer program instructions for conventional algorithms and processes have not been shown in detail in order not to obscure the general concepts unnecessarily.

Definitions.

The terms “link”, “linked”, "couple" and "couples" are intended to mean either an indirect or direct connection. Thus, if a first device couples to a second device, that connection may be through a direct connection, or through an indirect connection via other devices and connections.

Embodiment 1.

Turning now to the drawings, reference is initially made to Fig. 1, which is a semi-schematic exploded view of a smoking device 10 in accordance with an embodiment of the invention. Device 10 has a barrel comprising a battery section 12. The battery section 12 may include power control circuitry 14, which is typically encased as a unit with a vacuum sensor 24, and which may be enclosed in a plastic holder. Suitable power controls are disclosed in commonly assigned U.S. Provisional Application No. 61/441,133, which is herein incorporated by reference. The device 10 includes a cartridge section 16, including an atomizer having a high resistance electrical wire, which heats a liquid or gel when the atomizer is powered. The liquid is typically a mixture of nicotine, propylene glycol, vegetable glycerine, and flavorings. The components of the section 16 are integral, as taught in commonly assigned U.S. Provisional Application No. 61/474,569, which is herein

incorporated by reference. In such case, the section 16 is known as a "cartomizer". In some embodiments the power control circuitry 14 may be disposed in the section 16 rather than the battery section 12 as shown in Fig. 1.

In one mode of operation the device 10 is capped by a tip 20. When smoke enters the device 10, an internal aperture (not shown) typically constricts the flow, thereby creating a pressure differential, which is sensed by a vacuum sensor 24 of known type. The electronic power control circuitry 14 linked to the sensor 24 activates the atomizer in the section 16, which is powered, typically by a lithium ion battery 26 that is housed in a barrel 28 of the battery section 12.

An adaptor 30 connects the section 16 and the battery section 12, and may comprise a threaded connector. Details of a suitable adaptor 30 are disclosed in the above noted U.S. Provisional Application No. 61/474,569. The power control circuitry may disable the atomizer in the section 16 when the proportion of tobacco fumes exceeds a predefined threshold. Power output to atomizer in section 16 may also be disabled when the battery 26 is being actively charged. Additionally or alternatively all functions of the power control circuitry 14 may be disabled when a battery charger (not shown in Fig. 1) is in operation, as described below.

Reference is now made to Fig. 2, which is an elevation of a tip charge adaptor 34, shown in slight perspective, in accordance with an embodiment of the invention. This assembly is compact, comprising a tip section 36 that replaces the tip 20 of the standard device 10 shown in Fig. 1. In addition the adaptor 34 houses the sensor 24 (Fig. 1). A flange 38 is inset in the tip section 36 and provides a contact mechanism with a battery charging device (not shown). The flange 38 is preferably coated with nickel or gold to minimize corrosion and enhance electrical conductivity with the battery charging device. Side openings 40 receive contact pins, which provide a second contact mechanism with the same or a different battery charging device.

Reference is now made to Fig. 3, which is another perspective view of the adaptor 34, illustrating recesses 42. Recesses 42 are side grooves that allow air flow to and from the region below the sensor 24 (Fig. 1), e.g., the battery section 12 (Fig. 1), as indicated by arrows 148. They do not penetrate through the wall of the adaptor 34.

Reference is now made to Fig. 4, which is a cutaway view of the adaptor 34 (Fig. 2) shown in side elevation.

Reference is now made to Fig. 5, which is a sectional view of the adaptor 34 (Fig. 2), showing air vents 44, which penetrate the wall of the adaptor 34, allowing air communication

between the exterior and the interior of the adaptor 34, as indicated by arrows 138. The air communication ensures that the top part of sensor 24 (Fig. 1) is exposed to ambient pressure, which is necessary for its proper operation.

Reference is now made to Fig. 6, which is a cutaway view of the adaptor 34 (Fig. 2) shown as a bottom elevation. An orifice 46 receives the flange 38 (Fig. 2). The air vents 44 are visible on this view. A rectangular groove 140 receives a diode, which is described below in the discussion of the electrical circuitry adapted to a battery charger.

Reference is now made to Fig. 7, which is an elevation of a cradle 48, which is adapted to contain and connect to a battery charging device (not shown) and to receive the adaptor 34 in a concave receiving element 50. Stability is provided by support members 52. The concavity of the element 50 corresponds to a convexity of the adaptor 34. The matching curvatures facilitate a firm electromechanical mating between the cradle 48 and the adaptor 34. Alternatively, firm contact may be achieved by reversing the convexity and matching concavity such that the adaptor 34 presents a concave contacting surface and the cradle 48 has a convex receiving surface. Further alternatively, the element 50 and the adaptor 34 could have flat contacting surfaces.

Reference is now made to Fig. 8, which shows the cradle 48 with an electrical contact subassembly 54, and exposes magnetic contact surfaces of magnets 64, 66.

Reference is now made to Fig. 9, which is a partially schematic side elevation of the cradle 48, illustrating magnets 64, 66. The magnet 66 is a cylinder having an exposed contact face as shown on Fig. 9. The magnet 64 is a toroid, which, as shown in Fig. 9, similarly has an exposed contact face. The aperture of the magnet 64 encloses the magnet 66 and the element 50, such that the magnets 64, 66 are spaced apart by the element 50, as can be appreciated by reference to Fig. 7 together with Fig. 9. The magnets 64, 66, form contact points with the battery charging device (not shown). In different embodiments, one of the magnets 64, 66 may be omitted. In such embodiments one magnet contact is sufficient to magnetically attract adaptor 34. Disk 68 and ring 142 are formed of a paramagnetic material so as to be held in firm contact with the magnets 64, 66. Electrical leads 144 are soldered to tabs 146, which project from the disk 68 and the ring 142 to create electrical contact between a battery charging device (not shown) and the magnets 64, 66. Use of the disk 68 and the ring 142 and the tabs 146 in this manner avoids soldering the leads 144 to the permanent magnets directly, which would likely damage their magnetism. Alternatively, tabs 146 could be eliminated and electrical leads 144 soldered or spot welded directly to disk 68 and the ring 142.

NJOY Exhibit 1002.2257

Fig. 10 is a top view of the cradle 48 showing the configuration of the magnets 64, 66 and their relationship to the element 50.

Fig. 11 is an elevation in perspective illustrating the magnets 64, 66 disengaged from the cradle 48 (Fig. 2) with the disk 68 and the ring 142 attached. Alternatively,, disk 68 and the ring 142 may be placed above magnet 66 and magnet 64, respectively, wherein the magnets provide attraction to adaptor 34 from below and via the paramagnetic material of disk 68 and ring 142.

Reference is now made to Fig. 12, which is an exploded composite view of a tip charge adaptor 70, shown in slight perspective, in accordance with an alternate embodiment of the invention. The adaptor 70 may be press-fitted into the end of the device 10 (Fig. 1). Alternatively, a cap 72 on the adaptor 70 may be threaded. The cap 72 has a flange 74 that forms a first electrical contact with a battery charging device (not shown). A plastic insert 76 attaches to a lip 78 formed on the cap 72 and has an aperture 80 bored therethrough to accommodate a metallic coaxial contact 82 having a flat member 84 that may be inset in a corresponding depression 86 of the insert 76. The member 84 functions as a second electrical contact with the battery charging device (not shown). The contact 82 has an extended member 88 that passes through the aperture 80 and attaches to a conductor leading toward a battery being charged. Alternatively, the coaxial contact 82 may be realized in other configurations, e.g., a coaxial ring, and may have appears in profile as a domed or pointed tip contact. The member 88 could have many configurations on cross section, for example, tubular, square or rectangular, and could be hollow or solid. Several recesses 92 are formed externally along the circumference of the cap 72 for permitting air flow from outside and into the battery section 12 (Fig. 1) during normal smoking operation.

Preferably, the member 84 and the flange 74 are coated with nickel or gold to minimize corrosion and enhance electrical conductivity with the battery charging device. Contacts on the battery charging device are typically also coated with nickel or gold, and configured to mate with the contacts of the adaptor 70. Details of the battery charger are presented below.

In order that the device 10 (Fig. 1) simulate a lighted cigarette being smoked, the insert 76 is manufactured of a plastic having a translucency and diffusing property so that light from a light emitting diode (LED) (not shown) within the device diffuses at the tip, i.e., throughout the insert 76, so as to prevent recognition of internal structures and shadows by an observer. This effect may be enhanced by including tiny crystals, e.g., glass crystals, within the plastic.

NJOY Exhibit 1002.2258

During charging, it is desirable to disable the atomizer or otherwise eliminate it from the charging circuit. Were this not done, the wire (not shown) in the atomizer would constitute a relatively low resistance load on the charger, and would defeat the charging function.

Reference is now made to Fig. 13, which is a schematic diagram of electrical circuitry in an electronic cigarette 94 adapted to a battery charger in accordance with an embodiment of the invention. A battery charger electrode assembly 96 is provided with magnets 98, which are attracted to external contacts 100, 102. As the contacts 100, 102 incorporate a ferromagnetic material, they are urged into firm electrical contact with the magnets 98 by magnetic attraction. Positive and negative terminals 111 conduct the output of a conventional battery charger (not shown).

In this embodiment, when charging a rechargeable battery 104, it is not necessary to disassemble the cigarette 94, e.g., by unscrewing a threaded metallic connector 106. The cigarette 94 remains intact before, during, and after the charging operation. As will be seen from the following description, the circuit arrangement comprises a first circuit supplying the atomizer of the cigarette 94 and a second charging circuit extending from the contacts 100, 102 to the battery 104.

A diode 108 is interposed in the second circuit between contact 100 and positive terminal 110 of battery 104. The diode 108 permits the battery 104 to be charged, but prevents outflow of electricity to external contacts 100, 102 if the contacts 100, 102 are inadvertently connected so as to cause a short circuit. The positive terminal 110 is also connected to a contact 112 of a pressure sensor chip assembly 114 disposed at or near the tip of the cigarette 94. Another external contact, contact 102, is connected in common to ground point 116 of the sensor chip assembly 114, to negative terminal 118 of the battery 104, and to the connector 106. The connector 106 is typically a threaded connector joining the battery section with the atomizer section of the cigarette 94, as described above with reference to Fig. 1.

A wire 120 connects the atomizer with the sensor chip assembly 114 at a contact point 122. While cigarette 94 is connected to a battery charger, e.g., a USB charger, via assembly 96, if a user draws on the cigarette 94, he causes the atomizer to be actuated in normal smoking operation. As the atomizer is activated, power flow from the battery charger to the battery both charges the battery and powers the atomizer if the battery is not sufficiently charged.

The assembly 96 comprises the magnets 98, which are held by magnetic attraction against ferromagnetic disks 124, to which are bonded (e.g., soldered) wire leads 126

originating from the battery charger (not shown). This construction avoids the difficult operation of soldering the wire leads 126 directly onto the magnets 98, which would likely impair the magnets 98.

Embodiment 2

Reference is now made to Fig. 14, which is a schematic diagram of electrical circuitry in an electronic cigarette 130 adapted to a battery charger in accordance with an alternate embodiment of the invention. With this embodiment it is possible to connect the external charger while powering the atomizer. The battery charger assembly 96 is now connects to a side port 128 of an electronic cigarette 130 having external contacts 132, 134, which connect in a circuit including the diode 108 and the positive terminal 110 of the battery 104 within battery compartment 105, as in the previous embodiment. When the sensor chip assembly 114 is actuated as the user smokes, it actuates a switch, shown representatively as relay 136, thereby breaking the charger circuit so that the charger is no longer operative. Of course, other types of switches, such as a transistor or field effect transistor could be substituted for relay 136. The sensor chip assembly 114 is typically disposed within or near cigarette tip 115. The battery 104 then feeds power to atomizer 137. The atomizer 137 and the battery compartment 105 may be joined by a threaded connector 139. Once the user is no longer inhaling, the sensor chip assembly 114 operates the relay 136 to again make the circuit and enable charging to continue.

Reference is now made to Fig. 25, which is a block diagram of electrical circuitry for charging an electronic cigarette, in accordance with an alternate embodiment of the invention. There are charging control circuitry 223 for charging control and control switch 225 for smoking control. A battery charger 221 can be connected to and disconnected from charging control circuitry 223. The charging control circuitry 223 is linked to the control switch 225, a rechargeable battery 227, and a sensor unit having control circuitry 229. When the battery charger 221 is connected, the control switch 225 enables and disables the charging control circuitry 223 from charging the battery 227 as commanded by control signals from the circuitry 229. The circuitry 229 is actuated to disable the charging control circuitry 223 when a pressure sensor (not shown) detects a pressure difference from the ambient atmosphere, indicating that the user of the electronic cigarette is inhaling. When the sensor fails to detect a pressure difference, the control switch 225 is commanded to enable the charging control circuitry 223, allowing the battery 227 to continue charging.

NJOY Exhibit 1002.2260

Specifically, when the control switch 225 detects that the battery charger 221 is connected to the system, it automatically connects the circuitry 229 (sensor and atomizer coil control) to operate directly from the battery charger 221. The battery charger 221 performs two functions, according to the state of the control switch 225: (1) Charging the battery; and (2) supplying power to the cigarette for smoking. The only limitation is that the battery charger 221 has sufficient output capacity to support charging and smoking at the same time.

By suitably configuring the control switch 225, the electrical circuitry may selectively operate in either a first mode, wherein power flow to the battery is disabled when the atomizer is activated by a user drawing on the electronic cigarette and is enabled when the atomizer is not activated or may operate in a second mode, wherein power flow to the battery is enabled when the atomizer is activated by the user drawing on the electronic cigarette and when the atomizer is not activated. In the first mode battery charging is disabled while a puff is being taken on the electronic cigarette. In the second mode battery charging continues concurrently with puffing on the electronic cigarette.

Reference is now made to Fig. 15, which is a detailed schematic diagram of electrical circuitry 149 of an electronic cigarette adapted to a battery charger 150 in accordance with an alternate embodiment of the invention. The circuitry 149 allows concurrent smoking and charging. The circuitry shown in Fig. 14 will only charge the battery - between puffs, i.e., when the atomizer is not actuated.

The following describes the operation of the circuit shown in Fig. 15:

Scenario A: The charger 150 is not connected.

Microcontroller 159 and application-specific integrated circuit (ASIC 161) are constantly connected to battery cell 163 in cigarette 165. In this state, the output 4-GP2 of microcontroller 159 is set to "0", and transistor Q1 169 is "open", meaning that output OUT1 on the ASIC 161 is connected to output connector J3. Output 1-GP0 of microcontroller 159 exactly duplicates the signal from sensor S 167 (When sensor S 167 is disconnected, 1-GP0 shows a logical "1"; and when sensor S 167 is connected, 1-GP0 of microcontroller 159 shows a logical "0"). Alternatively, the sensor S 167 may be realized as an analog circuit, with appropriate modification of the microcontroller 159 to accommodate an analog device, for example, by including an analog-to-digital converter as is known in the art.

Therefore, the cigarette 165 works the same as usual, and the circuitry 149 does not affect the operation of the cigarette 165, since the input 6-GP3 of microcontroller 159 shows a logical "0", which indicates that the charger 150 is not connected.

Scenario B: The charger 150 is connected.

As the charger 150 is connected, a logical "1" is instantly created on leg 6-GP3 of the microcontroller 159, which indicates that the charger 150 is connected.

At this state, a logical "1" is produced constantly at the output 1-GP0 of the microcontroller 159, meaning that the ASIC 161 no longer controls sensor S 167. The transistor Q1 169 is also closed in this state, meaning that there is no electrical connection between OUT1 of the ASIC 161 and the output connector J3.

When the sensor S 167 is not activated, meaning that the cigarette 165 is not being puffed, the voltage from the charger 150 is being directed via connectors J1, J2 to the input OUT1 of ASIC 161 and goes out through output OUT2 of ASIC 161, to the cell 163, resulting in the charging of the cell 163.

When the sensor S 167 is activated, meaning that the cigarette 165 is being puffed, the signal from the sensor S 167 arrives at the input 3-GP1 of the microcontroller 159, which then does the following:

At the input 4-GP2 a logical "0" is generated. Transistor Q1 169 opens, and the power travels from the charger 150 through the transistor Q1 169 and goes to the heating element of the cartridge (not shown) in the cigarette 165, and at the same time the power charges the cell 163 (if it is not fully charged).

In some embodiments, LED's (not shown) are included with the ASIC 161 or separate from the ASIC 161 and controlled by the microcontroller 159 in either case. These LED's inform the user of the status of the ASIC 161 and simulate smoking activity.

In another embodiment of the circuit all the functionality of the circuitry 149 may be incorporated into the ASIC.

Embodiment 3.

Reference is now made to Fig. 16, which is a side elevation of a cradle 154 for connection to a battery charging device in accordance with an embodiment of the invention. This version features a circular ring 152 that engages the tip of a cigarette, holding it in contact with the cradle 154. The ring 152 should be made of a rubbery material such as silicone, in order to facilitate holding a cigarette tip inside the cradle 154 by friction. Notches 156 retain magnet 64.

Reference is now made to Fig. 17, which is a top view of the cradle 154, showing the ring 152, and the magnets 64, 66 in place.

Reference is now made to Fig. 18, which is a sectional view through the cradle 154, illustrating the magnet 64 being held in place by the notches 156.

Embodiment 4

Reference is now made to Fig. 19, which is a partially cut-away view of an electronic cigarette charging system 171, which is constructed and operative in accordance with an alternate embodiment of the invention. This embodiment, like the embodiment shown in Fig. 14, uses a side-port on the electronic cigarette to connect to a cradle 175 housing battery charging circuitry 177. Use of the system 171 avoids any need for disassembly of an electronic cigarette 173. Indeed, the electronic cigarette 173 may be temporarily removed during charging, puffing resumed, and the electronic cigarette then replaced in the cradle 175 to continue charging the battery of the electronic cigarette.

A universal serial bus (USB) adaptor 179 connects a source of power (not shown), e.g., a laptop computer to the circuitry 177 via a cable 185. When the electronic cigarette 173 is inserted into the cradle 175, electrical contacts 181 on the cradle 175 mate with side port electrical contacts 183, which may be magnetic, or spring-loaded, and which are disposed along the barrel of the electronic cigarette 173, as best seen in Fig. 14

Similar to the tip-charging variation described above, the side-charging configuration can also allow for puffing while the cigarette is inside the cradle 175. In such an embodiment, the circuitry shown in Fig. 15 may be used.

Embodiment 5

Reference is now made to Fig. 20, Fig. 21 and Fig. 22, which are, respectively, an elevation and two cutaway views of a tip of an electronic cigarette that is constructed and operative to engage a battery charger in accordance with an alternate embodiment of the invention. An outer metallic ring or band 189 functions as one electrical contact with the battery charger. The band 189 is typically, but not necessarily, the positive contact. As seen in Fig. 22, it extends proximally, and is exposed to the interior of body 195 of the electronic cigarette at a point 203. A centrally located metallic plug 191 functions as the other electrical contact, typically the negative pole. The band 189 and the plug 191 may be magnetic, or constructed of a paramagnetic material. Wires (not shown), lead from the band 189 and the plug 191 to a battery within the body of the cigarette as discussed above, or to regulatory circuitry, e.g., circuitry 149 (Fig. 15).

A member 193 appears on Fig. 20 as a ring separating the band 189 from the plug 191.

The member 193 has a first function: it acts as an electrical insulator between the two contacts, band 189 and plug 191. It is formed of an electrically non-conductive material.

NJOY Exhibit 1002.2263

The member 193 has a second function: placing the interior of the body 195 into fluid communication with ambient air as seen in Fig. 21, so as to facilitate operation of a pressure sensor, e.g., sensor 24 (Fig. 1). The member 193 achieves this using a groove or channel 197 formed therein, which emerges onto the exterior of the tip at a point 199 and debouches into the interior of the body 195 at point 201.

The member 193 has a third function: simulating the glow of a conventional cigarette tip. To that end, the member 193 is typically composed of a plastic having an opacity and diffusing property so that light from a LED (not shown) within the body 195 diffuses when it passes through the member 193, so as to mask internal structures and internal shadows produced by the LED, such that their features cannot be perceived by an observer. This effect may be enhanced by including tiny crystals, e.g., glass crystals, within the plastic.

Embodiment 6

Reference is now made to Fig. 23, which is a cut-away view of a portion of a barrel 215 of an electronic cigarette 211 having a LED cap 207, in accordance with an alternate embodiment of the invention. This embodiment is a modification of the tip adaptor 34 shown in Figs. 2, 3 and 4, which accommodates a sensor in an internal chamber, and may include integrated circuitry. The LED cap 207 is mostly inset into the end of the barrel 215, and lacks the electrical contact mechanisms of the adaptor 34 for tip-charging the electronic cigarette. The LED cap 207 may be constructed of a plastic material as described for the member 193 (Fig. 20). A sensor unit 209 occupies the interior of the LED cap 207, and is an embodiment of the sensor 24 (Fig. 1), but instead of being inside a plastic housing of its own, the sensor unit 209 is now disposed inside the LED cap 207 in order to save space. Electrical circuitry associated with or incorporated in the sensor unit 209 may enable the atomizer and perform various additional functions as may be required for the operation of the electronic cigarette 211. The LED cap 207 has a perforation 213 for communication between the sensor unit 209 and the ambient atmosphere. A battery 217 powers the electronic cigarette 211 as described above.

Reference is now made to Fig. 24, which is a sectional view of the electronic cigarette 211 shown in Fig. 23, illustrating structural details of the sensor unit 209 and its relationship with the LED cap 207 and perforation 213.

It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention includes both combinations and sub-combinations of the various features

described hereinabove, as well as variations and modifications thereof that are not in the prior art, which would occur to persons skilled in the art upon reading the foregoing *description.*

NJOY Exhibit 1002.2265

CLAIMS.

1. An electronic cigarette charging system, comprising:

a rechargeable electronic cigarette having an end and first and second electrical contacts;

a cradle, connectable to a battery charger, comprising:

a receiving element adapted to receive the end of the electronic cigarette, the receiving element having electrically conductive first and second contacts having respective first and second contact surfaces for contacting the first and second electrical contacts of the electronic cigarette, respectively to thereby establish an electrical connection with the battery charger.

2. The system according to claim 1, wherein the first and second electrical contacts of the electronic cigarette are magnetically attractive to the first and second contact surfaces of the receiving element, respectively.

3. The system according to any of claims 1-2, wherein at least one of the first and second contact surfaces of the receiving element is a magnet.

4. The system according to any of claims 1-3, wherein at least one of the first and second contacts of the electronic cigarette is a magnet.

5. The system according to any of claims 1-4, wherein the end of the electronic cigarette comprises an adaptor having an orifice formed therethrough and an inset for receiving a conductive flange, the orifice being disposed such that an extension of the flange is placed in contact with one of the first and second contacts of the receiving element when the electronic cigarette is in the cradle, the adaptor further comprising at least one side groove for receiving a contact pin to contact another of the first and second contacts of the receiving element.

6. The system according to claim 5, wherein the adaptor has vents formed therein to permit ambient air to enter an interior of the electronic cigarette.

7. The system according to any of claims 1-4, wherein the end of the electronic cigarette comprises an adaptor having a sensor unit housed in an interior chamber thereof, and having a

NJOY Exhibit 1002.2266

perforation extending from the interior chamber to an exterior of the electronic cigarette to place the interior chamber in fluid communication with ambient atmosphere.

8. The system according to any of claims 1-4, wherein the end of the electronic cigarette comprises an adaptor, the adaptor including:

a cap having a lip and a conductive flange on the cap for contacting one of the first and second contact surfaces of the receiving element; and

a conductive coaxial member having an insert attached to the lip, wherein the insert has an orifice formed therethrough for receiving an extension of the coaxial member, the orifice being disposed such that the extension of the coaxial member is placed in contact with another of the first and second contacts of the receiving element when the electronic cigarette is in the cradle.

9. The system according to claim 8, wherein the adaptor has vents formed therein to permit ambient air to enter an interior of the electronic cigarette.

10. The system according to any of claims 8-9, further comprising a light source within the electronic cigarette, wherein the insert has a translucency and diffusing property sufficient to prevent recognition of structures and shadows within the electronic cigarette when the insert is illuminated from within the electronic cigarette by the light source.

11. An electronic cigarette charging system, comprising:

an electronic cigarette having a first set of electrical contacts, an atomizer and a rechargeable battery for powering the atomizer;

an electrode assembly connectable to a power source having a second set of electrical contacts that are arranged to mate with the first set of electrical contacts, whereupon the electronic cigarette receives power via the electrode assembly for recharging the battery while remaining operational for use by a smoker; and

electrical circuitry connected to the first set of electrical contacts comprising a first circuit for supplying battery power to the atomizer and a second circuit for providing power from a battery charger to the battery for recharging thereof, the first circuit cooperative with the second circuit to disable power flow via the electrode assembly to the battery when the atomizer is activated and to resume the power flow when the atomizer ceases to be activated.

NJOY Exhibit 1002.2267

12. The system according to claim 11, wherein the second set of electrical contacts comprises:

respective ferromagnetic disks that are bonded to lead wires that are connectable to the battery charger; and

magnets held by magnetic attraction in contact with the disks.

13. The system according to any of claims 11-12, wherein the first set of electrical contacts are disposed at an end of the electronic cigarette.

14. The system according to any of claims 11-12, wherein the first set of electrical contacts are disposed at a side portal of the electronic cigarette.

15. The system according to claim 14, further comprising a cradle receiving the electronic cigarette and having the second set of electrical contacts disposed therein.

16. The system according to any of claims 14-15, further comprising a universal serial bus adaptor linked to the second set of electrical contacts for connection to the power source.

17. The system according to any of claims 11-14, wherein the electrical circuitry comprises:

a pressure sensor;

a transistor coupled to the battery and the first set of electrical contacts;

a microprocessor; and

electronic logic, wherein the microprocessor is responsive to the sensor and the electronic logic to regulate the transistor to enable and disable power flow to the battery via the first set of electrical contacts.

18. An electronic cigarette, comprising:

an atomizer;

a rechargeable battery for powering the atomizer; and

an adaptor having a first set of electrical contacts connectable to a battery charger, wherein the adaptor is disposed at an end of the electronic cigarette and comprises:

an outer metallic band having an extension that is exposed to an interior space of the electronic cigarette;

an inner metallic plug exposed to the interior space of the electronic cigarette; and

an electrically nonconductive intermediate member separating the band from the plug and having a channel formed therein that extends from an exterior of the electronic cigarette to the interior space thereof that allows ambient air to enter the interior space.

19. The electronic cigarette according to claim 18, wherein the intermediate member has a translucency and diffusing property sufficient to prevent recognition of structures and shadows within to the electronic cigarette when the adaptor is illuminated from within the electronic cigarette.

20. An electronic cigarette, comprising:

a first set of electrical contacts, an atomizer and a rechargeable battery for powering the atomizer, wherein the first set of electrical contacts is connectable to an electrode assembly having a second set of electrical contacts, whereupon the electronic cigarette receives power via the electrode assembly for recharging the battery while being smoked by a smoker; and

electrical circuitry connected to the first set of electrical contacts comprising a first circuit for supplying battery power to the atomizer and a second circuit for providing power from a battery charger to the battery for recharging thereof.

21. The electronic cigarette according to claim 20, wherein the first set of electrical contacts are disposed at an end of the electronic cigarette.

22. The electronic cigarette according to any of claims 20-21, wherein the first set of electrical contacts are disposed at a side portal of the electronic cigarette.

23. The electronic cigarette according to any of claims 20-22, wherein the electrical circuitry comprises:

a pressure sensor;

a transistor coupled to the battery and the first set of electrical contacts;

a microprocessor; and

electronic logic, wherein the microprocessor is responsive to the sensor and the electronic logic to regulate the transistor to enable and disable power flow to the battery via the first set of electrical contacts.

24. The electronic cigarette according to any of claims 20-23, wherein the electrical circuitry is configured for selective operation:

in a first mode, wherein power flow to the battery is disabled when the atomizer is activated by a user drawing on the electronic cigarette and is enabled when the atomizer is not activated; and

in a second mode wherein power flow to the battery is enabled when the atomizer is activated by the user drawing on the electronic cigarette and when the atomizer is not activated.

25. An electronic cigarette, comprising:

an atomizer;

a battery for powering the atomizer; and

a tip adaptor disposed at an end of the electronic cigarette, the adaptor having a sensor unit housed in an interior chamber thereof, and having a perforation extending from the interior chamber to an exterior of the electronic cigarette to place the interior chamber in fluid communication with ambient atmosphere.

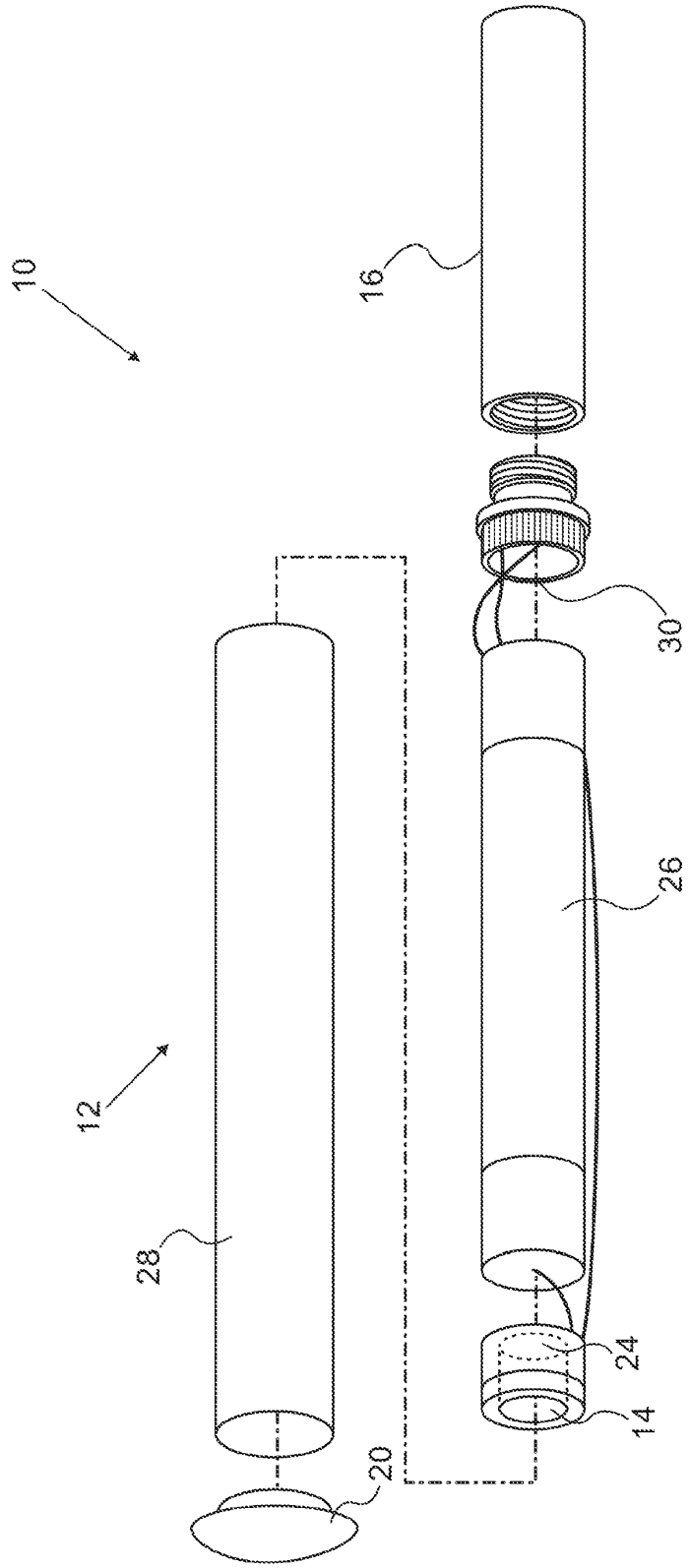


FIG. 1

NJOY Exhibit 1002.2271

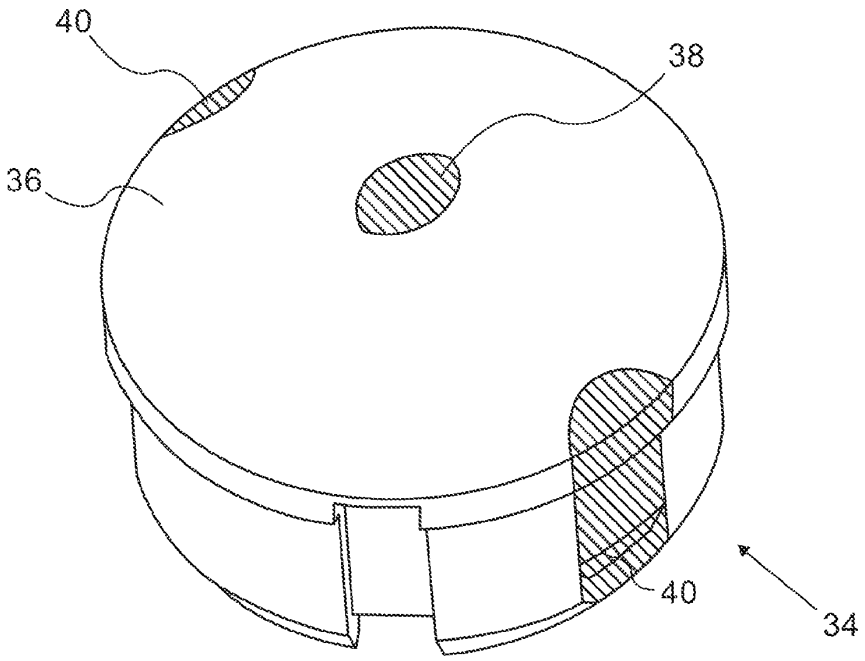


FIG. 2

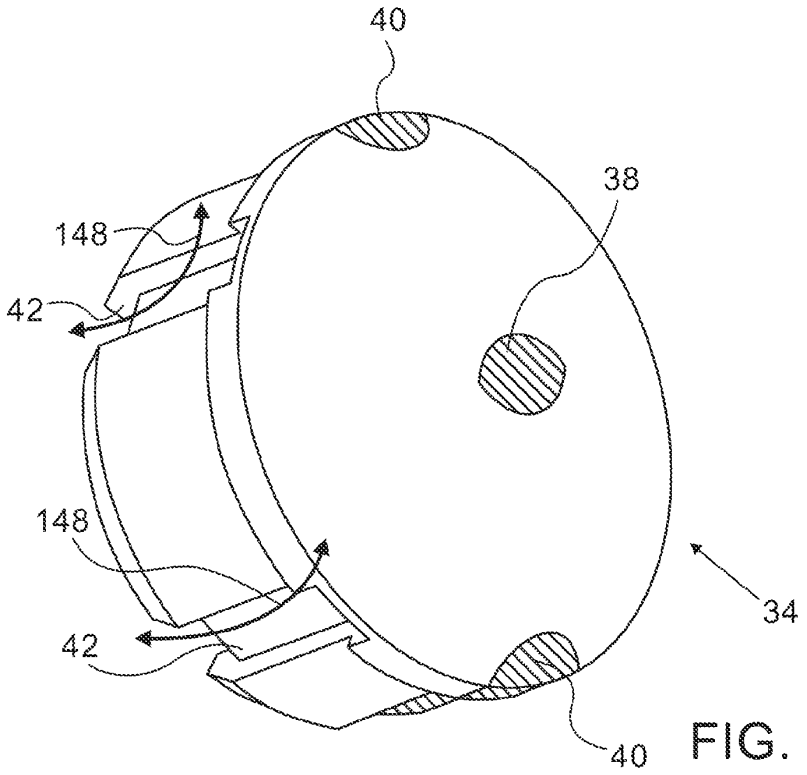


FIG. 3

NJOY Exhibit 1002.2272

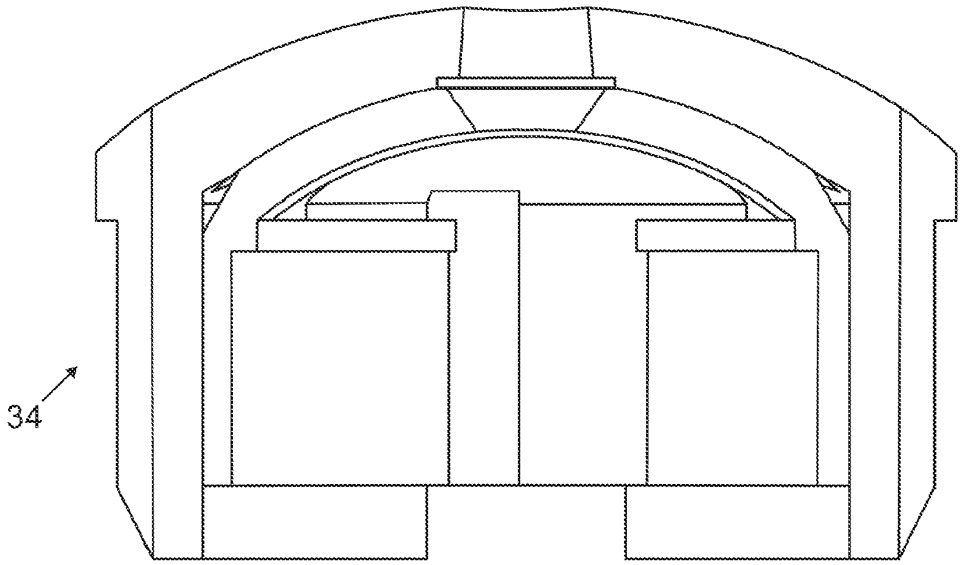


FIG. 4

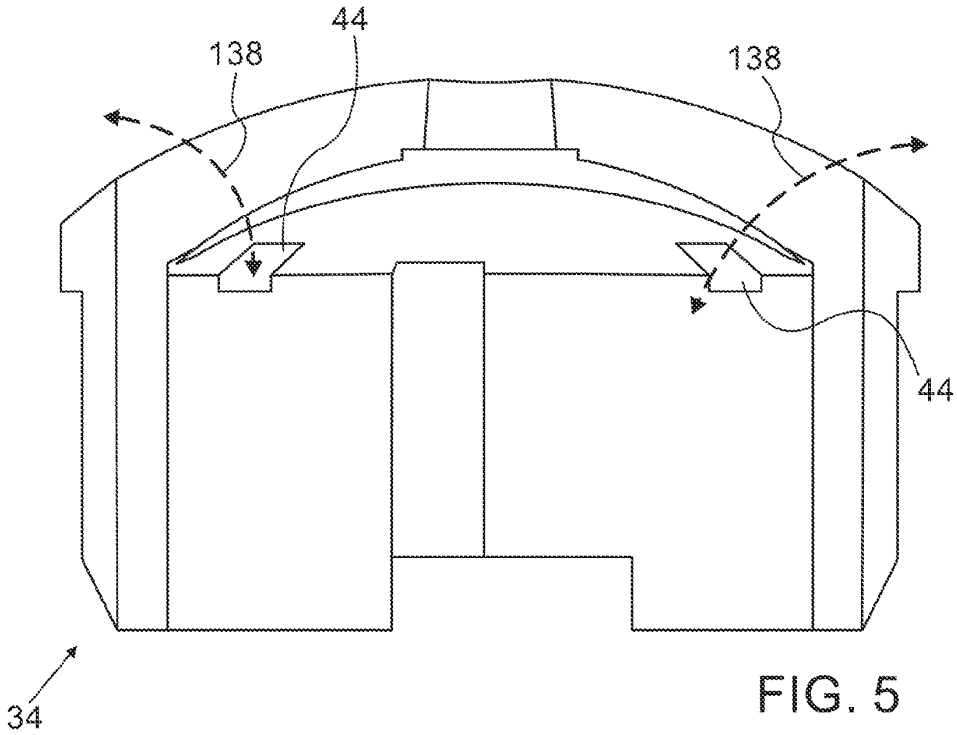


FIG. 5

NJOY Exhibit 1002.2273

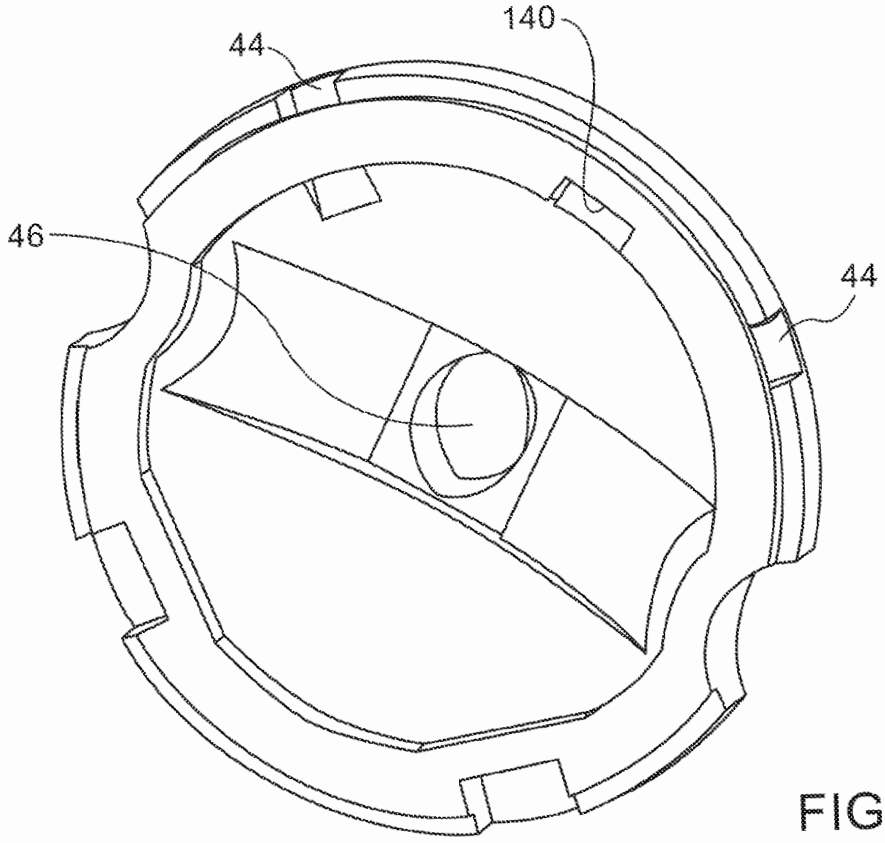


FIG. 6

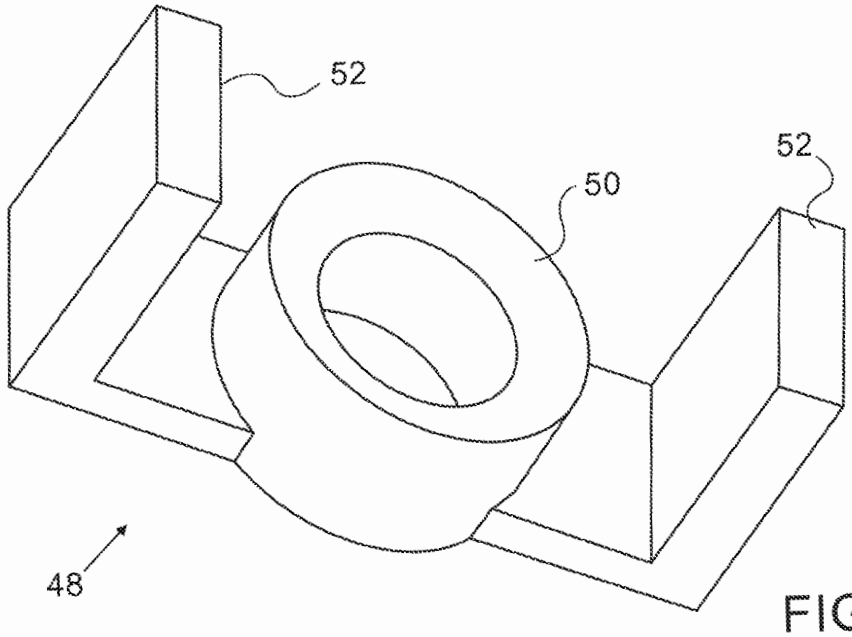


FIG. 7

NJOY Exhibit 1002.2274

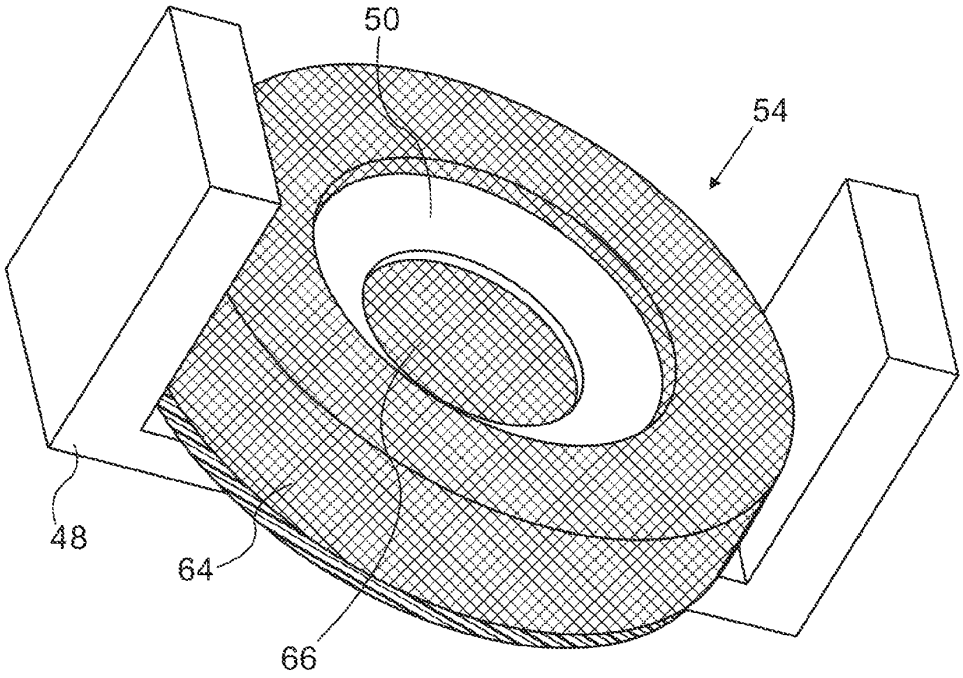


FIG. 8

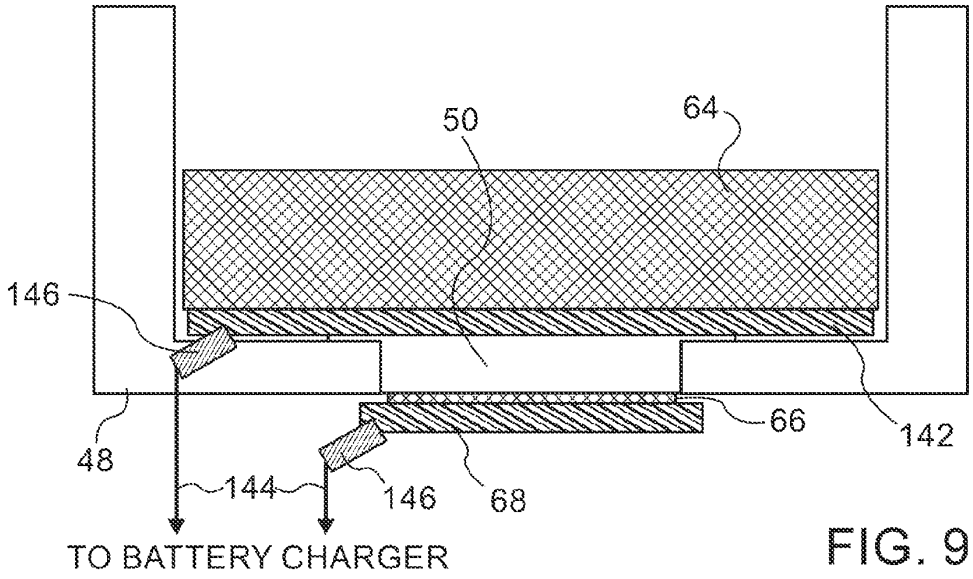


FIG. 9

NJOY Exhibit 1002.2275

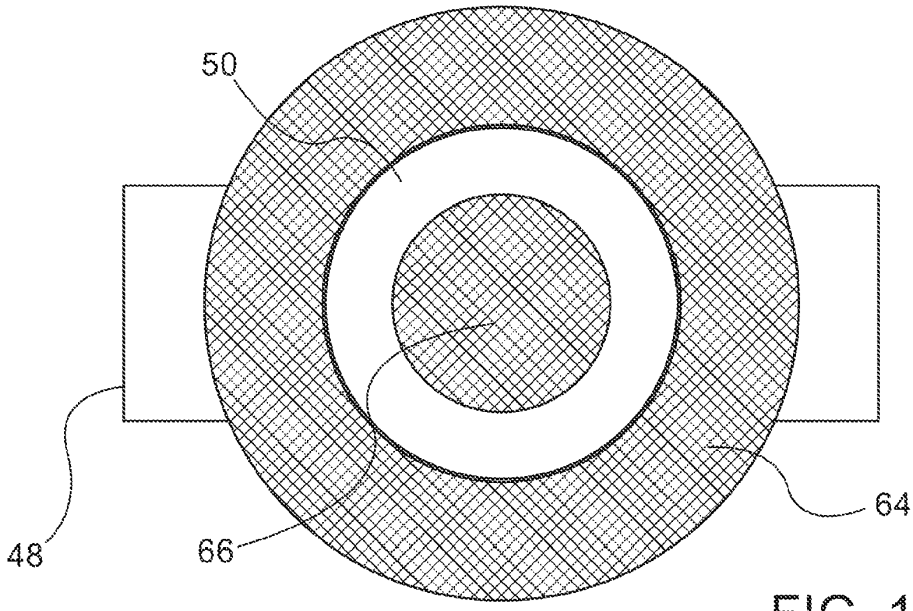


FIG. 10

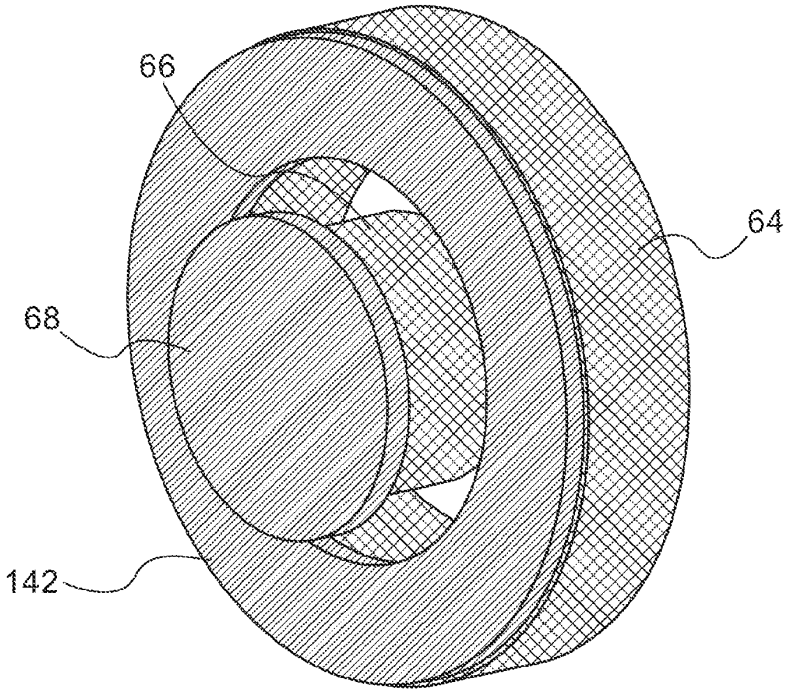


FIG. 11

NJOY Exhibit 1002.2276

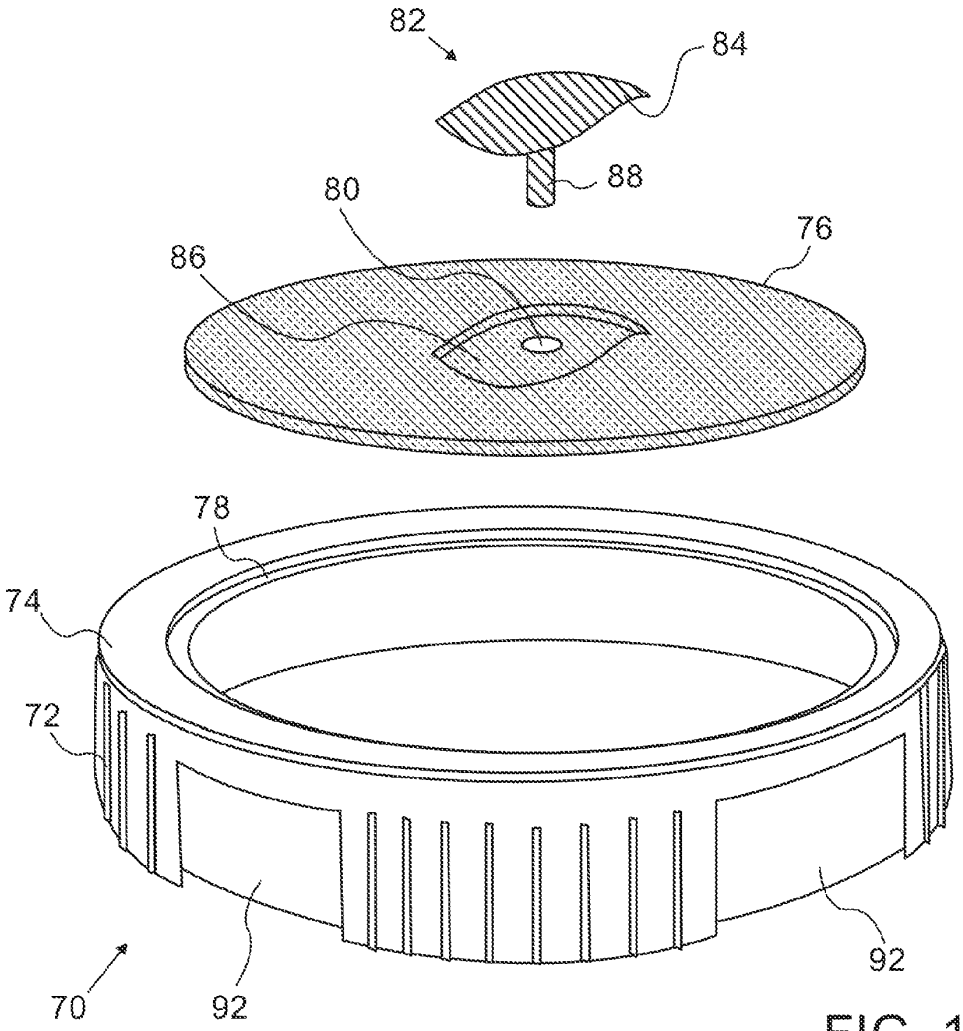


FIG. 12

NJOY Exhibit 1002.2277

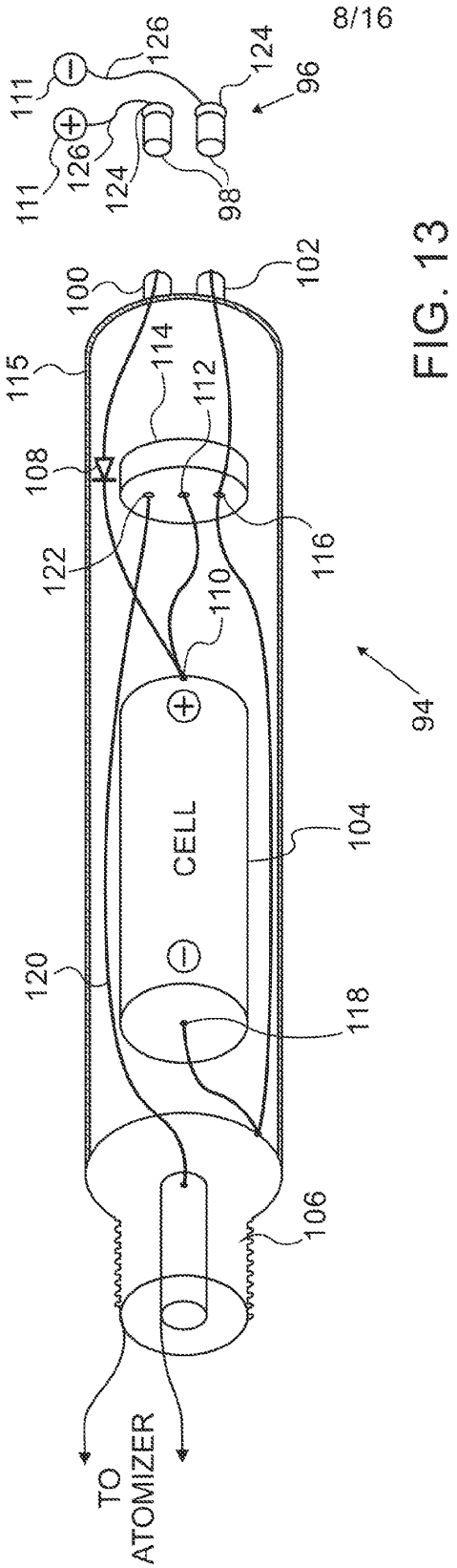


FIG. 13

NJOY Exhibit 1002.2278

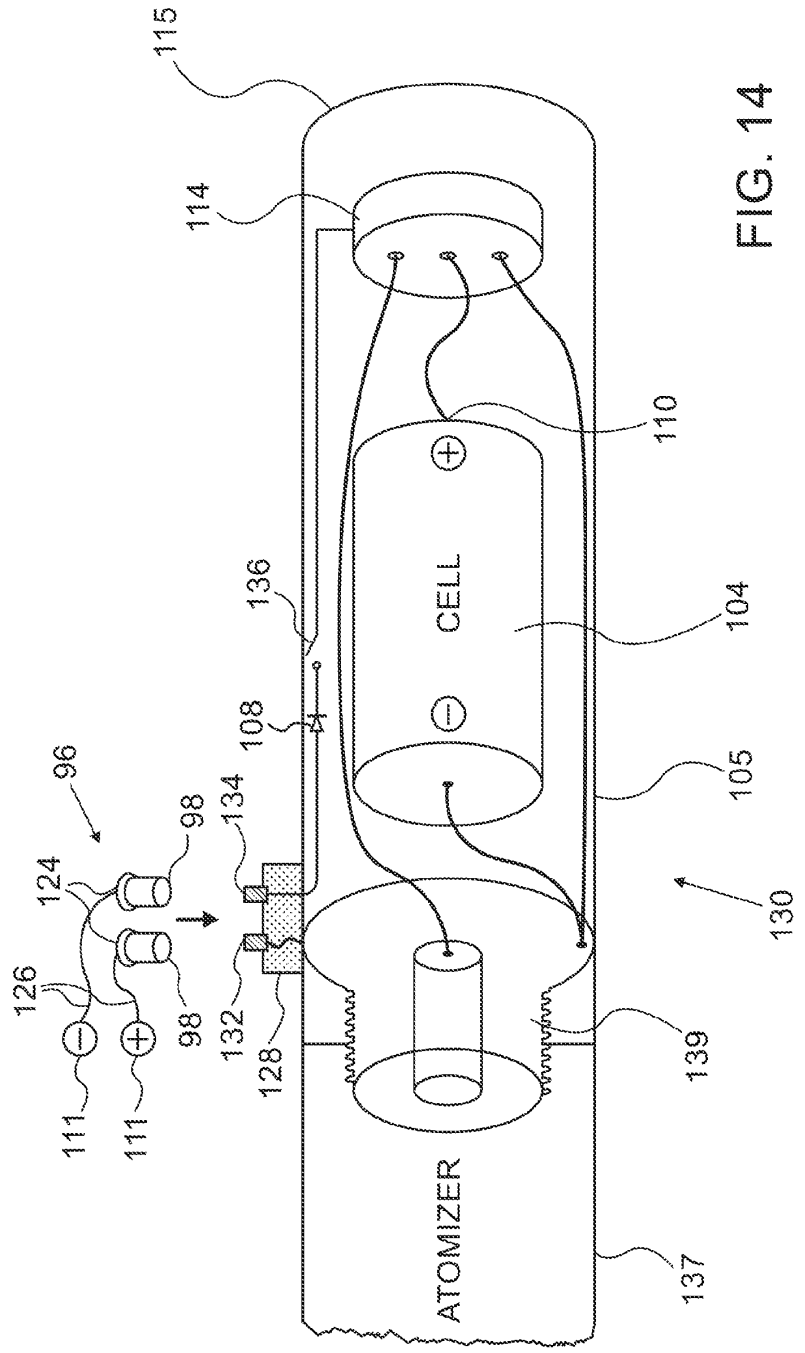


FIG. 14

NJOY Exhibit 1002.2279

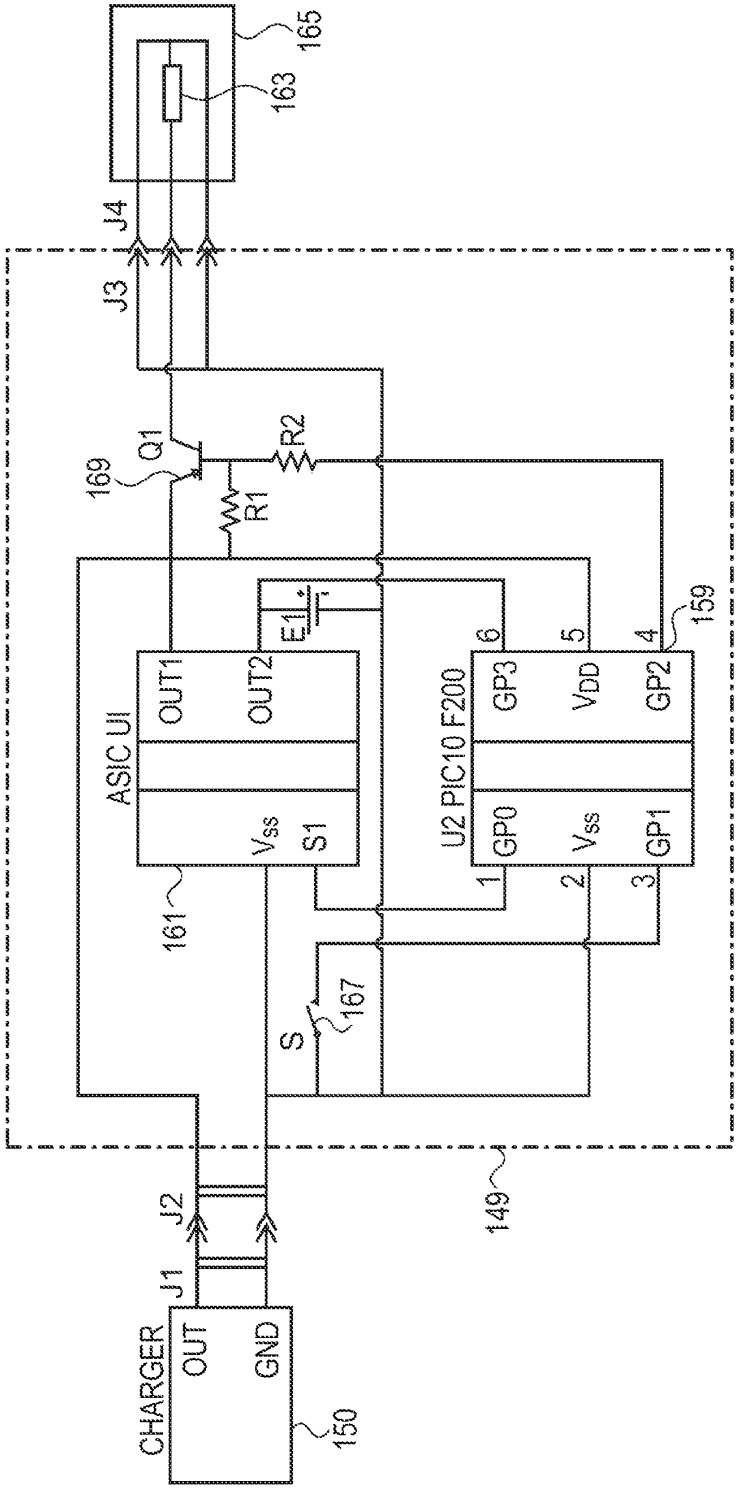


FIG. 15

NJOY Exhibit 1002.2280

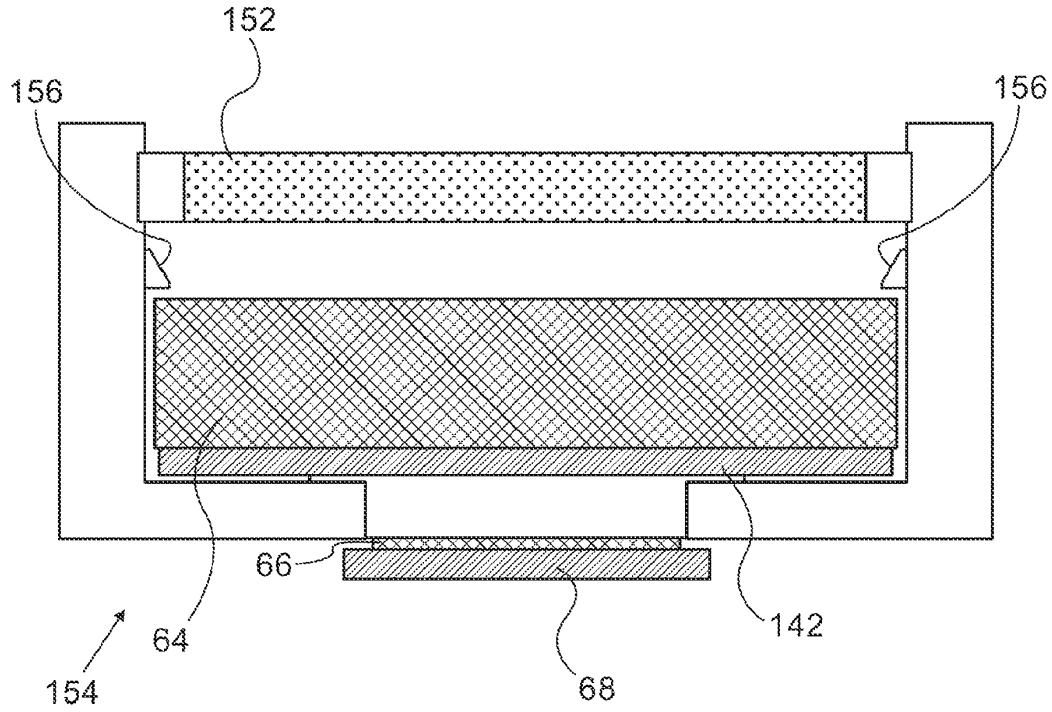


FIG. 16

NJOY Exhibit 1002.2281

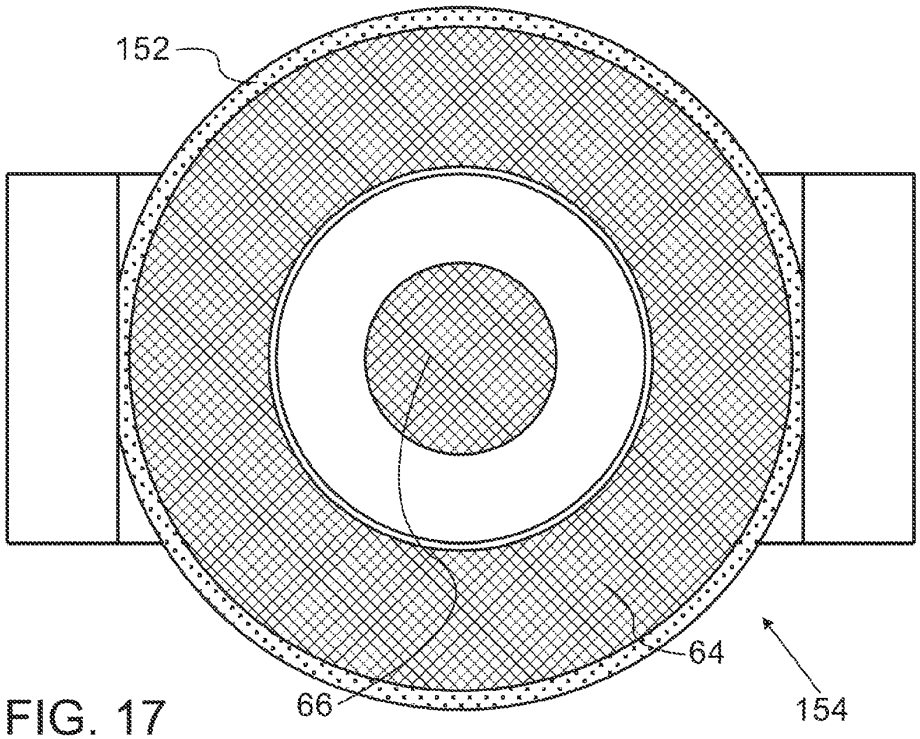


FIG. 17

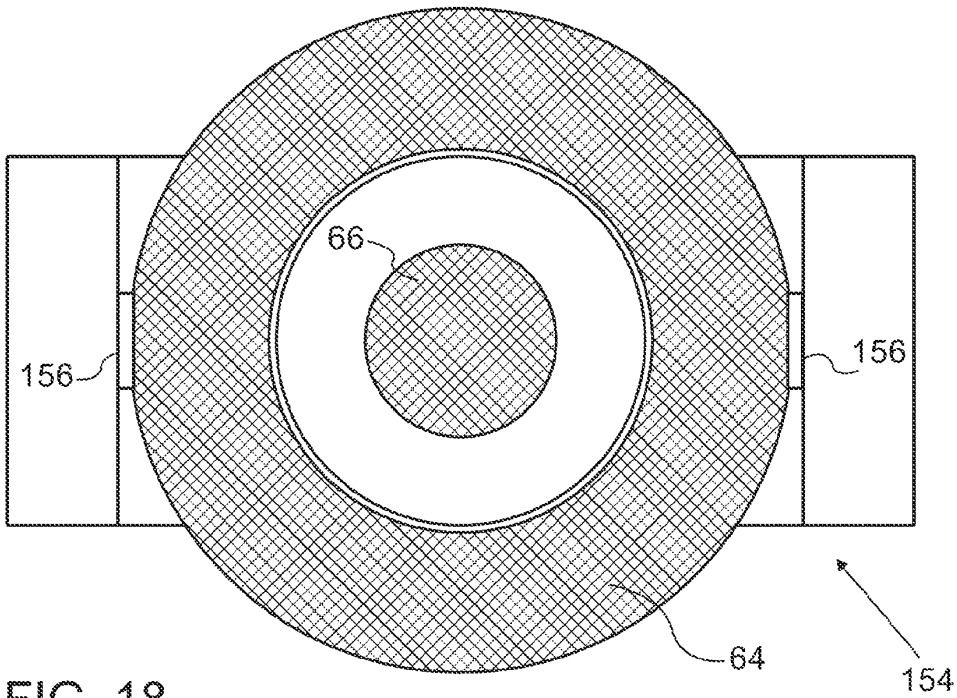
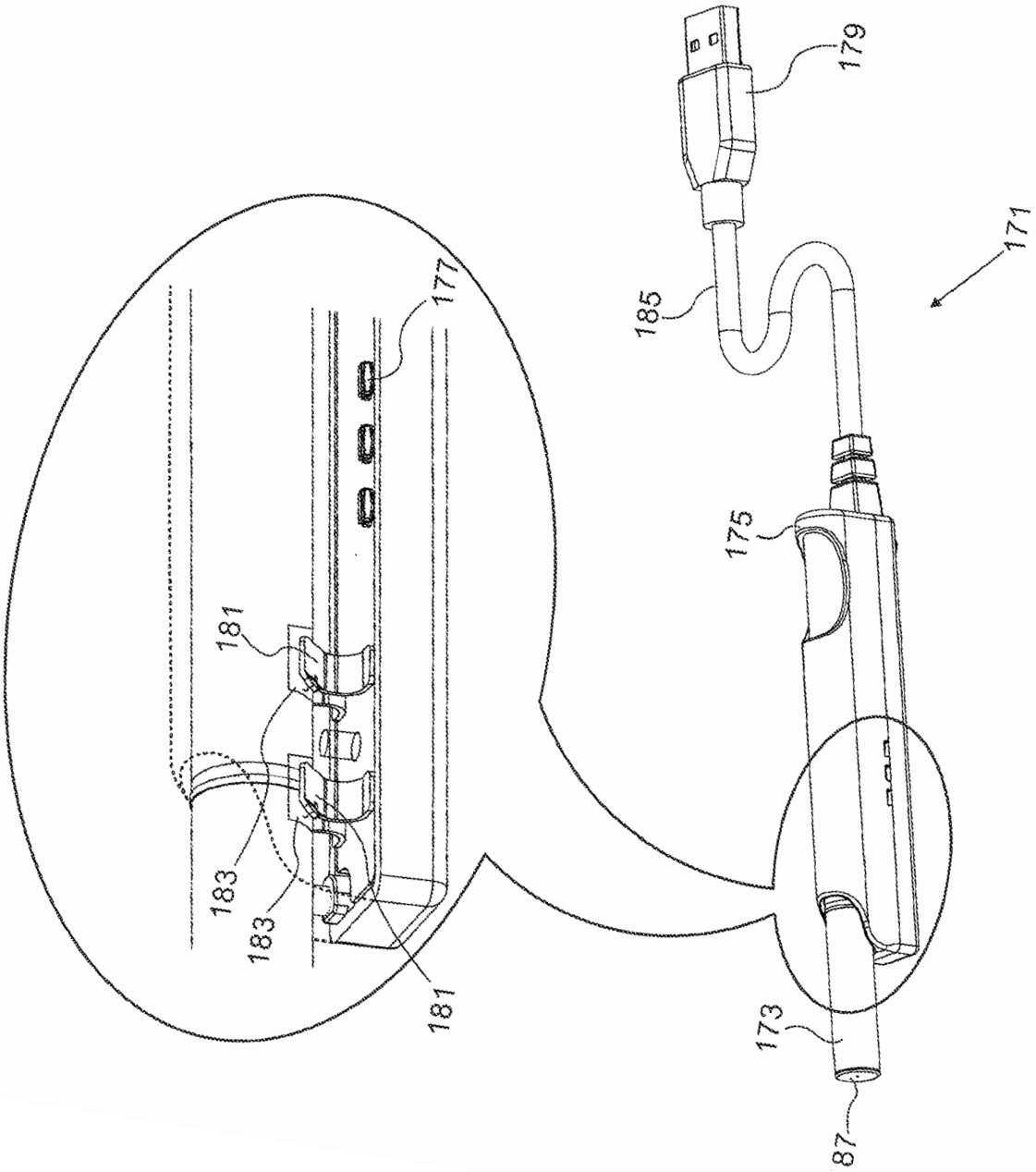


FIG. 18

NJOY Exhibit 1002.2282

FIG. 19



NJOY Exhibit 1002.2283

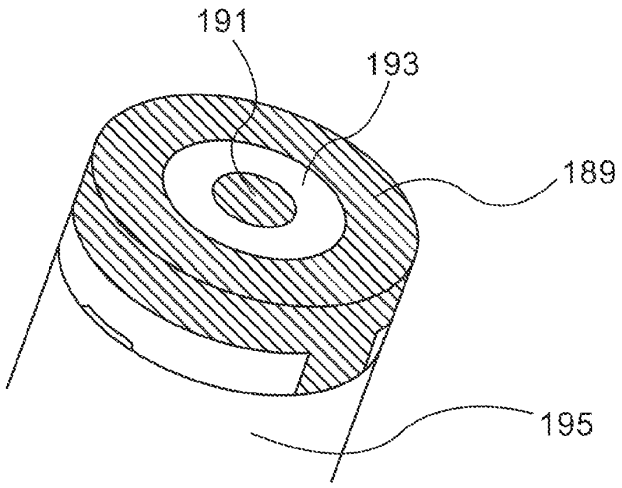


FIG. 20

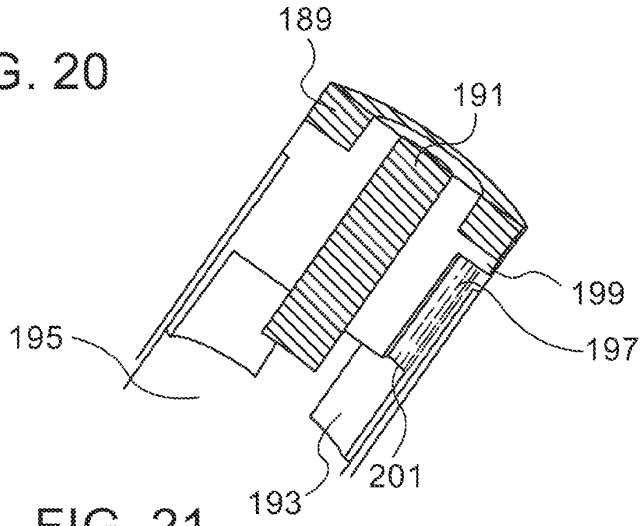


FIG. 21

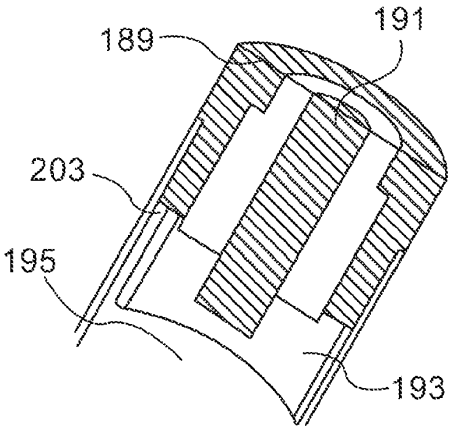


FIG. 22

NJOY Exhibit 1002.2284

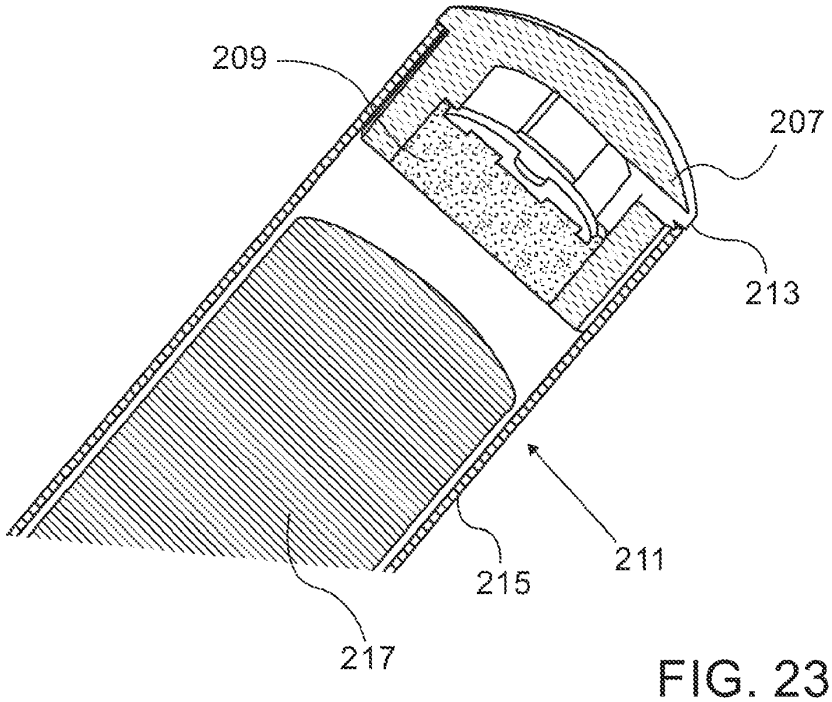


FIG. 23

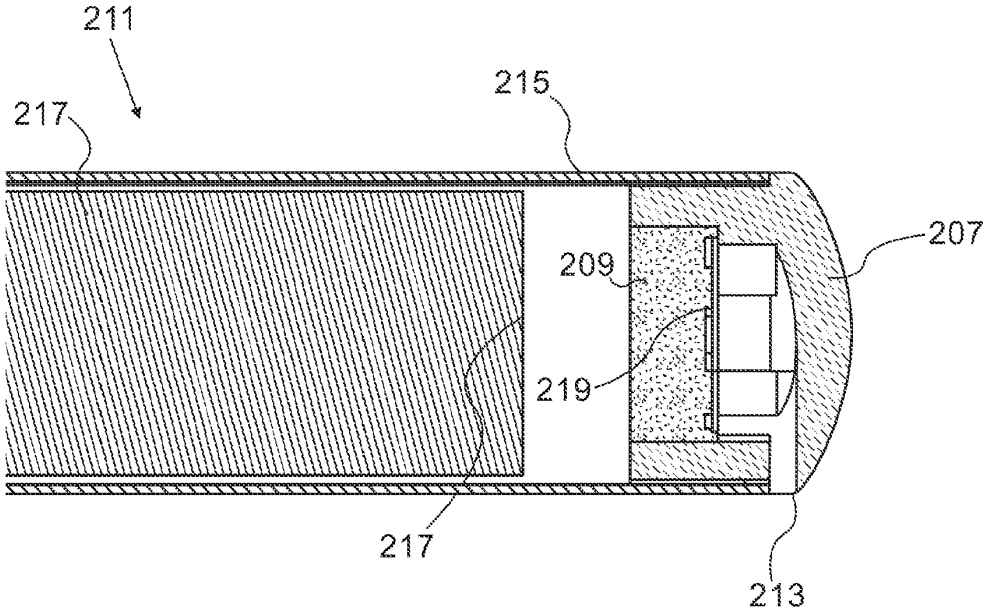


FIG. 24

NJOY Exhibit 1002.2285

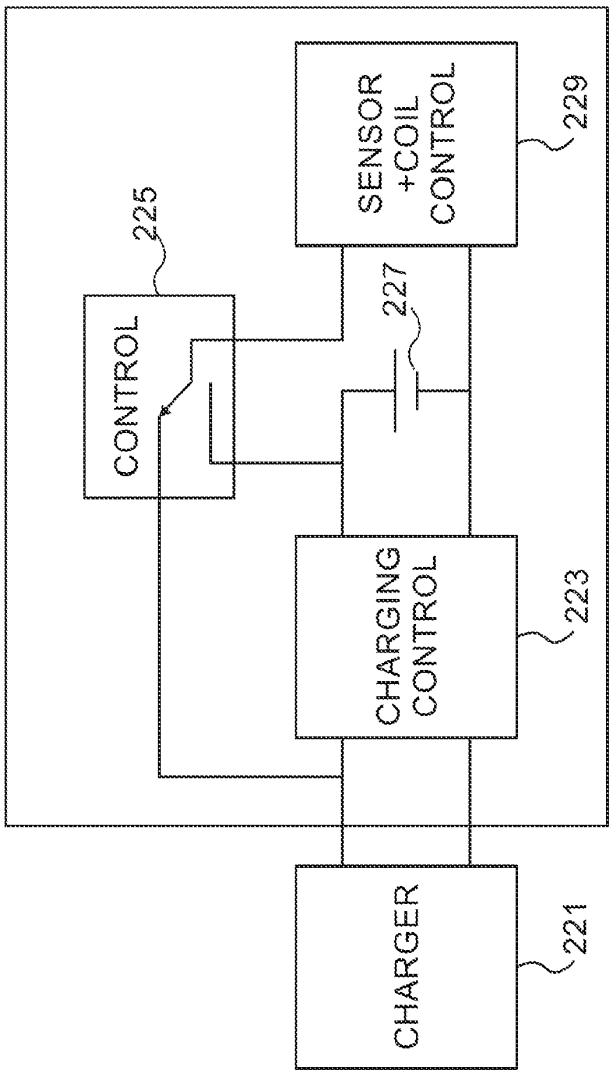

CHARGER
221
CHARGING CONTROL
223
CONTROL
225
227
SENSOR +COIL CONTROL
229

FIG. 25

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2012/057108

A. CLASSIFICATION OF SUBJECT MATTER
IPC (2013.01) A24F 47/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC (2013.01) A24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Databases consulted: THOMSON INNOVATION, Esp@cenet, Google Patents, FamPat database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010307518 A1 WANG XI YI 09 Dec 2010 (2010/12/09) the whole document	1,5-9,18,25
Y	the whole document	2-4,10,19
X	EP 2100525 A1 PHILIP MORRIS PROD 16 Sep 2009 (2009/09/16) the whole document	11,20
Y	the whole document	12-17,21-23
Y	GB 2445598 A MOTOROLA INC 16 Jul 2008 (2008/07/16) abstract	2-4,12
Y	US 2011304282 A1 LI YONGHAI 15 Dec 2011 (2011/12/15) the whole document	10,19

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published 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
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 Apr 2013	23 Apr 2013

Name and mailing address of the ISA:	Authorized officer
Israel Patent Office Technology Park, Bldg.5, Malcha, Jerusalem, 9695101, Israel Facsimile No. 972-2-5651616	NARGASI Ayelet Telephone No. 972-2-5651620

NJOY Exhibit 1002.2287

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2012/057108

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2011087569 A YASUDA TADAO 06 May 2011 (2011/05/06) abstract and figures	15,16
Y	US 5322075 A PHILIP MORRIS INC 21 Jun 1994 (1994/06/21) col.8 lines 28-46	11-17,20-23
A	US 2010313901 A1 PHILIP MORRIS USA INC 16 Dec 2010 (2010/12/16) the whole document	1-25

NJOY Exhibit 1002.2288

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2012/057108

Patent document cited search report	Publication date	Patent family member(s)	Publication Date
US 2010307518 A1	09 Dec 2010	AT 515200 T	15 Jul 2011
		AU 2008249613 A1	20 Nov 2008
		AU 2008249613 A2	07 Jan 2010
		CA 2705413 A1	20 Nov 2009
		CN 101795587 A	04 Aug 2010
		CN 101795587 B	04 Jul 2012
		DK 2157873 T3	24 Oct 2011
		EP 1989946 A1	12 Nov 2008
		EP 2157873 A2	03 Mar 2010
		EP 2157873 B1	06 Jul 2011
		ES 2370872 T3	23 Dec 2011
		JP 2010526553 A	05 Aug 2010
		KR 20100021595 A	25 Feb 2010
		RU 2009145954 A	20 Jun 2011
		US 2010307518 A1	09 Dec 2010
		WO 2008138650 A1	20 Nov 2008
		WO 2008139411 A2	20 Nov 2008
		WO 2008139411 A3	15 Jan 2009
		ZA 200907364 A	30 Jun 2010
EP 2100525 A1	16 Sep 2009	AR 071747 A1	14 Jul 2010
		AU 2009224980 A1	17 Sep 2009
		CA 2716986 A1	17 Sep 2009
		CN 101969800 A	09 Feb 2011
		CN 101969800 B	18 Jul 2012
		DK 2265138 T3	05 Nov 2012
		EP 2100525 A1	16 Sep 2009
		EP 2265138 A1	29 Dec 2010
		EP 2265138 B1	12 Sep 2012
		ES 2395223 T3	11 Feb 2013
		JP 2011515080 A	19 May 2011

NJOY Exhibit 1002.2289

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2012/057108

Patent document cited search report	Publication date	Patent family member(s)	Publication Date
		KR 20100127776 A	06 Dec 2010
		MX 2010009622 A	30 Sep 2010
		PT 2265138 E	11 Oct 2012
		RU 2010141985 A	20 Apr 2012
		TW 200942185 A	16 Oct 2009
		US 2009230117 A1	17 Sep 2009
		WO 2009112182 A1	17 Sep 2009
		WO 2009112182 A8	17 Dec 2009
GB 2445598 A	16 Jul 2008	GB 0700714 D0	21 Feb 2007
		GB 2445598 A	16 Jul 2008
		GB 2445598 B	02 Sep 2009
US 2011304282 A1	15 Dec 2011	CN 201830899 U	18 May 2011
		US 2011304282 A1	15 Dec 2011
JP 2011087569 A	06 May 2011	JP 2011087569 A	06 May 2011
US 5322075 A	21 Jun 1994	US 5322075 A	21 Jun 1994
US 2010313901 A1	16 Dec 2010	AU 2010251453 A1	12 Jan 2012
		CA 2762919 A1	25 Nov 2010
		CN 102438470 A	02 May 2012
		CO 6480913 A2	16 Jul 2012
		EP 2253233 A1	24 Nov 2010
		EP 2432339 A1	28 Mar 2012
		IL 216215 D0	31 Jan 2012
		JP 2012527222 A	08 Nov 2012
		KR 20120027029 A	20 Mar 2012
		MX 2011012355 A	06 Mar 2012
		SG 176001 A1	29 Dec 2011

NJOY Exhibit 1002.2290

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2012/057108

Patent document cited search report	Publication date	Patent family member(s)	Publication Date
		US 2010313901 A1	16 Dec 2010
		WO 2010133342 A1	25 Nov 2010

NJOY Exhibit 1002.2291

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2012/057108

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

NJOY Exhibit 1002.2292

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2012/057108

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet):

* This International Searching Authority found multiple inventions in this international application, as follows:

Invention/s 1	An electronic cigarette comprising a rechargeable battery and an adaptor having a first set of electrical contacts connectable to a battery charger.	Claim/s 1-24
Invention/s 2	An electronic cigarette comprising an adaptor having a sensor unit housed in an interior chamber thereof, and having a perforation to place the interior chamber in fluid communication with ambient atmosphere.	Claim/s 25

NJOY Exhibit 1002.2293

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 July 2013 (04.07.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/098397 A2

(51) International Patent Classification: Not classified

(21) International Application Number:
PCT/EP2012/077064

(22) International Filing Date:
28 December 2012 (28.12.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11196240.3 30 December 2011 (30.12.2011) EP
12162894.5 2 April 2012 (02.04.2012) EP

(71) Applicant: **PHILIP MORRIS PRODUCTS S.A.** [CH/CH]; Quai Jeanrenaud 3, CH-2000 Neuchatel (CH).

(72) Inventor: **TALON, Pascal**; 18 Avenues des Romains, F-74200 Thonon-les-Bains (FR).

(74) Agent: **REDDIE & GROSE LLP**; 16 Theobalds Road, London Greater London WC1X 8PL (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

(54) Title: AEROSOL GENERATING DEVICE WITH AIR FLOW DETECTION

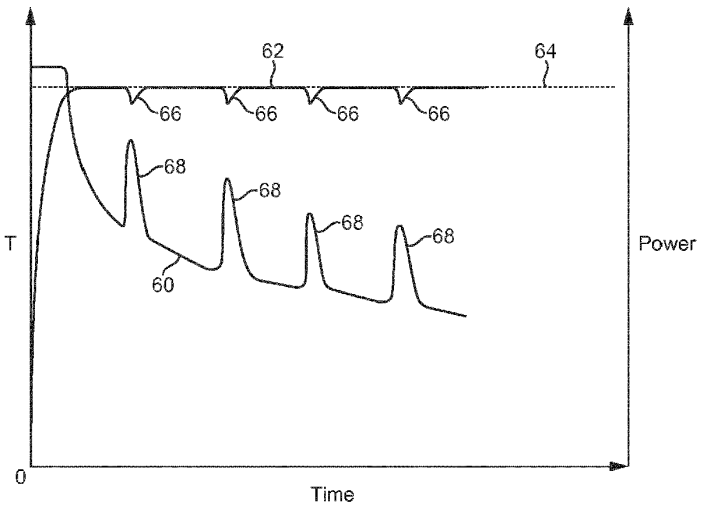


FIG. 3

(57) Abstract: There is provided an aerosol generating device configured for user inhalation of a generated aerosol, the device comprising: a heater element configured to heat an aerosol-forming substrate; a power source connected to the heater element; and a controller connected to the heater element and to the power source, wherein the controller is configured to control the power supplied to the heater element from the power source to maintain the temperature of the heater element at a target temperature, and is configured to monitor changes in the temperature of the heater element or changes in the power supplied to the heater element to detect a change in air flow past the heater element indicative of a user inhalation. The controller may determine when a user has inhaled and may use this for dynamic control of the device as well as provide user inhalation data for subsequent analysis.

WO 2013/098397 A2

NJOY Exhibit 1002.2294

AEROSOL GENERATING DEVICE WITH AIR FLOW DETECTION

This specification relates to aerosol generating systems and in particular to aerosol generating devices for user inhalation, such as smoking devices. The specification relates to a device and method for detecting changes in air flow through an aerosol generating device, typically corresponding to a user inhalation or puff, in a cost effective and reliable way.

Conventional lit end cigarettes deliver smoke as a result of combustion of the tobacco and a wrapper which occurs at temperatures which may exceed 800 degrees Celsius during a puff. At these temperatures, the tobacco is thermally degraded by pyrolysis and combustion. The heat of combustion releases and generates various gaseous combustion products and distillates from the tobacco. The products are drawn through the cigarette and cool and condense to form a smoke containing the tastes and aromas associated with smoking. At combustion temperatures, not only tastes and aromas are generated but also a number of undesirable compounds.

Electrically heated smoking devices are known, which are essentially aerosol generating systems, which operate at lower temperatures than conventional lit end cigarettes. An example of such an electrical smoking device is disclosed in WO2009/118085. WO2009/118085 discloses an electrical smoking system in which an aerosol-forming substrate is heated by a heater element to generate an aerosol. The temperature of the heater element is controlled to be within a particular range of temperatures in order to ensure that undesirable volatile compounds are not generated and released from the substrate while other, desired volatile compounds are released.

It is desirable to provide a puff detection function in an aerosol generating device in an inexpensive and reliable manner. Puff detection is useful, for example, both for dynamic control of a heater element within the system and for analytical purposes.

In an aspect of the specification, there is provided an aerosol generating device configured to user inhalation of a generated aerosol, the device comprising:
a heater element configured to heat an aerosol-forming substrate;
a power source connected to the heater element; and
a controller connected to the heater element and to the power source, wherein the controller is configured to control the power supplied to the heater element from the power source to maintain the temperature of the heater element at a target temperature, and is configured to monitor changes in the temperature of the heater element or changes in the power supplied

NJOY Exhibit 1002.2295

to the heater element to detect a change in air flow past the heater element indicative of a user inhalation.

As used herein, an 'aerosol-generating device' relates to a device that interacts with an aerosol-forming substrate to generate an aerosol. The aerosol-forming substrate may be part of an aerosol-generating article, for example part of a smoking article. An aerosol-generating device may be a smoking device that interacts with an aerosol-forming substrate of an aerosol-generating article to generate an aerosol that is directly inhalable into a user's lungs thorough the user's mouth. An aerosol-generating device may be a holder.

As used herein, the term 'aerosol-forming substrate' relates to a substrate capable of releasing volatile compounds that can form an aerosol. Such volatile compounds may be released by heating the aerosol-forming substrate. An aerosol-forming substrate may conveniently be part of an aerosol-generating article or smoking article.

As used herein, the terms 'aerosol-generating article' and 'smoking article' refer to an article comprising an aerosol-forming substrate that is capable of releasing volatile compounds that can form an aerosol. For example, an aerosol-generating article may be a smoking article that generates an aerosol that is directly inhalable into a user's lungs through the user's mouth. An aerosol-generating article may be disposable. The term 'smoking article' is generally used hereafter. A smoking article may be, or may comprise, a tobacco stick.

As used herein, the term "inhalation" is intended to mean the action of a user drawing an aerosol into their body through their mouth or nose. Inhalation includes the situation where an aerosol is drawn into the user's lungs, and also the situation where an aerosol is only drawn into the user's mouth or nasal cavity before being expelled from the user's body.

The controller may comprise a programmable microprocessor. In another embodiment, the controller may comprise a dedicated electronic chip such as a field programmable gate array (FPGA) or an application specific integrated circuit (ASIC). In general, any device capable of providing a signal capable of controlling a heater element may be used consistent with the embodiments discussed herein. In one embodiment the controller is configured to monitor a difference between the temperature of the heater element and the target temperature to detect a change in air flow past the heater element indicative of a user inhalation.

The specification provides for detection of changes in airflow through an aerosol generating device, and in particular detection of user inhalations or puffs, without requiring a dedicated

NJOY Exhibit 1002.2296

air flow sensor. This reduces the cost and complexity of providing for detection of user inhalation as compared with existing devices that include a dedicated air flow sensor, and increases reliability as there are fewer components that can potentially fail.

In one embodiment, the controller may be configured to monitor if a difference between the temperature of the heater element and the target temperature exceeds a threshold in order to detect a change in air flow past the heater element indicative of a user inhalation. The controller may be configured to monitor whether a difference between the temperature of the heater element and the target temperature exceeds a threshold for a predetermined time period or for a predetermined number of measurement cycles to detect a change in air flow past the heater element indicative of a user inhalation. This ensures that very short term fluctuations in temperature do not lead to false detection of a user inhalation.

In another embodiment the controller may be configured to monitor a difference between the power supplied to the heater element and an expected power level to detect a change in air flow past the heater element indicative of a user inhalation. Alternatively, or in addition, the controller may be configured to compare a rate of change of temperature, or a rate of change of power supplied, with a threshold level to detect a change in air flow past the heater element indicative of a user inhalation.

The controller may be configured to adjust the target temperature when a change in airflow past the heater is detected. Increased airflow brings more oxygen into contact with the substrate. This increases the likelihood of combustion of the substrate at a given temperature. Combustion of the substrate is undesirable. So the target temperature may be lowered when an increase in airflow is detected in order to reduce the likelihood of combustion of the substrate. Alternatively, or in addition, the controller may be configured to adjust the power supplied to the heater element when a change in airflow past the heater element is detected. Airflow past the heater element typically has a cooling effect on the heater element. The power to the heater element may be temporarily increased to compensate for this cooling.

The power source may be any suitable power supply, for example a DC voltage source such as a battery. In one embodiment, the power supply is a Lithium-ion battery. Alternatively, the power supply may be a Nickel-metal hydride battery, a Nickel cadmium battery, or a Lithium based battery, for example a Lithium-Cobalt, a Lithium-Iron-Phosphate or a Lithium-Polymer battery. Power may be supplied to the heater element as a pulsed signal. The amount of power delivered to the heater element may be adjusted by altering the duty cycle or the

NJOY Exhibit 1002.2297

pulse width of the power signal.

In one embodiment, the controller may be configured to monitor the temperature of the heater element based on a measure of the electrical resistance of the heater element. This allows the temperature of the heater element to be detected without the need for additional sensing hardware.

The temperature of the heater may be monitored at predetermined time intervals, such as every few milliseconds. This may be done continuously or only during periods when power is being supplied to the heater element.

The controller may be configured to reset, ready to detect the next user puff when the difference between the detected temperature and the target temperature is less than a threshold amount. The controller may be configured to require that the difference between the detected temperature and the target temperature is less than a threshold amount for a predetermined time or number of measurement cycles.

The controller may include a memory. The memory may be configured to record the detected changes in airflow or user puffs. The memory may record a count of user puffs or the time of each puff. The memory may also be configured to record the temperature of the heater element and the power supplied during each puff. The memory may record any available data from the controller, as desired.

This user puff may be useful for subsequent clinical studies, as well as device maintenance and design. The user puff data may be transferred to an external memory or processing device by any suitable data output means. For example the aerosol generating device may include a wireless radio connected to the controller or memory or a universal serial bus (USB) socket connected to the controller or memory. Alternatively, the aerosol generating device may be configured to transfer data from the memory to an external memory in a battery charging device every time the aerosol generating device is recharged through suitable data connections.

The device may be an electrical smoking device. The aerosol-generating device may be an electrically heated smoking device comprising an electric heater. The term "electric heater" refers to one or more electric heater elements.

The electric heater may comprise a single heater element. Alternatively, the electric heater

NJOY Exhibit 1002.2298

may comprise more than one heater element. The heater element or heater elements may be arranged appropriately so as to most effectively heat the aerosol-forming substrate.

The electric heater element may comprise an electrically resistive material. Suitable electrically resistive materials include but are not limited to: semiconductors such as doped ceramics, electrically "conductive" ceramics (such as, for example, molybdenum disilicide), carbon, graphite, metals, metal alloys and composite materials made of a ceramic material and a metallic material. Such composite materials may comprise doped or undoped ceramics. Examples of suitable doped ceramics include doped silicon carbides. Examples of suitable metals include titanium, zirconium, tantalum and metals from the platinum group. Examples of suitable metal alloys include stainless steel, nickel-, cobalt-, chromium-, aluminium- titanium- zirconium-, hafnium-, niobium-, molybdenum-, tantalum-, tungsten-, tin-, gallium-, manganese-, gold- and iron-containing alloys, and super-alloys based on nickel, iron, cobalt, stainless steel, Timetal® and iron-manganese-aluminium based alloys. In composite materials, the electrically resistive material may optionally be embedded in, encapsulated or coated with an insulating material or vice-versa, depending on the kinetics of energy transfer and the external physicochemical properties required. Ceramic and/or insulating materials may include, for example, aluminium oxide or zirconia oxide (ZrO_2). Alternatively, the electric heater may comprise an infra-red heater element, a photonic source, or an inductive heater element.

The electric heater element may take any suitable form. For example, the electric heater element may take the form of a heating blade. Alternatively, the electric heater element may take the form of a casing or substrate having different electro-conductive portions, or an electrically resistive metallic tube. Alternatively, one or more heating needles or rods that run through the centre of the aerosol-forming substrate may be as already described. Alternatively, the electric heater element may be a disk (end) heater or a combination of a disk heater with heating needles or rods. Other alternatives include a heating wire or filament, for example a Ni-Cr (Nickel-Chromium), platinum, gold, silver, tungsten or alloy wire or a heating plate. Optionally, the heater element may be deposited in or on a rigid carrier material. In one such embodiment, the electrically resistive heater element may be formed using a metal having a defined relationship between temperature and resistivity. In such an exemplary device, the metal may be formed as a track on a suitable insulating material, such as ceramic material, and then sandwiched in another insulating material, such as a glass. Heaters formed in this manner may be used to both heat and monitor the temperature of the heaters during operation.

NJOY Exhibit 1002.2299

The electric heater may comprise a heat sink, or heat reservoir comprising a material capable of absorbing and storing heat and subsequently releasing the heat over time to the aerosol-forming substrate. The heat sink may be formed of any suitable material, such as a suitable metal or ceramic material. In one embodiment, the material has a high heat capacity (sensible heat storage material), or is a material capable of absorbing and subsequently releasing heat via a reversible process, such as a high temperature phase change. Suitable sensible heat storage materials include silica gel, alumina, carbon, glass mat, glass fibre, minerals, a metal or alloy such as aluminium, silver or lead, and a cellulose material such as paper. Other suitable materials which release heat via a reversible phase change include paraffin, sodium acetate, naphthalene, wax, polyethylene oxide, a metal, metal salt, a mixture of eutectic salts or an alloy.

The heat sink or heat reservoir may be arranged such that it is directly in contact with the aerosol-forming substrate and can transfer the stored heat directly to the substrate. Alternatively, the heat stored in the heat sink or heat reservoir may be transferred to the aerosol-forming substrate by means of a thermal conductor, such as a metallic tube.

The electric heater element may heat the aerosol-forming substrate by means of conduction. The electric heater element may be at least partially in contact with the substrate, or the carrier on which the substrate is deposited. Alternatively, the heat from the electric heater element may be conducted to the substrate by means of a heat conductive element.

Alternatively, the electric heater element may transfer heat to the incoming ambient air that is drawn through the electrically heated smoking system during use, which in turn heats the aerosol-forming substrate by convection. The ambient air may be heated before passing through the aerosol-forming substrate.

In one embodiment, power is supplied to the electric heater until the heater element or elements of the electric heater reach a temperature of between approximately 250 °C and 440 °C in order to produce an aerosol from the aerosol-forming substrate. Any suitable temperature sensor and control circuitry may be used in order to control heating of the heater element or elements to reach the temperature of between approximately 250 °C and 440 °C, including the use of one or more heaters. This is in contrast to conventional cigarettes in which the combustion of tobacco and cigarette wrapper may reach 800 °C.

The aerosol-forming substrate may be contained in a smoking article. During operation, the smoking article containing the aerosol-forming substrate may be completely contained within

NJOY Exhibit 1002.2300

the aerosol-generating device. In that case, a user may puff on a mouthpiece of the aerosol-generating device. A mouthpiece may be any portion of the aerosol-generating device that is placed into a user's mouth in order to directly inhale an aerosol generated by the aerosol-generating article or aerosol-generating device. The aerosol is conveyed to the user's mouth through the mouthpiece. Alternatively, during operation the smoking article containing the aerosol-forming substrate may be partially contained within the aerosol-generating device. In that case, the user may puff directly on a mouthpiece of the smoking article.

The smoking article may be substantially cylindrical in shape. The smoking article may be substantially elongate. The smoking article may have a length and a circumference substantially perpendicular to the length. The aerosol-forming substrate may be substantially cylindrical in shape. The aerosol-forming substrate may be substantially elongate. The aerosol-forming substrate may also have a length and a circumference substantially perpendicular to the length. The aerosol-forming substrate may be received in the sliding receptacle of the aerosol-generating device such that the length of the aerosol-forming substrate is substantially parallel to the airflow direction in the aerosol generating device.

The smoking article may have a total length between approximately 30 mm and approximately 100 mm. The smoking article may have an external diameter between approximately 5 mm and approximately 12 mm. The smoking article may comprise a filter plug. The filter plug may be located at the downstream end of the smoking article. The filter plug may be a cellulose acetate filter plug. The filter plug is approximately 7 mm in length in one embodiment, but may have a length of between approximately 5 mm to approximately 10 mm.

In one embodiment, the smoking article has a total length of approximately 45 mm. The smoking article may have an external diameter of approximately 7.2 mm. Further, the aerosol-forming substrate may have a length of approximately 10 mm. Alternatively, the aerosol-forming substrate may have a length of approximately 12 mm. Further, the diameter of the aerosol-forming substrate may be between approximately 5 mm and approximately 12 mm. The smoking article may comprise an outer paper wrapper. Further, the smoking article may comprise a separation between the aerosol-forming substrate and the filter plug. The separation may be approximately 18 mm, but may be in the range of approximately 5 mm to approximately 25 mm.

The aerosol-forming substrate may be a solid aerosol-forming substrate. Alternatively, the aerosol-forming substrate may comprise both solid and liquid components. The aerosol-

NJOY Exhibit 1002.2301

forming substrate may comprise a tobacco-containing material containing volatile tobacco flavour compounds which are released from the substrate upon heating. Alternatively, the aerosol-forming substrate may comprise a non-tobacco material. The aerosol-forming substrate may further comprise an aerosol former that facilitates the formation of a dense and stable aerosol. Examples of suitable aerosol formers are glycerine and propylene glycol.

If the aerosol-forming substrate is a solid aerosol-forming substrate, the solid aerosol-forming substrate may comprise, for example, one or more of: powder, granules, pellets, shreds, spaghettis, strips or sheets containing one or more of: herb leaf, tobacco leaf, fragments of tobacco ribs, reconstituted tobacco, homogenised tobacco, extruded tobacco and expanded tobacco. The solid aerosol-forming substrate may be in loose form, or may be provided in a suitable container or cartridge. Optionally, the solid aerosol-forming substrate may contain additional tobacco or non-tobacco volatile flavour compounds, to be released upon heating of the substrate. The solid aerosol-forming substrate may also contain capsules that, for example, include the additional tobacco or non-tobacco volatile flavour compounds and such capsules may melt during heating of the solid aerosol-forming substrate.

As used herein, homogenised tobacco refers to material formed by agglomerating particulate tobacco. Homogenised tobacco may be in the form of a sheet. Homogenised tobacco material may have an aerosol-former content of greater than 5% on a dry weight basis. Homogenised tobacco material may alternatively have an aerosol former content of between 5% and 30% by weight on a dry weight basis. Sheets of homogenised tobacco material may be formed by agglomerating particulate tobacco obtained by grinding or otherwise comminuting one or both of tobacco leaf lamina and tobacco leaf stems. Alternatively, or in addition, sheets of homogenised tobacco material may comprise one or more of tobacco dust, tobacco fines and other particulate tobacco by-products formed during, for example, the treating, handling and shipping of tobacco. Sheets of homogenised tobacco material may comprise one or more intrinsic binders, that is tobacco endogenous binders, one or more extrinsic binders, that is tobacco exogenous binders, or a combination thereof to help agglomerate the particulate tobacco; alternatively, or in addition, sheets of homogenised tobacco material may comprise other additives including, but not limited to, tobacco and non-tobacco fibres, aerosol-formers, humectants, plasticisers, flavourants, fillers, aqueous and non-aqueous solvents and combinations thereof.

In a particularly preferred embodiment, the aerosol-forming substrate comprises a gathered

NJOY Exhibit 1002.2302

crimpled sheet of homogenised tobacco material. As used herein, the term 'crimped sheet' denotes a sheet having a plurality of substantially parallel ridges or corrugations. Preferably, when the aerosol-generating article has been assembled, the substantially parallel ridges or corrugations extend along or parallel to the longitudinal axis of the aerosol-generating article. This advantageously facilitates gathering of the crimped sheet of homogenised tobacco material to form the aerosol-forming substrate. However, it will be appreciated that crimped sheets of homogenised tobacco material for inclusion in the aerosol-generating article may alternatively or in addition have a plurality of substantially parallel ridges or corrugations that are disposed at an acute or obtuse angle to the longitudinal axis of the aerosol-generating article when the aerosol-generating article has been assembled. In certain embodiments, the aerosol-forming substrate may comprise a gathered sheet of homogenised tobacco material that is substantially evenly textured over substantially its entire surface. For example, the aerosol-forming substrate may comprise a gathered crimped sheet of homogenised tobacco material comprising a plurality of substantially parallel ridges or corrugations that are substantially evenly spaced-apart across the width of the sheet.

Optionally, the solid aerosol-forming substrate may be provided on or embedded in a thermally stable carrier. The carrier may take the form of powder, granules, pellets, shreds, spaghettis, strips or sheets. Alternatively, the carrier may be a tubular carrier having a thin layer of the solid substrate deposited on its inner surface, or on its outer surface, or on both its inner and outer surfaces. Such a tubular carrier may be formed of, for example, a paper, or paper like material, a non-woven carbon fibre mat, a low mass open mesh metallic screen, or a perforated metallic foil or any other thermally stable polymer matrix.

The solid aerosol-forming substrate may be deposited on the surface of the carrier in the form of, for example, a sheet, foam, gel or slurry. The solid aerosol-forming substrate may be deposited on the entire surface of the carrier, or alternatively, may be deposited in a pattern in order to provide a non-uniform flavour delivery during use.

Although reference is made to solid aerosol-forming substrates above, it will be clear to one of ordinary skill in the art that other forms of aerosol-forming substrate may be used with other embodiments. For example, the aerosol-forming substrate may be a liquid aerosol-forming substrate. If a liquid aerosol-forming substrate is provided, the aerosol-generating device preferably comprises means for retaining the liquid. For example, the liquid aerosol-forming substrate may be retained in a container. Alternatively or in addition, the liquid aerosol-forming substrate may be absorbed into a porous carrier material. The porous carrier material may be made from any suitable absorbent plug or body, for example, a

NJOY Exhibit 1002.2303

foamed metal or plastics material, polypropylene, terylene, nylon fibres or ceramic. The liquid aerosol-forming substrate may be retained in the porous carrier material prior to use of the aerosol-generating device or alternatively, the liquid aerosol-forming substrate material may be released into the porous carrier material during, or immediately prior to use. For example, the liquid aerosol-forming substrate may be provided in a capsule. The shell of the capsule preferably melts upon heating and releases the liquid aerosol-forming substrate into the porous carrier material. The capsule may optionally contain a solid in combination with the liquid.

Alternatively, the carrier may be a non-woven fabric or fibre bundle into which tobacco components have been incorporated. The non-woven fabric or fibre bundle may comprise, for example, carbon fibres, natural cellulose fibres, or cellulose derivative fibres.

The aerosol-generating device may still further comprise an air inlet. The aerosol-generating device may still further comprise an air outlet. The aerosol-generating device may still further comprise a condensation chamber for allowing the aerosol having the desired characteristics to form.

The aerosol-generating device is preferably a handheld aerosol-generating device that is comfortable for a user to hold between the fingers of a single hand. The aerosol-generating device may be substantially cylindrical in shape. The aerosol-generating device may have a polygonal cross section and a protruding button formed on one face: in this embodiment, the external diameter of the aerosol-generating device may be between about 12.7 mm and about 13.65 mm measured from a flat face to an opposing flat face; between about 13.4 mm and about 14.2mm measured from an edge to an opposing edge (that is, from the intersection of two faces on one side of the aerosol-generating device to a corresponding intersection on the other side); and between about 14.2 mm and about 15 mm measured from a top of the button to an opposing bottom flat face. The length of the aerosol generating device may be between about 70mm and 120mm.

In another aspect of the specification, there is provided a method for detecting a user inhalation through an electrically heated aerosol generating device, the device comprising a heater element and a power supply for supplying power to the heater element, comprising: controlling power supplied to the heater element from the power source to maintain the heater element at a target temperature, and monitoring changes in the temperature of the heater element or changes in the power supplied to the heater element to detect a change in air flow past the heater element indicative of a user inhalation.

NJOY Exhibit 1002.2304

The step of monitoring may comprise monitoring a difference between the temperature of the heater element and the target temperature to detect a change in air flow past the heater element indicative of a user inhalation.

The method may further comprise the step of adjusting the target temperature when a change in air flow past the heater element indicative of a user inhalation is detected. As described, increased airflow brings more oxygen into contact with the substrate.

In another aspect of the specification, there is provided a computer program that when executed on a computer or other suitable processing device, carries out the method according to the another aspect described above. The specification includes embodiments that may be implemented as a software product suitable for running on an aerosol generating devices having a programmable controller as well as the other required hardware elements.

Examples will now be described in detail with reference to the accompanying drawings, in which:

Figure 1 is a schematic drawing showing the basic elements of an aerosol generating device in accordance with one embodiment;
Figure 2 is a schematic diagram illustrating the control elements of one embodiment;
Figure 3 is a graph illustrating changes in heater temperature and supplied power during user puffs in accordance with another embodiment; and
Figure 4 illustrates a control sequence for determining if a user puff is taking place in accordance with an yet another embodiment.

In Figure 1, the inside of an embodiment of an aerosol-generating device 100 is shown in a simplified manner. Particularly, the elements of the aerosol-generating device 100 are not drawn to scale. Elements that are not relevant for the understanding of the embodiment discussed herein have been omitted to simplify Figure 1.

The aerosol-generating device 100 comprises a housing 10 and an aerosol-forming substrate 2, for example a cigarette. The aerosol-forming substrate 2 is pushed inside the housing 10 to come into thermal proximity with the heater element 20. The aerosol-forming substrate 2 will release a range of volatile compounds at different temperatures. Some of the volatile compounds released from the aerosol-forming substrate 2 are only formed through the heating process. Each volatile compound will be released above a characteristic release temperature. By controlling the maximum operation temperature of the aerosol-generating

NJOY Exhibit 1002.2305

device 100 to be below the release temperature of some of the volatile compounds, the release or formation of these smoke constituents can be avoided.

Additionally, the aerosol-generating device 100 includes an electrical energy supply 40, for example a rechargeable lithium ion battery, provided within the housing 10 . The aerosol-generating device 100 further includes a controller 30 that is connected to the heater element 20, the electrical energy supply 40, an aerosol-forming substrate detector 32 and a user interface 36, for example a graphical display or a combination of LED indicator lights that convey information regarding device 100 to a user.

The aerosol-forming substrate detector 32 may detect the presence and identity of an aerosol-forming substrate 2 in thermal proximity with the heater element 20 and signals the presence of an aerosol-forming substrate 2 to the controller 30. The provision of a substrate detector is optional.

The controller 30 controls the user interface 36 to display system information, for example, battery power, temperature, status of aerosol-forming substrate 2, other messages or combinations thereof.

The controller 30 further controls the maximum operation temperature of the heater element 20. The temperature of the heater element can be detected by a dedicated temperature sensor. Alternatively, in another embodiment the temperature of the heater element is determined by monitoring its electrical resistivity. The electrical resistivity of a length of wire is dependent on its temperature. Resistivity ρ increases with increasing temperature. The actual resistivity ρ characteristic will vary depending on the exact composition of the alloy and the geometrical configuration of the heater element 20, and an empirically determined relationship can be used in the controller. Thus, knowledge of resistivity ρ at any given time can be used to deduce the actual operation temperature of the heater element 20.

The resistance of the heater element $R = V/I$; where V is the voltage across the heater element and I is the current passing through the heater element 20. The resistance R depends on the configuration of the heater element 20 as well as the temperature and is expressed by the following relationship:

$$R = \rho(T) * L/S \qquad \text{equation 1}$$

NJOY Exhibit 1002.2306

Where ρ (T) is the temperature dependent resistivity, L is length and S the cross-sectional area of the heater element 20. L and S are fixed for a given heater element 20 configuration and can be measured. Thus, for a given heater element design R is proportional to ρ (T).

The resistivity $\rho(T)$ of the heater element can be expressed in polynomial form as follows:

$$\rho (T) = \rho_o * (1 + \alpha_1 T + \alpha_2 T^2) \qquad \text{equation 2}$$

Where ρ_o is the resistivity at a reference temperature T_o and α_1 and α_2 are the polynominal coefficients.

Thus, knowing the length and cross-section of the heater element 20, it is possible to determine the resistance R, and therefore the resistivity ρ at a given temperature by measuring the heater element voltage V and current I. The temperature can be obtained simply from a look-up table of the characteristic resistivity versus temperature relationship for the heater element being used or by evaluating the polynomial of equation (2) above. In one embodiment, the process may be simplified by representing the resistivity ρ versus temperature curve in one or more, preferably two, linear approximations in the temperature range applicable to tobacco. This simplifies evaluation of temperature which is desirable in a controller 30 having limited computational resources.

Figure 2 is a block diagram illustrating the control elements of the device of Figure 1. Figure 2 also illustrates the device being connected to one or more external devices 58, 60. The controller 30 includes a measurement unit 50 and a control unit 52. The measurement unit is configured to determine the resistance R of the heater element 20. The measurement unit 50 passes resistance measurements to the control unit 52. The control unit 52 then controls the provision of power from the battery 40 to the heater element 20 by toggling switch 54. The controller may comprise a microprocessor as well as separate electronic control circuitry. In one embodiment, the microprocessor may include standard functionality such as an internal clock in addition to other functionality.

In a preparation of the controlling of the temperature, a value for the target operation temperature of the aerosol-generating device 100 is selected. The selection is based on the release temperatures of the volatile compounds that should and should not be released. This predetermined value is then stored in the control unit 52. The control unit 52 includes a non-volatile memory 56.

NJOY Exhibit 1002.2307

The controller 30 controls the heating of the heater element 20 by controlling the supply electrical energy from the battery to the heater element 20. The controller 30 only allows for the supply of power to the heater element 20 if the aerosol-forming substrate detector 32 has detected an aerosol-forming substrate 20 and the user has activated the device. By the switching of switch 54, power is provided as a pulsed signal. The pulse width or duty cycle of the signal can be modulated by the control unit 52 to alter the amount of energy supplied to the heater element. In one embodiment, the duty cycle may be limited to 60-80%. This may provide additional safety and prevent a user from inadvertently raising the compensated temperature of the heater such that the substrate reaches a temperature above a combustion temperature.

In use, the controller 30 measures the resistivity ρ of the heater element 20. The controller 30 then converts the resistivity of the heater element 20 into a value for the actual operation temperature of the heater element, by comparing the measured resistivity ρ with the look-up table. This may be done within the measurement unit 50 or by the control unit 52. In the next step, the controller 30 compares the actual derived operation temperature with the target operation temperature. Alternatively, temperature values in the heating profile are pre-converted to resistance values so the controller regulates resistance instead of temperature, this avoids real-time computations to convert resistance to temperature during the smoking experience.

If the actual operation temperature is below the target operation temperature, then the control unit 52 supplies the heater element 20 with additional electrical energy in order to raise the actual operation temperature of the heater element 20. If the actual operation temperature is above the target operation temperature, the control unit 52 reduces the electrical energy supplied to the heater element 20 in order to lower the actual operation temperature back to the target operation temperature.

The control unit may implement any suitable control technique to regulate the temperature, such as a simple thermostatic feedback loop or a proportional, integral, derivative (PID) control technique.

The temperature of the heater element 20 is not only affected by the power being supplied to it. Airflow past the heater element 20 cools the heater element, reducing its temperature. This cooling effect can be exploited to detect changes in air flow through the device. The temperature of the heater element, and also its electrical resistance, will drop when air flow

NJOY Exhibit 1002.2308

increases before the control unit 52 brings the heater element back to the target temperature.

Figure 3 shows a typical evolution of heater element temperature and applied power during use of an aerosol generating device of the type shown in Figure 1. The level of supplied power is shown as line 60 and the temperature of the heater element as line 62. The target temperature is shown as dotted line 64.

An initial period of high power is required at the start of use in order to bring the heater element up to the target temperature as quickly as possible. Once the target temperature has been reached the applied power drops to the level required to maintain the heater element at the target temperature. However, when a user puffs on the substrate 2, air is drawn past the heater element and cools it below the target temperature. This is shown as feature 66 in Figure 3. In order to return the heater element 20 to the target temperature there is a corresponding spike in the applied power, shown as feature 68 in Figure 3. This pattern is repeated throughout the use of the device, in this example a smoking session, in which four puffs are taken.

By detecting temporary changes in temperature or power, or in the rate of change of temperature or power, user puffs or other airflow events can be detected. Figure 4 illustrates an example of a control process, using a Schmitt trigger debounce approach, which can be used within control unit 52 to determine when a puff is taking place. The process in Figure 4 is based on detecting changes in heater element temperature. In step 400 an arbitrary state variable, which is initially set as 0, is modified to three quarters of its original value. In step 410 a delta value is determined that is the difference between a measured temperature of the heater element and the target temperature. Steps 400 and 410 can be performed in reverse order or in parallel. In step 415 the delta value is compared with a delta threshold value. If the delta value is greater than the delta threshold then the state variable is increased by one quarter before passing to step 425. This is shown as step 420. If the delta value is less that the threshold the state variable is unchanged and the process moves to step 425. The state variable is then compared with a state threshold. The value of the state threshold used is different depending on whether the device is determined at that time to be in a puffing or not-puffing state. In step 430 the control unit determines whether the device is in a puffing or not-puffing state. Initially, i.e. in a first control cycle, the device is assumed to be in a not-puffing state.

NJOY Exhibit 1002.2309

If the device is in a not-puffing state the state variable is compared to a HIGH state threshold in step 440. If the state variable is higher than the HIGH state threshold then the device is determined to be in a puffing state. If not, it is determined to remain in a not-puffing state. In both cases, the process then passes to step 460 and then returns to 400.

If the device is in a puffing state the state variable is compared to a LOW state threshold in step 450. If the state variable is lower than the LOW state threshold then the device is determined to be in a not-puffing state. If not, it is determined to remain in a puffing state. In both cases, the process then passes to step 460 and then returns step to 400.

The value of the HIGH and LOW threshold values directly influence the number of cycles through the process are required to transition between not-puffing and puffing states, and vice versa. In this way very short term fluctuations in temperature and noise in the system, which are not the result of a user puff, can be prevented from being detected as a puff. Short fluctuations are effectively filtered out. However, the number of cycles required is desirably chosen so that the puff detection transition can take place before the device compensates for the drop in temperature by increasing the power delivered to the heater element. Alternatively the controller could suspend the compensation process while making the decision of whether a puff is taken or not. In one example LOW = 0.06 and HIGH = 0.94, which means that the system would need to go through at least 10 iterations when the delta value was greater than the delta threshold to go from not puffing to puffing.

The system illustrated in Figure 4 can be used to provide a puff count and, if the controller includes a clock, an indication of the time at which each puff takes place. The puffing and not-puffing states can also be used to dynamically control the target temperature. Increased airflow brings more oxygen into contact with the substrate. This increases the likelihood of combustion of the substrate at a given temperature. Combustion of the substrate is undesirable. So the target temperature may be lowered when a puffing state is determined in order to reduce the likelihood of combustion of the substrate. The target temperature can then be returned to its original value when a not-puffing state is determined.

The process shown in Figure 4 is just one example of a puff detection process. For example, similar processes to that illustrate in Figure 4 could be carried out using applied power as a measure or using rate of change of temperature or rate of change of applied power. It is also possible to use a process similar to that shown in Figure 4, but using only a single state threshold instead of different HIGH and LOW thresholds.

NJOY Exhibit 1002.2310

As well as being useful for dynamic control of the aerosol generating device, the puff detection data determined by the controller 30 may be useful for analysis purposes, for example, in clinical trials or in device maintenance and design processes. Figure 2 illustrates connection of the controller 30 to an external device 58. The puff count and time data can be exported to the external device 58 (together with any other captured data) and may be further relayed from the device 58 to other external processing or data storage devices 60. The aerosol generating device may include any suitable data output means. For example the aerosol generating device may include a wireless radio connected to the controller 30 or memory 56, or a universal serial bus (USB) socket connected to the controller 30 or memory 56. Alternatively, the aerosol generating device may be configured to transfer data from the memory to an external memory in a battery charging device every time the aerosol generating device is recharged through suitable data connections. The battery charging device can provide a larger memory for longer term storage of the puff data and can be subsequently connected to a suitable data processing device or to a communications network. In addition, data as well as instructions for controller 30 may be uploaded, for example, to control unit 52 when controller 30 is connected to the external device 58.

Additional data may also be collected during operation of aerosol generating device 100 and transferred to the external device 58. Such data may include, for example, a serial number or other identifying information of the aerosol generating device; the time at start of smoking session; the time of the end of smoking session; and information related to the reason for ending a smoking session.

In one embodiment, a serial number or other identifying information, or tracking information, associated with the aerosol generating device 100 may be stored within controller 30. For example, such tracking information may be stored in memory 56. Because the aerosol generating device 100 may be not always be connected to the same external device 58 for charging or data transfer purposes, this tracking information can be exported to external processing or data storage devices 60 and gathered to provide a more complete picture of the user's behaviour.

It will now be apparent to one of ordinary skill in the art that knowledge of the time of the operation of the aerosol generating device, such as a start and stop of the smoking session, may also be captured using the methods and apparatuses described herein. For example, using the clock functionality of the controller 30 or the control unit 52, a start time of the smoking session may be captured and stored by controller 30. Similarly, a stop time may be recorded when the user or the aerosol generating device 100 ends the session by stopping

NJOY Exhibit 1002.2311

power to the heater element 20. The accuracy of such start and stop times may further be enhanced if a more accurate time is uploaded to the controller 30 by the external device 58 to correct any loss or inaccuracy. For example, during a connection of the controller 30 to the external device 58, device 58 may interrogate the internal clock function of the controller 30, compare the received time value with a clock provided within external device 58 or one or more of external processing or data storage devices 60, and provide an updated clock signal to controller 30.

The reason for terminating a smoking session or operation of the aerosol generating device 100 may also be identified and captured. For example, control unit 52 may contain a look up table that includes various reasons for the end of the smoking session or operation. An exemplary listing of such reasons is provided here.

Session code	Reason for session ending	Description of reason
0	(normal end)	End of session reached
1	(stop by user)	The user aborted the experience (by pushing power button to end session, by inserting aerosol generating device into the external device 58, or via a remote control command
2	(heater broken)	Suspected heater damage in view of temperature measurements outside of a predetermined range during heating
3	(incorrect heating level)	Malfunction occurs where heater element temperature overshoots or undershoots a predetermined operating temperature outside of an acceptable tolerance range
4	(external heating)	Heater element temperature remains higher than the target even if the supplied power is reduced

The above table provides a number of exemplary reasons why operation or a smoking session may be terminated. It will now be apparent to one of ordinary skill in the art, by using various indications provided by the measurement unit 50 and the control unit 52 provided in the controller 30, either alone or in combination with recorded indications in response to the controller 30 control of the heating of the heater element 20, controller 30 may assign session codes with a reason for ending the operation of aerosol generating

NJOY Exhibit 1002.2312

device 100 or a smoking session using such a device. Other reasons that may be determined from available data using the above described methods and apparatuses will now be apparent to one of ordinary skill in the art and may also be implemented using the methods and apparatuses described herein without deviating from the scope or spirit of this specification and the exemplary embodiments described herein.

Other data regarding a user operation of the aerosol generating device 100 may also be determined using the methods and apparatuses described herein. For example, the user's consumption of aerosol deliverables may be accurately approximated because the aerosol generating device 100 described herein may accurately control temperature of the heater element 20, and because data may be gathered by the controller 30, as well as the units 50 and 52 provided within the controller 30, an accurate profile of the actual use of the device 100 during a session can be obtained.

In one exemplary embodiment, the session data captured by the controller 30 can be compared to data determined during controlled sessions to even further enhance the understanding of the user use of the device 100. For example, by first collecting data using a smoking machine under controlled environmental conditions and measuring data such as the puff number, puffing volume, puff interval, and resistivity of heater element, a database can be constructed that provides, for examples, levels of nicotine or other deliverables provided under the experimental conditions. Such experimental data can then be compared to data collected by the controller 30 during actual use and be used to determine, for example, information on how much of a deliverable the user has inhaled. In one embodiment, such experimental data may be stored in one or more of devices 60 and additional comparison and processing of the data may take place in one or more of devices 60.

To the extent that additional environmental data is required to accurately compare actual user data and the experimental data, the control unit 52 may include additional functionality to provide such data. For example, the control unit 52 may include a humidity sensor or ambient temperature sensor and humidity data or ambient temperature data may be included as part of the data eventually provided to the external device 58. The usage of the device may also be analysed to determine which experimentally determined data most closely matches the usage behaviour, e.g. in terms of length and frequency of inhalation and number of inhalations. The experimental data with the most closely matching usage behaviour may then be used as the basis for further analysis and display.

NJOY Exhibit 1002.2313

It will now be apparent to one of ordinary skill in the art, that using the methods and apparatuses discussed herein, nearly any desired information may be captured by such that comparison to experimental data is possible and various attributes associated with a user's operation of the aerosol generating device 100 be accurately approximated.

The exemplary embodiments described above illustrate but are not limiting. In view of the above discussed exemplary embodiments, other embodiments consistent with the above exemplary embodiments will now be apparent to one of ordinary skill in the art.

NJOY Exhibit 1002.2314

Claims

1. An aerosol generating device configured for user inhalation of a generated aerosol, the device comprising:

a heater element configured to heat an aerosol-forming substrate;

a power source connected to the heater element; and

a controller connected to the heater element and to the power source, wherein the controller is configured to control power supplied to the heater element from the power source to maintain the heater element at a target temperature, and is configured to monitor changes in a temperature of the heater element or changes in the power supplied to the heater element to detect a change in air flow past the heater element indicative of a user inhalation.

2. An aerosol generating device according to claim 1, wherein the controller is configured to monitor a difference between the temperature of the heater element and the target temperature to detect a change in air flow past the heater element indicative of a user inhalation.

3. An aerosol generating device according to claim 2, wherein the controller is configured to monitor if a difference between the temperature of the heater element and the target temperature exceeds a threshold to detect a change in air flow past the heater element indicative of a user inhalation.

4. An aerosol generating device according to claim 3, wherein the controller is configured to monitor whether a difference between the temperature of the heater element and the target temperature exceeds a threshold for a predetermined time period or for a predetermined number of measurement cycles to detect a change in air flow past the heater element indicative of a user inhalation.

5. An aerosol generating device according to any preceding claim, wherein the controller is configured to monitor a difference between the power supplied to the heater element and an expected power level.

6. An aerosol generating device according to any preceding claim, wherein the controller is configured to compare a rate of change of temperature or a rate of change of power supplied with a threshold level.

NJOY Exhibit 1002.2315

7. An aerosol generating device according to any preceding claim, wherein the controller is configured to adjust the power supplied to the heater element when a change in airflow past the heater element is detected.

8. An aerosol generating device according to any preceding claim, wherein the controller is configured to adjust the target temperature when a change in airflow past the heater is detected.

9. An aerosol generating device according to any preceding claim 1, wherein the controller is configured to monitor the temperature of the heater element based on a measure of the electrical resistance of the heater element.

10. An aerosol generating device according to any preceding claim, wherein the device includes a data output means and wherein the controller is configured to provide a record of each detected change in air flow past the heater element indicative of a user inhalation to the data output means.

11. An aerosol generating device according to any preceding claim, wherein the device is an electrical smoking device.

12. A method for detecting a user inhalation through an electrically heated aerosol generating device, the device comprising a heater element and a power supply for supplying power to the heater element, comprising controlling power supplied to the heater element from the power source to maintain the heater element at a target temperature, and monitoring changes in the temperature of the heater element or changes in the power supplied to the heater element to detect a change in air flow past the heater element indicative of a user inhalation.

13. A method according to claim 12, wherein the step of monitoring comprises monitoring a difference between the temperature of the heater element and the target temperature to detect a change in air flow past the heater element indicative of a user inhalation.

14. A method according to claim 12 or 13, further comprising the step of adjusting the target temperature when a change in air flow past the heater element indicative of a user inhalation is detected.

NJOY Exhibit 1002.2316

15. A computer program that when executed on a computer or other suitable processing device, carries out the method of any one of claims 11 to 14.

NJOY Exhibit 1002.2317

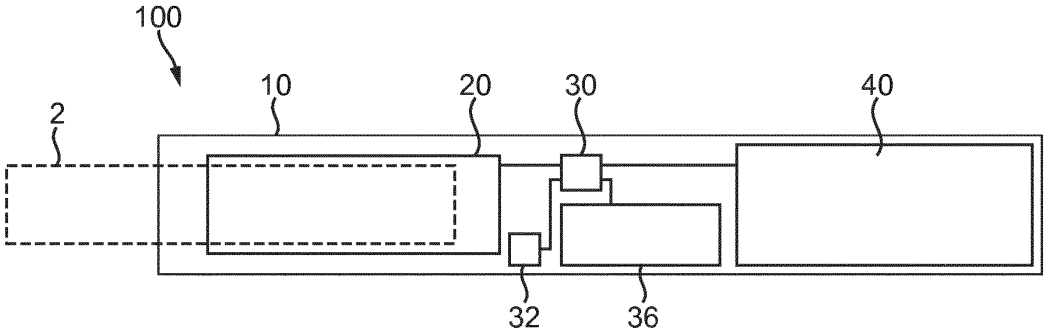


FIG. 1

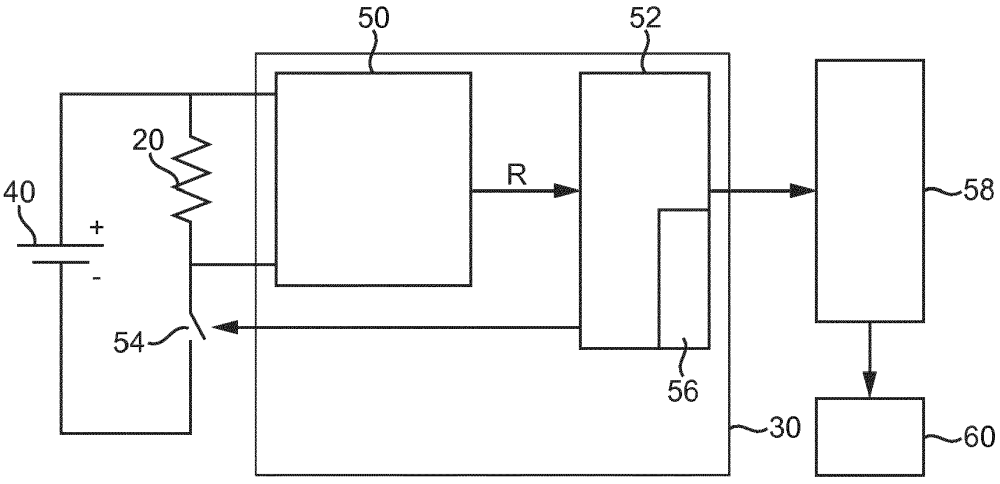


FIG. 2

NJOY Exhibit 1002.2318

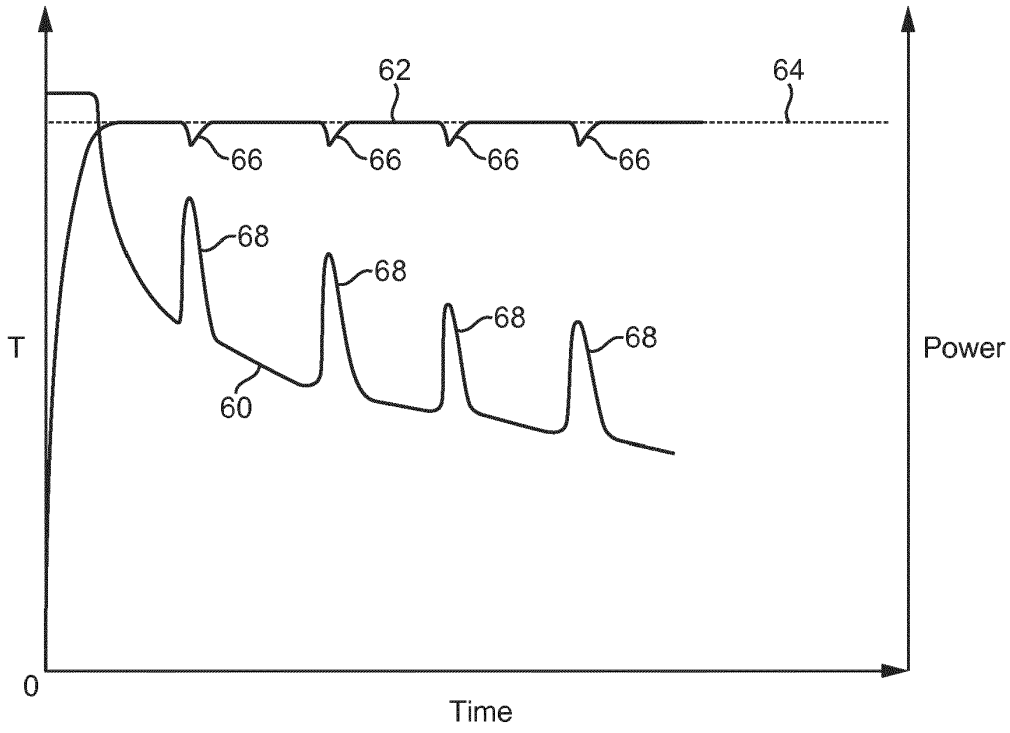


FIG. 3

NJOY Exhibit 1002.2319

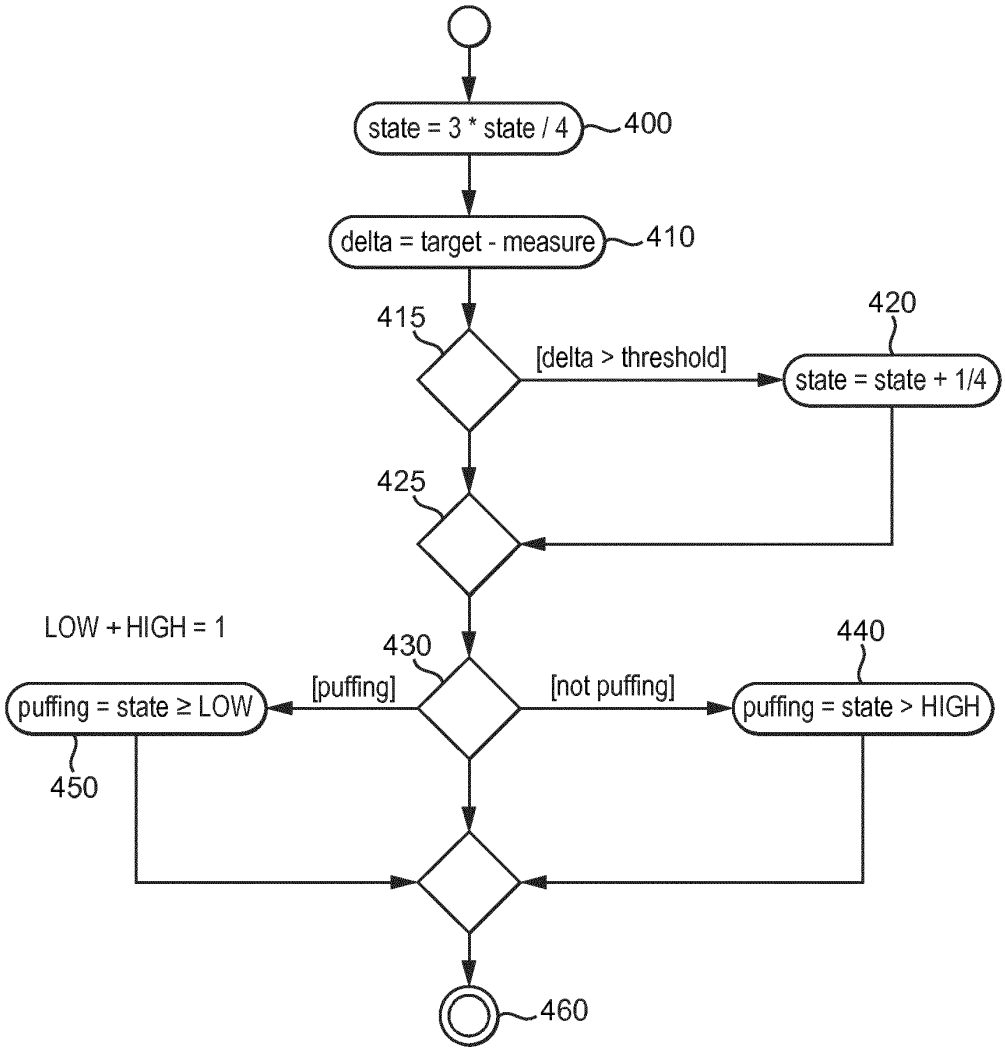


FIG. 4

NJOY Exhibit 1002.2320

(12) 특허협력조약에 의하여 공개된 국제출원

(19) 세계지식재산권기구
국제사무국

(43) 국제공개일
2013 년 10 월 3 일 (03.10.2013)

WIPO | PCT

(10) 국제공개번호
WO 2013/147492 A1

(51) 국제특허분류:
A24F 47/00 (2006.01) *G09F 9/00* (2006.01)
A61M 15/06 (2006.01)

(21) 국제출원번호: PCT/KR2013/002497

(22) 국제출원일: 2013 년 3 월 26 일 (26.03.2013)

(25) 출원언어: 한국어

(26) 공개언어: 한국어

(30) 우선권정보:
10-2012-0030591 2012 년 3 월 26 일 (26.03.2012) KR
20-2012-0007135 2012 년 8 월 9 일 (09.08.2012) KR

(71) 출원인: **주식회사 엔브라이트 (ENBRIGHT CO., LTD)** [KR/KR]; 135-907 서울시 강남구 서울특별시 강남구 논현로 555 (역삼동, 한진빌딩 3 층), Seoul (KR).

(72) 발명자: **최동수 (CHOI, Dong Su)**; 122-820 서울시 은평구 구산동 224 경남아파트 108-1304 호, Seoul (KR).

(74) 대리인: **김권석 (KIM, Kwonseok)**; 135-090 서울시 강남구 삼성동 150 번지 진성빌딩 4 층, Seoul (KR).

(81) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 국내 권리의 보호를 위하여): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

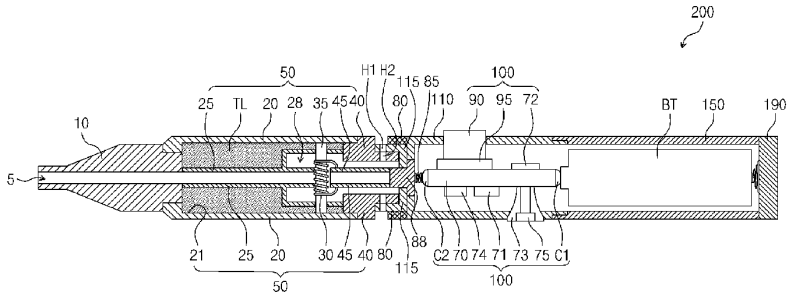
(84) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 역내 권리의 보호를 위하여): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), 유라시아 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 유럽 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

공개:

— 국제조사보고서와 함께 (조약 제 21 조(3))

(54) **Title**: ATOMIZATION CONTROL UNIT AND A PORTABLE ATOMIZING APPRATUS HAVING THE SAME

(54) **발명의 명칭** : 무화 제어 유닛 및 이를 갖는 휴대용 무화 장치



(57) **Abstract**: A portable atomizing apparatus according to the present invention includes a battery case, an atomizing device, a body case, a control unit, and a suction adjustment. The battery case receives a battery, and the atomizing device includes a heating member electrically connected to the battery for generating heat to atomize a source material. The body case is connected between the battery case and atomizing device. Besides, the control unit is mounted inside the body case, electrically connected to the battery and to the heating member, so that the control unit receives an electrical power from the battery to control the output signal delivered to the heating member. Also the suction adjustment opens or closes an air inlet of the atomizing apparatus so as to adjust the amount of air entering the atomizing apparatus.

(57) **요약서**: 본 발명에 따른 휴대용 무화 장치는, 배터리 케이스, 무화기, 몸체 케이스, 제어부 및 흡입량 조절부를 포함한다. 상기 배터리 케이스는 배터리를 수납하고, 상기 무화기는 상기 배터리와 전기적으로 연결되어 소오스 재료를 무화시키는 열을 발생하는 가열부재를 포함한다. 상기 몸체 케이스는 상기 배터리 케이스 및 상기 무화기 사이에서 상기 배터리 케이스 및 상기 무화기와 결합된다. 또한, 상기 제어부는 상기 몸체 케이스의 내부에 수납되어 상기 배터리 및 상기 가열부재와 전기적으로 연결되고, 상기 배터리로부터 전력을 제공받아 상기 가열 부재 측으로 출력되는 출력 신호를 제어한다. 또한, 상기 흡입량 조절부는 외부로부터 상기 무화기측으로 통하는 공기 유입구를 개방하거나 차폐하여, 상기 무화기 측으로 유입되는 공기의 양을 조절한다

WO 2013/147492 A1

NJOY Exhibit 1002.2321

명세서

발명의 명칭: 무화 제어 유닛 및 이를 갖는 휴대용 무화 장치

기술분야

[1] 본 발명은 무화 기술에 관한 것으로, 더욱 상세하게는, 소스 재료의 무화를 조절하는 무화 제어 유닛 및 이를 갖는 휴대용 무화 장치에 관한 것이다.

배경기술

[2] 휴대용 무화 장치는 휴대가 용이하도록 개발되어, 사람이 상기 휴대용 무화 장치에서 발생되는 연무를 흡입하여 기호성을 충족시키거나, 소정의 다른 목적을 달성하기 위한 수단으로 사용되고 있다. 휴대용 무화 장치의 한 예로 전자 담배가 있을 수 있고, 상기 전자 담배는 흡연을 대체하거나, 금연을 보조하기 위한 수단으로 사용되고 있다. 상기 전자 담배는 사용법 및 사용 시 발생되는 효과가 일반 담배와 유사한 특성을 가지므로, 사용자는 상기 전자 담배를 흡입하여 일반 담배를 흡연하는 느낌을 받을 수 있다.

[3] 상술한 휴대용 무화 장치의 사용 목적에 있어서, 기호성을 결정하는 요소들로는 상기 소스 재료에 첨가된 물질 외에, 상기 무화기가 상기 소스 재료를 무화시키는 조건이 있을 수 있다. 즉, 동일한 소스 재료를 무화 시키더라도, 휴대용 무화 장치가 상기 소스 재료를 무화 시키는 조건이 상이한 경우에, 사용자는 연무를 흡입하면서 느끼는 맛, 향 및 흡입감이 변화될 수 있다. 이 경우에, 사용자가 무화기, 카트리지 및 배터리와 같은 소모성 부품을 교체하는 경우가 발생되고, 이에 따라 사용자가 휴대용 무화 장치를 사용하는 데 비용이 추가적으로 발생되는 문제점이 발생될 수 있다.

[4] 또한, 사용자가 휴대용 무화 장치를 1회 흡입을 하는데 있어 흡입시간은 개인별로 다를 수 있다. 이때 사용자가 흡입 시간을 장시간 지속시키면 무화기 내의 가열 부재가 과열되어 가열 부재의 손상이 일어나거나, 무화기 내의 액상 소스 재료가 과다 연소되어 연무의 풍미 또는 향이 훼손될 수 있다.

발명의 상세한 설명

기술적 과제

[5] 본 발명이 이루고자 하는 기술적 과제는, 연무를 흡입함에 있어서 무화 조건의 능동적 조절이 가능하고, 다양한 소스 성분에 대응하여 무화 성능의 조절이 가능한 무화 제어 유닛을 제공하는 것이다.

[6] 본 발명이 해결하고자 하는 다른 기술적 과제는, 가열 부재의 과열을 방지하고 액상 소스 재료의 풍미 또는 향을 열화시키지 않아 프레시한 연무를 발생시킬 수 있는 무화 제어 유닛을 제공하는 것이다.

[7] 본 발명이 이루고자 하는 또다른 기술적 과제는, 전술한 이점을 갖는 무화 제어 유닛을 포함하는 휴대용 무화 장치를 제공하는 것이다.

과제 해결 수단

NJOY Exhibit 1002.2322

[8] 상기 기술적 과제를 달성하기 위한 본 발명의 일 실시예에 따른 무화 제어 장치는, 소스 재료를 가열시키는 가열 부재를 갖는 무화기 및 배터리를 수납하는 배터리 케이스를 포함하는 휴대용 무화 장치의 무화 제어 유닛에 있어서, 상술한 본 발명의 과제를 해결하기 위한 무화 제어 유닛은, 몸체 케이스, 제어부 및 흡입량 조절부를 포함한다.

[9] 상기 몸체 케이스는 일 측에서 상기 배터리 케이스와 결합되고, 타 측에서 상기 무화기와 결합된다. 상기 제어부는 상기 몸체 케이스의 내부에 수납되어 상기 배터리 및 상기 가열부재와 전기적으로 연결되고, 상기 배터리로부터 전원 전압을 제공받아 상기 가열부재 측으로 출력되는 출력 신호를 제어한다. 또한, 상기 흡입량 제어부는 외부로부터 상기 무화기 측으로 통하는 공기 유입구를 개방하거나 차폐하여, 상기 무화기 측으로 유입되는 공기의 양을 조절한다.

[10] 상술한 본 발명의 다른 기술적 과제를 해결하기 위한 휴대용 무화 장치는, 배터리 케이스, 무화기, 몸체 케이스, 제어부 및 흡입량 조절부를 포함한다. 상기 배터리 케이스는 배터리를 수납하고, 상기 무화기는 상기 배터리와 전기적으로 연결되어 소스 재료를 무화시키는 열을 발생하는 가열부재를 포함한다. 상기 몸체 케이스는 상기 배터리 케이스 및 상기 무화기 사이에서 상기 배터리 케이스 및 상기 무화기와 결합된다.

[11] 또한, 상기 제어부는 상기 몸체 케이스의 내부에 수납되어 상기 배터리 및 상기 가열부재와 전기적으로 연결되고, 상기 배터리로부터 전력을 제공받아 상기 가열 부재 측으로 출력되는 출력 신호를 제어한다. 또한, 상기 흡입량 조절부는 외부로부터 상기 무화기측으로 통하는 공기 유입구를 개방하거나 차폐하여, 상기 무화기 측으로 유입되는 공기의 양을 조절한다.

[12] 상기 또다른 기술적 과제를 달성하기 위한 본 발명의 일 실시예에 따른 휴대용 무화 장치는, 배터리와 전기적으로 연결되고, 소스 재료를 무화시키는 열을 발생하는 가열 부재를 포함하는 무화기; 및 사용자의 지속적인 누름 동작을 인식할 수 있는 감지 부재를 포함하며, 상기 감지 부재의 누름 동작이 지속되는 동안 제 1 전압 레벨을 갖는 가열 동작 구간과 상기 제 1 전압 레벨보다 작은 제 2 전압 레벨을 갖는 가열 휴지 구간이 적어도 1회 이상 교번하는 출력 신호를 상기 가열 부재로 출력하는 제어부를 포함한다.

[13] 일부 실시예에서, 상기 감지 부재는, 버튼식 또는 터치식일 수 있다. 일부 실시예에서, 상기 가열 부재의 저항 측정값으로부터 상기 제 1 전압 레벨이 정의될 수 있다. 일부 실시예에서, 상기 제 2 전압 레벨은 0 V인 것이 바람직하다. 일부 실시예에서, 상기 사용자의 지속적인 누름 동작의 시작 시점으로부터 일정 시간 동안 상기 출력 신호가 턴 온되지 않는 가열 대기 구간을 가질 수 있다. 일부 실시예에서, 상기 가열 대기 구간은 0.01 초 내지 1 초 범위 내의 지속 시간을 가질 수 있다. 일부 실시예에서, 상기 가열 동작 구간은 0.1 초 내지 20 초 범위 내의 지속 시간을 가지며, 상기 가열 휴지 구간은 0.05 초 내지 5 초 범위 내의 지속 시간을 가질 수 있다.

NJOY Exhibit 1002.2323

[14] 일부 실시예에서, 상기 가열 동작 구간과 상기 가열 휴지 구간 중 어느 하나 또는 이들 모두를 설정하기 위한 사용자 설정 인터페이스를 표시하는 디스플레이부를 더 포함하며, 상기 제어부는 상기 감지 부재를 사용자 입력 인터페이스로 사용하여 상기 사용자의 누름 동작에 따라 상기 가열 동작 구간 및 상기 가열 휴지 구간의 값을 조절할 수 있다.

[15] 일부 실시예에서, 상기 제어부는, 상기 감지 부재의 누름 동작이 미리 설정된 대기시간 이상 중지될 경우, 이후 감지 부재의 누름 동작에 의한 출력 신호는 상기 가열 대기 구간부터 출력할 수 있다. 일부 실시예에서, 상기 출력 신호는 미리 설정된 최대 동작 시간 내로 출력이 제한할 수 있다. 일부 실시예에서, 상기 최대 동작 시간은 0.15 초 내지 25 초인 것이 바람직하다.

[16] 일부 실시예에서, 상기 배터리를 수납하는 배터리 케이스; 상기 배터리 케이스 및 상기 무화기 사이에서 상기 배터리 케이스 및 상기 무화기와 결합되는 몸체 케이스; 및 외부로부터 상기 무화기 측으로 통하는 공기 유입구를 개방하거나 차폐하여, 상기 무화기 측으로 유입되는 공기의 양을 조절하는 흡입량 조절부를 더 포함할 수 있다. 일부 실시예에서, 상기 휴대용 무화 장치는, 전자 담배, 향기 치료기, 살균기, 살충기 및 호흡기 치료기 중 어느 하나일 수 있다.

발명의 효과

[17] 본 발명에 따르면, 배터리의 전원 전압의 크기 또는 가열 부재의 저항의 크기에 따라 출력 신호를 조절함으로써 가열 부재 측으로 제공되는 전력을 일정하게 유지할 수 있다. 따라서, 가열 부재가 고 전력에 의해 단선되거나, 전력 저하에 따라 휴대용 무화 장치의 연무량이 감소되거나, 연무의 향 및 맛이 변화되는 문제점이 해결될 수 있다.

[18] 또한, 본 발명의 일부 실시예에 따르면, 출력 신호를 사용자의 기호에 따라 사용자가 직접 제어할 수도 있다. 이에 따라, 사용자의 조작으로 본인의 기호에 보다 적합한 연무 조건을 선택할 수 있다.

[19] 또한, 흡입량 조절부를 이용하여 무화된 소스 재료와 혼합되는 외부의 공기의 양을 용이하게 조절할 수 있다. 따라서, 사용자는 흡입량 조절부를 이용하여 연무량을 용이하게 조절할 수 있다.

[20] 또한, 제어부의 인쇄회로기판은 몸체 케이스의 결합홈에 체결되어 그 위에 실장된 디스플레이부 및 스위치를 지지할 수 있을 뿐만 아니라, 배터리 및 출력 단자들과 직접적 또는 간접적으로 접촉되어 서로 전기적으로 연결될 수 있다. 따라서, 별도의 연결부재 또는 결합부재 없이, 휴대용 무화 장치의 회로 구성과 기계적 조립이 용이 해질 수 있는 효과가 발생될 수 있다.

[21] 따라서, 납과 같은 유해성 물질의 배제에 따른 친환경 적인 특성을 가질 수 있고, 제조 공정이 보다 단순화되어 제조 원가가 절감되는 효과가 발생될 수 있다.

[22] 또한, 사용자는 감지 부재와 같은 터치 방식의 스위치를 이용하여 휴대용 무화

NJOY Exhibit 1002.2324

장치를 구동할 수 있다. 따라서, 휴대용 무화 장치가 전자 담배에 적용되는 경우, 일반 버튼과 같이 계속 누르지 않더라도, 감지 부재가 배치된 휴대용 무화 장치의 몸체를 단순히 파지하는 방식으로 휴대용 무화 장치를 구동할 수 있으므로 사용자의 편의성이 향상될 수 있다.

[23] 또한, 제 1 전압 레벨의 가열 동작 구간과 제 1 전압 레벨보다 낮은 제 2 전압 레벨의 가열 휴지 구간을 갖는 출력 신호로 가열 부재를 제어함으로써, 가열 부재의 장시간 가열로 인한 무화기의 손상 및 소스 재료의 낭비를 방지할 수 있다.

[24] 또한, 가열 구간과 휴지 구간의 지속 시간을 사용자의 흡입 시간이나 흡입 습관에 맞추어 사용자가 직접 조절할 수 있도록 함으로써, 본인의 기호에 보다 적합한 연무 조건을 선택/조절하고 변화된 소스 재료의 맛, 향 및 흡입감을 취할 수 있다.

[25] 또한, 출력 신호의 최대 동작 시간 및 감지 부재의 누름 동작의 중지에 따른 대기시간을 설정함으로써, 가열 부재에 공급되는 전력 소모가 줄어들고 결과적으로, 배터리 사용시간이 증가되는 이점을 가질 수 있다.

도면의 간단한 설명

[26] 도 1a는 본 발명의 실시예에 따른 휴대용 무화 장치의 분해 사시도이다.

[27] 도 1b는 도 1a에 도시된 휴대용 무화 장치의 정면도이다.

[28] 도 2a는 도 1b의 I-I'을 따라 절취된 부분을 나타내는 단면도이다.

[29] 도 2b는 도 1a에 도시된 흡입량 조절부를 확대하여 나타낸 도면이다.

[30] 도 2c는 도 2b에 도시된 흡입량 조절부의 동작을 나타내는 도면이다.

[31] 도 3은 도 2c의 II-II'을 따라 절취된 부분을 나타내는 단면도이다.

[32] 도 4a 및 도 4b는 도 1a에 도시된 디스플레이부에 표시되는 정보를 확대하여 나타낸 도면들이다.

[33] 도 5는 도 2a에 도시된 휴대용 무화 장치의 블록도이다.

[34] 도 6은 가열 동작 구간 및 가열 휴지 구간을 갖는 출력 신호를 설명하기 위한 타이밍도이다.

[35] 도 7은 최대 동작 시간 설정에 따른 출력 신호를 설명하기 위한 타이밍도이다.

[36] 도 8은 대기시간 설정에 따른 출력 신호를 설명하기 위한 타이밍도이다.

발명의 실시를 위한 최선의 형태

[37] 본 발명의 휴대용 무화 장치는 배터리를 수납하는 배터리 케이스, 상기 배터리와 전기적으로 연결되고, 소스 재료를 무화시키는 열을 발생하는 가열부재를 포함하는 무화기, 상기 배터리 케이스 및 상기 무화기 사이에서 상기 배터리 케이스 및 상기 무화기와 결합되는 몸체 케이스, 상기 몸체 케이스의 내부에 수납되어 상기 배터리 및 상기 가열부재와 전기적으로 연결되고, 상기 배터리로부터 전력을 제공받아 상기 가열 부재 측으로 출력되는 출력 신호를 제어하는 제어부, 및 외부로부터 상기 무화기측으로 통하는 공기 유입구를

NJOY Exhibit 1002.2325

개방하거나 차폐하여, 상기 무화기 측으로 유입되는 공기의 양을 조절하는 흡입량 조절부를 포함할 수 있다.

[38] 또한, 본 발명의 또다른 휴대용 무화 장치는 배터리와 전기적으로 연결되고, 소스 재료를 무화시키는 열을 발생하는 가열 부재를 포함하는 무화기, 및 사용자의 지속적인 누름 동작을 인식할 수 있는 감지 부재를 포함하며, 상기 감지 부재의 누름 동작이 지속되는 동안 제 1 전압 레벨을 갖는 가열 동작 구간과 상기 제 1 전압 레벨보다 작은 제 2 전압 레벨을 갖는 가열 휴지 구간이 적어도 1회 이상 교번하는 출력 신호를 상기 가열 부재로 출력하는 제어부를 포함할 수 있다.

발명의 실시를 위한 형태

[39] 이하, 첨부된 도면을 참조하여 본 발명의 바람직한 실시예를 상세히 설명하기로 한다.

[40] 본 발명의 실시예들은 당해 기술 분야에서 통상의 지식을 가진 자에게 본 발명을 더욱 완전하게 설명하기 위하여 제공되는 것이며, 하기 실시예는 여러 가지 다른 형태로 변형될 수 있으며, 본 발명의 범위가 하기 실시예에 한정되는 것은 아니다. 오히려, 이들 실시예는 본 개시를 더욱 충실하고 완전하게 하고, 당업자에게 본 발명의 사상을 완전하게 전달하기 위하여 제공되는 것이다.

[41] 또한, 도면에서 각 층의 두께나 크기는 설명의 편의 및 명확성을 위하여 과장된 것이며, 도면상에서 동일 부호는 동일한 요소를 지칭한다. 본 명세서에서 사용된 바와 같이, 용어 "및/또는"은 해당 열거된 항목 중 어느 하나 및 하나 이상의 모든 조합을 포함한다.

[42] 본 명세서에서 사용된 용어는 특정 실시예를 설명하기 위하여 사용되며, 본 발명을 제한하기 위한 것이 아니다. 본 명세서에서 사용된 바와 같이, 단수 형태는 문맥상 다른 경우를 분명히 지적하는 것이 아니라면, 복수의 형태를 포함할 수 있다. 또한, 본 명세서에서 사용되는 경우 "포함한다(comprise)" 및/또는 "포함하는(comprising)"은 언급한 형상들, 숫자, 단계, 동작, 부재, 요소 및/또는 이들 그룹의 존재를 특정하는 것이며, 하나 이상의 다른 형상, 숫자, 동작, 부재, 요소 및/또는 그룹들의 존재 또는 부가를 배제하는 것이 아니다.

[43] 이하, 본 발명의 실시예들은 본 발명의 이상적인 실시예들을 개략적으로 도시하는 도면들을 참조하여 설명한다. 도면들에 있어서, 예를 들면, 부재들의 크기와 형상은 설명의 편의와 명확성을 위하여 과장될 수 있으며, 실제 구현 시, 도시된 형상의 변형들이 예상될 수 있다. 따라서, 본 발명의 실시예는 본 명세서에 도시된 영역의 특정 형상에 제한된 것으로 해석되어서는 아니 된다.

[44] 도 1a는 본 발명의 실시예에 따른 휴대용 무화 장치(200)의 분해도이고, 도 1b는 도 1a에 도시된 휴대용 무화 장치(200)의 정면도이다.

[45] 도 1a 및 도 1b를 참조하면, 휴대용 무화 장치(200)는 소스 재료를 무화시켜 연무를 발생시키고, 상기 연무를 사용자가 흡입하여 사람의 기호 또는 치료와

NJOY Exhibit 1002.2326

같은 소정의 목적을 달성하기 위한 수단으로 사용되는 장치이다. 예를 들면, 휴대용 무화 장치(200)는 전자 담배와 같이 일반 담배의 흡연을 대체하는 용도로 사용될 수 있고, 이 경우에 상기 소스 재료는 니코틴을 포함하는 액상 재료일 수 있다. 하지만, 본 발명의 휴대용 무화 장치(200)가 전자 담배의 실시예로 한정되는 것은 아니다. 예를 들면, 휴대용 무화 장치(200)는 니코틴을 포함하지 않은 액상 재료를 무화시켜 연무를 발생시키는 금연 보조기기에 적용될 수 있고, 허브 추출액과 같은 건강에 유효한 성분을 포함하는 소스 재료를 무화시키는 건강 보조 기구로 적용될 수도 있다. 또는, 기관지염 및 폐렴과 같은 호흡기 질환에 대한 약리 활성 효과가 있는 물질, 예를 들면, 벤토린 또는 풀미칸을 함유하는 소스 재료를 무화시켜 흡입하도록 함으로써, 휴대용 무화장치(200)는 치료용으로도 사용될 수도 있다. 이들 예들은 예시적일 뿐, 본 발명이 이에 제한되는 것은 아니며, 상기 소스 재료의 성분에 따라 휴대용 무화 장치(200)의 용도가 변경될 수 있음은 자명하다.

[46] 휴대용 무화 장치(200)는 배터리 케이스(150), 배터리 캡(190), 무화기(50), 흡입 마우스피스(10) 및 무화 제어 유닛(ACU)을 포함한다. 배터리 케이스(150)는 그 내부가 빈 중공형의 형상을 가져 배터리(BT)가 수납될 수 있다. 일부 실시예에서, 배터리 케이스(150)의 내부는 무화 제어 유닛(ACU)의 몸체 케이스(110)와 통하는 구조를 가질 수 있어, 노출된 배터리(BT)의 전극, 예를 들면, 양극은 직접 무화 제어 유닛(ACU)에 마련된 전극 패드와 접촉되어 전기적으로 연결될 수 있다. 이 경우, 배터리(BT)의 다른 전극, 예를 들면, 음극은 배터리 케이스(150)에 접촉하여, 무화 제어 유닛(ACU)의 몸체 케이스(110)와 배터리 케이스(150)가 체결되는 것에 의해 무화 제어 유닛(ACU)에 전기적으로 연결되어 회로를 형성할 수 있다. 그러나, 이는 예시적이며, 배터리 케이스(150) 내에 배터리(BT)가 은폐될 수도 있다. 일부 실시예에서, 배터리 케이스(150)의 일 단부는 배터리 캡(190)에 의해 커버될 수 있다.

[47] 일부 실시예에서, 배터리 케이스(150), 배터리 캡(190) 및 몸체 케이스(110)가 상호 간에 체결되는 부분들에는 나사산들이 형성되어 상호 간에 결합될 수 있다. 이에 따라, 사용자는 휴대용 무화 장치(200)로부터 배터리 케이스(150) 또는 배터리 캡(190)를 용이하게 분리 및 결합할 수 있어, 수명이 다한 배터리(BT)를 주기적으로 용이하게 교체할 수 있다.

[48] 또한, 흡입 마우스피스(10)는 전자 담배용 또는 호흡기 치료용으로서 적합하며, 향기 발생기, 살균기 또는 살충기와 같은 응용을 위해서 생략되거나, 연무의 공기 중 분산을 촉진하기 위해 노즐로 대체될 수도 있다.

[49] 무화 제어 유닛(ACU)은 몸체 케이스(110) 및 디스플레이부(90)를 갖는 제어부(도 2a의 100), 및 흡입량 조절부(80)를 포함한다. 몸체 케이스(110)는 중공형의 형상을 가져 그 내부가 배터리 케이스(150)와 통하고, 그 내부에 제어부(도 2a의 100)를 수납한다. 도 1a 및 도 1b에서는, 상기 제어부의 구성요소들 중 디스플레이부(90)가 도시되며, 디스플레이부(90)는 몸체

NJOY Exhibit 1002.2327

케이스(110)의 일부에 형성된 개구부를 통해 외부로 노출된다.
디스플레이부(90)는 액정, 유기발광소자, 진공 형광 디스플레이와 같은 자발광형 또는 비자발광형 디스플레이 소자를 포함할 수 있다.

[50] 흡입량 조절부(80)는 몸체 케이스(110)의 일 단부와 결합되어, 몸체 케이스(110)와 무화기(50)가 결합된 상태에서 외부 및 무화기(50)와 통하는 공기 유입구(도 2a의 H2)를 개방하거나 차폐한다. 따라서, 흡입량 조절부(80)가 상기 공기 유입구를 개방 또는 차폐하는 상태에 따라 무화기(50)에서 무화되어 흡입 마우스피스(10)를 통해 외부로 배출되는 연무의 양이 변경될 수 있다.

[51] 일부 실시예에서, 흡입량 조절부(80)는 상기 공기 유입구가 형성된 몸체 케이스(110)의 단부와 결합되는 링의 형태를 가질 수 있다. 이 경우에, 흡입량 조절부(80)는 몸체 케이스(110)의 단부에서 장축 방향으로 이동이 가능하여 상기 공기 유입구 상으로 경과하면서 유입구를 개방하거나, 차폐할 수 있다. 상술한 흡입량 조절부(80)의 구조 및 기능에 대해서는 도 2b 및 도 2c를 참조하여 보다 상세히 후술된다.

[52] 무화기(50)는 무화 제어 유닛(ACU)을 사이에 두고 배터리 케이스(150)와 대향하도록 무화 제어 유닛(ACU)과 결합된다. 무화기(50)는 무화 제어 유닛(ACU)을 통해 배터리(BT)와 전기적으로 연결되고, 소스 재료를 무화시켜 연무를 발생시킨다. 일부 실시예에서, 무화기(50)는 그 내면에 나사산이 형성된 결합부(40)를 통해 무화 제어 유닛(ACU)과 결합될 수 있어, 사용자는 무화기(50)를 휴대용 무화 장치(200)로부터 용이하게 분리 및 교체할 수 있다. 따라서, 장시간 사용에 따라 무화기(50)의 성능이 저하된 경우에, 사용자는 무화기(50)를 용이하게 교체할 수 있다.

[53] 흡입 마우스피스(10)는 무화기(50)의 일 단부와 결합되어, 무화기(50)에서 발생된 연무는 흡입 마우스피스(10)를 통해 외부로 배출될 수 있다. 즉, 사용자는 흡입 마우스피스(10)를 통하여 무화기(50)에서 발생된 연무를 흡입할 수 있다. 일부 실시예에서, 흡입 마우스피스(10)는 금속 재료와 같이 내구성이 우수한 재질로 형성될 수도 있고, 사용자의 사용감을 향상시키기 위하여 실리콘 고분자 수지와 같이 가요성을 갖는 재질로 형성될 수도 있다. 이하, 휴대용 무화 장치(200)의 내부 구조에 대해 도 2a 및 도 2b를 참조하여 보다 상세히 설명한다.

[54] 도 2a는 도 1b의 선 I-I'을 따라 절취된 부분을 나타내는 단면도이고, 도 2b는 도 1a에 도시된 흡입량 조절부(80)를 확대하여 나타낸 도면이고, 도 2c는 도 2b에 도시된 흡입량 조절부(80)의 기능을 설명하기 위한 도면이다. 도시된 구성 요소들 중 이전의 도면들의 구성 요소와 동일한 참조 번호를 갖는 구성 요소들에 대하여는 모순되지 않는 한, 전술한 개시 사항을 참조할 수 있다.

[55] 도 2a 내지 도 2c를 참조하면, 무화 제어 유닛(ACU)의 몸체 케이스(110)는 출력 단자(88) 및 제1 결합부(115)를 포함한다. 출력 단자(88)는 몸체 케이스(110)와 무화기(50)가 연결되는 부위에 배치되어, 제어부(100)로부터 무화기(50)로 전력을 공급받는다.

NJOY Exhibit 1002.2328

[56] 제1 결합부(115)는 몸체 케이스(110)의 일 단부로부터 무화기(50) 측으로 연장되고, 상부가 개방되어 출력 단자(88)를 둘러싸는 중공형의 형상을 갖는다. 출력 단자(88)는 제1 결합부(115)를 통하여 그 일부가 노출될 수 있다. 또한, 제1 결합부(115)의 측벽에는 외부와 통하는 하나 또는 복수의(적어도 하나 이상의) 공기 유입구들(H2)이 형성되고, 그 내면에 무화기(50)의 제2 결합부(40)의 제3 나사산(S3)과 결합되는 제1 나사산(S1) 및 그 외면에 흡입량 조절부(80)와 결합되는 제2 나사산(S2)이 형성된다. 상술한 제1 결합부(115)의 구조에 따르면, 제1 결합부(115)의 내부에 무화기(50)의 제2 결합부(40)가 삽입 및 결합되어, 무화 제어 유닛(ACU)과 무화기(50)가 상호 간에 체결될 수 있다.

[57] 또한, 제2 결합부(40)에는 제2 결합부(40)를 관통하는 에어홀들(H1)이 형성되고, 무화기 케이스(20)의 단부에 하나 또는 복수의 통기구들(H3)이 형성될 수 있다. 따라서, 외부의 공기는 통기구들(H3), 공기 유입구들(H2) 및 에어홀들(H1)을 순차적으로 통과하여 무화기(50) 내측으로 제공될 수 있다.

[58] 무화기(50)는 제2 결합부(40), 무화기 케이스(20), 카트리지(21), 전극관(45), 심지(35), 가열 부재(30), 및 배기관(25)을 포함한다. 무화기 케이스(20)의 일단부에는 제2 결합부(40)가 배치된다. 제2 결합부(40)는 상부가 개방되어 전극관(45)의 주변을 둘러싸는 중공형의 형상을 가져, 앞서 상술한 바와 같이 제2 결합부(40)가 제1 결합부(115)의 내부에 삽입되는 경우, 전극관(45)은 출력 단자(88)과 접촉되어 출력 단자(88)에 전기적으로 연결될 수 있다.

[59] 무화기 케이스(20)의 내부에 카트리지(21)가 배치되고, 카트리지(21)에는 소스 재료(TL)가 수용된다. 일부 실시예에서, 소스 재료(TL)는 액상일 수 있고, 휴대용 무화 장치(200)의 용도에 따라 소스 재료(TL)의 성분이 결정될 수 있다. 또한, 카트리지(21) 내부에는 소스 재료(TL)와 격리되는 무화실(28)이 위치하고, 무화실(28)에는 심지(35), 심지(35)의 외부를 감는 가열 부재(30) 및 전극관(45)이 배치된다. 전극관(45)은 도전성 재료로 형성되어 출력 단자(88)와 전기적으로 연결되고, 심지(35)의 일부는 소스 재료(TL)에 노출되어 소스 재료(TL)가 심지(35)에 의해 흡인되어 가열 부재(30) 측으로 제공된다.

[60] 가열 부재(30)는 필라멘트와 같은 도전성 코일일 수 있고, 가열 부재(30)는 출력 단자(88)로부터 출력 신호, 예를 들면, 제어된 전압 신호 또는 전류 신호를 제공받아 열을 발생시킨다. 상기 출력 신호는 DC 또는 AC 또는 펄스일 수 있으며, 바람직하게는, 전력 제어가 용이한 DC일 수 있다. 상기 펄스의 경우는 펄스의 크기 또는 폭을 제어함으로써 전력 제어를 할 수도 있다. 가열 부재(30)에 상기 출력 신호가 인가되면, 가열 부재(30)가 가열되어, 가열 부재(30)에 의해 감겨 있는 심지(35)에 스며든 소스 재료(TL)가 무화되어 무화실(28)이 연무로 채워진다. 상기 출력 신호에 관하여는 도 6을 참조하여 후술하도록 한다.

[61] 또한, 카트리지(21)의 내부에는 배기관(25)이 배치되고, 배기관(25)의 일 단부는 흡입 마우스피스(10)의 흡입관(5)과 연결되며, 배기관(25)의 타 단부는 무화실(28)과 연결된다. 따라서, 액상의 소스 재료(TL)가 무화되어 무화실(28)이

NJOY Exhibit 1002.2329

연무로 채워지고, 사람이 흡입 마우스피스(10)를 흡입하면, 배기관(25) 및 흡입관(5)을 통해 무화실(28)에 채워진 연무를 흡입할 수 있다.

[62] 다른 실시예에서, 휴대용 무화 장치(200)는 상술한 가열식으로 동작하는 무화기(50) 대신에 다른 구조를 갖는 무화기를 포함할 수도 있다. 예를 들면, 휴대용 무화 장치(200)는 진동자를 포함하여 초음파 진동식 방법으로 연무를 발생시키는 무화기를 포함할 수도 있다.

[63] 흡입량 조절부(80)는 제1 결합부(115)의 외면을 둘러싸는 링의 형상을 갖고, 그 내면에는 제2 나사산(S2)과 결합되는 나사산(미도시)이 형성되어 제1 결합부(115)와 결합된다. 따라서, 사용자가 흡입량 조절부(80)를 회전하는 경우에, 흡입량 조절부(80)는 제1 방향(D1) 또는 제2 방향(D2)으로 이동이 가능하여 공기 유입구들(H2)을 완전히 개방시키거나, 부분적으로 개방시키거나, 차폐할 수 있다. 예를 들면, 도 2b에서는 흡입량 조절부(80)가 제2 방향(D2)으로 최대로 이동된 상태가 도시되며, 이 경우에, 흡입량 조절부(80)는 공기 유입구들(H2)과 중첩되지 않으므로 공기 유입구들(H2)은 완전히 개방된다.

[64] 이와 달리, 도 2c에서는 흡입량 조절부(80)가 제2 나사산(S2)을 따라 회전하여 제1 방향(D1)으로 이동된 상태가 도시된다. 이 경우에, 흡입량 조절부(80)는 대략적으로 공기 유입구(H2)의 절반과 중첩되어 공기 유입구(H2)의 절반 정도를 차폐하게 된다. 따라서, 도 2c에 도시된 흡입량 조절부(80)의 위치에서 공기 유입구들(H2)을 통해 외부로부터 무화실(28) 측으로 제공되는 공기의 양을 제1 양이라고 가정하면, 도 2b에 도시된 흡입량 조절부(80)의 위치에서는 공기 유입구들(H2)을 통해 외부로부터 무화실(28) 측으로 제공되는 공기의 양은 상기 제1 양보다 큰 제2 양이 된다.

[65] 따라서, 사용자가 흡입 마우스피스(10)를 동일한 압력으로 들이마신다고 가정할 때, 도 2c에 도시된 흡입량 조절부(80)의 위치에서보다 도 2b에 도시된 흡입량 조절부(80)의 위치에서 보다 많은 양의 연무를 흡입할 수 있다. 이는 곧, 사용자가 흡입량 조절부(80)의 위치를 조절하여 흡입하는 연무의 양을 용이하게 조절할 수 있음을 의미한다.

[66] 일부 실시예에서, 휴대용 무화 장치(200)는 탄성 부재(85)를 더 포함할 수 있다. 탄성 부재(85)는 금속성 재료로 형성된 스프링과 같이 도전성 및 탄성을 가질 수 있다. 탄성 부재(85)는 출력 단자(88) 및 인쇄회로기판(70) 사이에 개재되어 출력 단자(88)와 인쇄회로기판(70) 사이의 전기적 연결을 확보하면서 출력 단자(88)와 전극관(45)의 접촉을 보정한다. 출력 단자(88)는 인쇄회로기판(70)을 통해 배터리(BT)와 전기적으로 연결될 수 있다. 더욱 상세하게는, 탄성 부재(85)는 출력 단자(88) 및 인쇄회로기판(70)의 제2 도전층(C2)과 접촉되고, 인쇄회로기판(70)의 제1 도전층(C1)은 배터리(BT)의 단자와 접촉되어 배터리(BT)의 전원 전압은 인쇄회로기판(70)을 통해 출력 단자(88) 측으로 출력될 수 있다.

[67] 이와 같이, 인쇄회로기판(70) 자체에 도전층들을 형성하여 배터리(BT)와

NJOY Exhibit 1002.2330

인쇄회로기판(70)의 접촉, 그리고, 인쇄회로기판(70)과 전극관(45)의 접촉만으로 무화기(50)에 전력 공급을 위한 회로가 구성됨으로서, 무화기(50), 무화 제어 유닛(ACU) 및 배터리 케이스(150)를 체결하는 것만으로도 전기적 연결이 달성될 수 있다. 그 결과, 본 발명의 일 실시예에 따르면, 와이어와 같은 복잡한 도전 부재 없이, 회로 구성이 단순화되고, 제조와 조립이 용이한 무화 장치가 제공될 수 있다.

[68] 또한, 무화기(50)는 카트리지(21)에 소스 재료(TL)를 채우기 위해 휴대용 무화 장치(200)로부터 수시로 분리 및 결합되므로, 탄성 부재(85)가 없는 경우에, 휴대용 무화 장치(200)의 사용 시간이 길어짐에 따라 출력 단자(88) 및 제2 도전층(C2) 간에 간격이 발생되어 출력 단자(88) 및 제2 도전층(C2) 간에 전기적인 접속이 불안정해질 수 있다. 하지만, 본 발명의 실시예에 따르면, 출력 단자(88) 및 제2 도전층(C2) 간에 간격이 발생되더라도, 탄성 부재(85)에 의해 출력 단자(88) 및 제2 도전층(C2) 간에 전기적 접속의 신뢰성이 향상될 수 있다.

[69] 도 3은 도 2c의 II-II'을 따라 절취된 부분을 나타내는 단면도이다.

[70] 도 3과 함께 도 2a를 다시 참조하면, 제어부(100)는 몸체 케이스(110) 내부에 수납된다. 제어부(100)는 배터리(BT) 및 가열부재(30)와 전기적으로 연결되고, 배터리(BT)로부터 전력을 제공받아 가열부재(30) 측으로 출력되는 전기적 출력, 예를 들면, 출력 전압의 크기를 제어한다.

[71] 제어부(100)는 인쇄회로기판(70), 저항 측정부(71), 전압 보정부(74), 마이컴 소자(72), 감지 부재(75), 광원(95), 및 디스플레이부(90)를 포함한다. 저항측정부(71), 전압 보정부(74), 마이컴 소자(72), 감지 부재(75), 광원(95)은 서로 독립된 소자로 도시되어 있지만, 이는 예시적이며, 이들 중 적어도 2 이상은 서로 조합되어 시스템 IC로 원칩되어 경박단소화될 수 있으며, 본 발명이 이에 제한되는 것은 아니다. 인쇄회로기판(70)은 몸체 케이스(110)의 내면에 형성된 결합홈(112)에 삽입되어 몸체 케이스(110)의 내부에 수납되고, 배터리(BT) 및 가열 부재(30)와 전기적으로 연결된다. 보다 상세하게는, 배터리 케이스(150)에 인접하는 인쇄회로기판(70)의 일 측부 위에는 제1 도전층(C1)이 형성되고, 제1 도전층(C1)은 배터리(BT)의 단자와 전기적으로 연결된다. 또한, 무화기(50)에 인접하는 인쇄회로기판(70)의 타 측부 위에는 제2 도전층(C2)이 형성되고, 제2 도전층(C2)은 도전성의 탄성 부재(85)를 통해 출력 단자(88)와 접촉되어 가열 부재(30)와 전기적으로 연결될 수 있다. 제1 및 제2 도전층들(C1, C2)은 인쇄회로기판(70)의 측부에 형성된 솔더링층 또는 인쇄된 도전성 패드일 수 있다.

[72] 상술한 구조에 따르면, 인쇄회로기판(70)은 제1 및 제2 도전층들(C1, C2)에 의해, 별도의 와이어 또는 솔더링 없이, 배터리(BT) 및 가열 부재(30)와 전기적으로 연결될 수 있다. 또한, 인쇄회로기판(70)은 회로적 구성을 완성할 뿐만 아니라, 각 부재들(71, 74, 72, 75, 95, 90)의 기계적 지지체로서 기능하여, 몸체 케이스(110)의 내부 구성을 단일 바디로 간소화한다. 따라서, 납과 같은

NJOY Exhibit 1002.2331

유해성 물질의 배제에 따른 친환경 적인 특성을 가질 수 있고, 제조 공정이 보다 단순화되어 제조 원가가 절감되는 효과가 발생될 수도 있다.

[73] 인쇄회로기판(70) 위에는 저항 측정부(71), 전압 보정부(74), 마이컴 소자(72), 감지 부재(75), 광원(95), 및 디스플레이부(90)가 실장된다. 일부 실시예에서, 저항 측정부(71)는 가열 부재(30)의 저항을 감지하도록 인쇄회로기판(70) 상에 형성된 전기 회로를 포함할 수 있고, 전압 보정부(74)는 정전압 회로 또는 승압 회로와 같이 배터리(BT)의 전원 전압의 크기를 보정하여 전력 신호를 출력하는 전기 회로를 포함할 수 있다. 또한, 다른 실시예에서는, 저항 측정부(71) 및 전압 보정부(74)는 마이컴 소자(72)에 내장될 수도 있다. 저항 측정부(71)는 가열 부재(30)에 측정 전류를 인가하고, 가열 부재(30)에 걸리는 전압 레벨을 측정함으로써 가열 부재(30)의 저항을 측정하거나, 반대로 가열 부재(30)에 측정 전압을 인가하고, 가열 부재(30)에 흐르는 출력 전류를 측정함으로써 저항을 측정할 수 있다.

[74] 상술한 구성에 따르면, 무화기(50)의 규격이나 제품의 신뢰성에 따라 가열 부재(30)의 저항이 기 설정 값, 예를 들면, 사용자가 자신에게 적합한 것이라고 맞추어 놓은 무화기에 인가되는 전력 조건의 저항 값보다 작은 경우에, 저항 측정부(71)는 가열 부재(30)의 저항을 감지하고, 전압 보정부(74)는 상기 감지된 가열 부재(30)의 저항 값에 근거하여 상기 출력 전압을 기 설정 값보다 낮게 보정할 수 있다. 따라서, 가열 부재(30)의 저항 값에 관계 없이, 조절된 설정 값을 갖는 전력이 가열 부재(30) 측으로 일정하게 제공될 수 있으며, 예를 들어, 무화기에 동일한 전력이 공급됨으로써 무화 성능과 그에 따른 연무량이 동일하게 유지할 수 있다. 또한, 저항의 크기에 따라 제공되는 전력의 크기를 조절할 수 있으므로, 가열 부재(30)가 고 전압으로 단선되는 현상이 방지될 수 있다. 이와 관하여는 도 5를 참조하여 상세히 후술하도록 한다.

[75] 감지 부재(75)는 실리콘과 같은 지지부재(73)에 지지되어 인쇄회로기판(70) 상에 실장되고, 몸체 케이스(110)에 형성된 개구부(111)를 통해 외부로 노출되어 터치 이벤트에 대응하여 입력 신호를 생성한다. 감지 부재(75)에 의해 생성된 상기 입력 신호는 후술될 마이컴 소자(72) 측으로 입력되어 휴대용 무화 장치(200)의 전반적인 동작을 제어하는 데 사용된다. 다른 실시예에서, 감지 부재(75)는 정전식 스위치 및 감압식 스위치와 같이 다른 방식으로 동작하는 터치 방식의 스위치로 대체될 수도 있다.

[76] 마이컴 소자(72)는 수많은 전자회로를 집적한 대규모집적회로(LSI)를 이용하여, 중앙 연산 회로, 기억 회로, 입출력 제어 회로를 갖추고 있어 단순한 산술 계산 및 논리 계산을 하는 소자로서, 상기 입력 신호를 제공받아 휴대용 무화 장치(200)의 전반적인 동작을 제어할 수 있다. 예를 들면, 일부 실시예에서, 마이컴 소자(72)는 상기 입력 신호에 응답하여, 휴대용 무화 장치(200)의 전원을 온 또는 오프시키거나, 배터리의 전력이 가열 부재(30) 측으로 제공되도록 제어하거나, 휴대용 무화 장치(200)의 동작 모드를 변경시키거나, 상기 동작

NJOY Exhibit 1002.2332

모드에 따라 상기 전력의 크기를 조절할 수 있다. 일부 실시예에서는, 제어부(100)는 EEPROM(Electrically Erasable Programmable Read-Only Memory), 플래시 메모리 및 상변화 메모리와 같은 비휘발성 메모리 소자를 더 포함할 수 있으며, 이들 비휘발성 메모리 소자는 마이컴 소자(72)에 탑재되거나, 별도로 실장될 수도 있다. 사용자 설정값 또는 후술하는 데이터베이스부는 전술한 메모리 소자 또는 비휘발성 메모리 소자에 저장될 수 있다.

[77] 보다 상세하게는, 사용자가 감지 부재(75)를 복수회 터치하는 경우, 마이컴 소자(72)는 휴대용 무화 장치(200)의 전원을 온 시킬 수 있다. 또한, 전원이 온 된 이후에, 사용자가 감지 부재(75)를 터치하고 동안에, 마이컴 소자(72)는 상기 전력이 가열 부재(30) 측으로 제공되어 소스 재료의 무화가 개시될 수 있다.

[78] 또한, 휴대용 무화 장치(200)가 온 된 이후에, 사용자가 기 설정된 방식으로 감지 부재(75)를 터치하고, 상기 터치에 대응하여 마이컴 소자(72)는 휴대용 무화 장치(200)의 동작모드를 전력의 크기가 자동적으로 제어되는 제1 동작 모드로 설정할 수 있다. 이 경우에, 앞서 설명한 전압 보정부(74) 및 저항 측정부(71)의 기능에 의해 무화기(50)에 인가되는 전력이 일정하게 유지되거나 변화할 수 있다.

[79] 또한, 휴대용 무화 장치(200)가 온 된 이후에, 사용자가 기 설정된 다른 방식으로 감지 부재(75)를 터치하고, 상기 터치에 대응하여 마이컴 소자(72)는 휴대용 무화 장치(200)의 동작모드를 상기 전력의 크기가 사용자의 수동 조작으로 제어되는 제2 동작 모드로 설정할 수 있다. 예를 들면, 이 경우에, 마이컴 소자(72)는 사용자의 터치 이벤트의 횟수에 따라 상기 전력의 크기를 수동으로 제어할 수 있다. 따라서, 사용자는 연무를 흡연하는 기호에 따라 상기 전력을 용이하게 증가시키거나 감소시킬 수 있다.

[80] 일부 실시예에서, 마이컴 소자(72)는 배터리(BT)의 전원의 전원 전압을 감지하고, 상기 감지된 전원 전압의 크기에 따라 상기 출력 전압의 크기를 디폴트 값으로 조절할 수도 있다. 예를 들어, 상기 출력 전압의 디폴트 값이 5.1V이고, 배터리(BT)의 전원의 전원 전압이 3.7V라고 가정하면, 마이컴 소자(72)는 상기 전원 전압을 감지하고, 상기 출력 전압이 상기 디폴트 값과 동일해지도록 전압 보정부(74)를 이용하여 상기 출력 전압을 보정할 수도 있다.

[81] 디스플레이부(90)는 인쇄회로기판(70) 위에 실장되어 몸체 케이스(150)에 형성된 개구부(111)를 통해 외부로 노출되고, 광원(95)으로부터 광을 제공받아 휴대용 무화 장치(200)가 구동되는 각 종의 정보를 표시한다. 일부 실시예에서, 디스플레이부(90)는 상기 전원 전압의 크기, 상기 출력 전압의 크기, 가열부재(30)의 저항의 크기, 배터리(BT)의 전원의 잔류량, 상기 잔류량에 따른 경고 표시, 가열부재(30)의 온도, 상기 온도에 따른 경고 표시, 상기 제1 동작 모드, 및 상기 제2 동작 모드와 같은 정보를 표시할 수 있다.

[82] 상술한 바와 같이, 인쇄회로기판(70) 위에 저항 측정부(71), 전압 보정부(74), 마이컴 소자(72), 감지 부재(75), 광원(95), 및 디스플레이부(90)가 실장되고,

NJOY Exhibit 1002.2333

인쇄회로기판(70)이 몸체 케이스(110)의 내면에 형성된 결합홈(112)에 체결되는 경우에, 인쇄회로기판(70) 위에 실장된 상술한 구성 요소들의 회로 구성이 용이해질 뿐만 아니라, 인쇄회로기판(70)은 감지 부재(75) 및 디스플레이부(90)를 기계적으로 지지하는 역할을 할 수도 있다. 따라서, 전반적으로 휴대용 무화 장치의 회로 구성과 기계적 조립이 용이 해질 수 있는 효과가 발생될 수 있다.

[83] 도 4a 및 도 4b는 도 1에 도시된 디스플레이부(90)에 표시되는 정보를 확대하여 나타낸 도면들로, 우선 도 4a를 참조하면, 디스플레이부(90)에는 휴대용 무화 장치가 구동되는 각 종의 정보가 표시된다. 보다 상세하게는, 디스플레이부(90)는 제1 표시창(DP1) 및 제2 표시창(DP2)을 포함하고, 제1 표시창(DP1)에는 상기 제1 동작 모드, 즉, 자동 모드를 알리는 그림 또는 문자가 표시될 수 있다.

[84] 또한, 제2 표시창(DP2)에는 가열 부재(도 2a의 30) 측으로 제공되는 출력 전압이 수치가 표시되거나, 출력 전압의 크기를 나타내는 그림이 표시될 수 있다. 따라서, 사용자는 제1 및 제2 표시창들(DP1, DP2)에 표시되는 정보를 통해 휴대용 무화 장치(200)가 현재 상기 자동 모드로 구동되며, 상기 출력 전압이 5.1V임을 용이하게 파악할 수 있다.

[85] 도 4b를 참조하면, 디스플레이부(90)에 앞서 설명한 제2 동작 모드를 알리는 정보가 표시될 수 있다. 예를 들면, 제3 표시창(DP3)에는 상기 제2 동작 모드, 즉, 수동 모드를 알리는 그림 또는 문자가 표시될 수 있고 제2 표시창(DP2)에는 가열 부재(도 2a의 30) 측으로 제공되는 출력 전압이 표시될 수 있다. 따라서, 사용자는 제2 및 제3 표시창들(DP2, DP3)에 표시되는 정보를 통해 휴대용 무화 장치(200)가 현재 상기 수동 모드로 구동되며, 상기 출력 전압이 4.1V임을 용이하게 파악할 수 있다. 또한, 상기 제2 동작 모드에서, 사용자가 감지 부재(도 3의 75)를 터치하는 경우에, 사용자는 제2 표시창(DP2)을 통해 상기 출력 전압이 4.1V에서 증가되거나, 감소되는 것을 직접 확인할 수 있다.

[86] 다른 실시예에서, 감지 부재(도 3의 75)에 행해지는 터치의 시간에 따라 휴대용 무화 장치의 전원이 온되거나 오프되도록 마이컴 소자(도 3의 72)를 설계할 수도 있다. 예를 들면, 사용자의 의도하지 않은 터치, 예컨대 단순히 휴대용 무화 장치를 파지할 때 발생되는 터치에 대해 휴대용 무화 장치의 전원이 켜지는 것을 방지하기 위하여 0.5초 이내 3회 또는 5회 상기 감지 부재를 연속적으로 터치하는 경우에, 메뉴 모드 및 이를 이용하여 전원을 온 또는 오프하도록 설계될 수도 있다.

[87] 또한, 다른 실시예에서, 상기 출력 전압 외에, 배터리(도 2a의 BT)의 전원의 잔량, 가열부재(도 2a의 30)의 크기, 상기 가열부재의 온도 또는 상기 온도와 관련된 경고 표시와 같은 각 종 정보들이 디스플레이부(90)에 표시될 수도 있다. 상술한 정보들은 디스플레이부(90)에 동시에 표시될 수도 있고, 상기 감지 부재를 터치하는 횟수에 따라 변경되는 표시모드들에 따라 서로 구분되어

NJOY Exhibit 1002.2334

표시될 수 있다. 또한, 상술한 디스플레이부(90)에 표시되는 각 종 정보들 외에도, 흡입 횟수와 같은 휴대용 무화 장치의 구동과 관련된 다른 정보 및 이를 표시하는 방법은 상기 마이컴 소자 및 디스플레이부(90)의 설계에 따라 다양하게 변경될 수 있다.

[88] 도 5는 도 2a에 도시된 휴대용 무화 장치(200)의 제어 블록도이고, 도 6은 가열 동작 구간 및 가열 휴지 구간을 갖는 제어부(100)의 출력 신호(S2)를 설명하기 위한 타이밍도이다.

[89] 도 5 및 도 6을 참조하면, 감지 부재(75)는 사용자의 누름 동작이 지속되는 동안(이하, 터치 온 구간이라 함; S1_t1), 입력 신호(S1)를 발생시키고, 제어부(100)는 입력 신호(S1)에 응답하여 출력 신호(S2)를 가열 부재(50)로 출력한다. 출력 신호(S2)는 입력 신호(S1)의 터치 온 구간(S1_t1)에 대응하여 제 1 전압 레벨(V1)을 갖는 가열 동작 구간(S2_t1)과 제 1 전압 레벨(V1)보다 작은 제 2 전압 레벨(V2)을 갖는 가열 휴지 구간(S2_t2)이 교번되는 파형을 가진다. 이를 위하여, 제어부(100)는 가열 동작 구간(S2_t1) 동안 턴 온되고 가열 휴지 구간(S2_t2) 동안 턴 오프되는 스위칭 소자(미도시)를 포함할 수 있다.

[90] 출력 신호(S2)는 하나의 사이클이 하이 레벨의 전압을 갖는 구간과 로우 레벨의 전압을 갖는 구간이 반복되는 사각 펄스파 파형을 가질 수 있다. 그러나, 이는 예시적이며, 가열 동작 구간(S2_t2) 및 가열 휴지 구간(S2_T2)을 포함하는 출력 신호(S2)는 삼각파, 톱니파 및 반원파와 같이 선형 또는 곡선형의 상승 구간 및/또는 하강 구간을 갖는 임의의 파형을 가질 수 있으며, 이 경우, 각 구간의 전압 레벨은 평균값으로 결정될 수 있다.

[91] 출력 신호(S2)의 가열 동작 구간(S2_t1)의 지속 시간은 가열 휴지 구간(S2_t2)의 지속 시간보다 길 수 있다. 예를 들면, 가열 동작 구간(S2_t1)은 0.1초 내지 20초 범위 내, 바람직하게는, 기화 또는 승화 동작이 일어나는 0.5 초 내지 2 초 범위 내의 지속 시간을 가지며, 가열 휴지 구간(S2_t2)은 0.01 초 내지 5 초 범위 내, 바람직하게는, 최적 기화 및 승화가 일어나면서도 가열부재를 보호하고 액상 소스 재료의 연소를 막기 위해 05 초 내지 0.2 초 범위 내의 지속 시간을 가질 수 있다.

[92] 일부 실시예에서, 가열 동작 구간(S2_t1)과 가열 휴지 구간(S2_t2)의 지속 시간은 사용자에 의해 미리 설정될 수 있다. 예를 들면, 가열 동작 구간(S2_t1)을 길게 하고 가열 휴지 구간(S2_t2)을 짧게 조절하면 액상 소스를 가열하는 시간이 길어 연무량이 증가할 수 있다. 또한, 상기 나열한 각각의 시간을 조절하면 시간 변화에 따라 액상 소스 본연의 맛이 달라질 수 있으며, 사용자는 자신의 기호에 맞게 이러한 시간들을 임의로 조절하여 조절된 액상의 소스 맛을 취할 수 있다. 이를 위하여, 휴대용 무화 장치(200)는 가열 동작 구간(S2_t1)과 가열 휴지 구간(S2_t2)을 설정하기 위한 사용자 설정 인터페이스를 표시하는 디스플레이부(90)를 더 포함할 수 있고, 제어부(100)는 감지 부재(75)를 사용자 입력 인터페이스로 사용하여 사용자의 누름 동작에 따라 가열 동작 구간(S2_t1)

NJOY Exhibit 1002.2335

및 가열 휴지 구간(S2_t2)의 값을 입력받아 이를 조절할 수 있다. 다른 실시예에서, 가열 동작 구간(S2_t1)과 가열 휴지 구간(S2_t2) 중 적어도 어느 하나, 바람직하게는, 가열 휴지 구간(S2_t2)는 가열 부재(30)의 저항값에 따라 이의 열손상을 방지하도록 자동 설정되거나, 추천 값을 제공할 수도 있다.

[93] 일부 실시예에서, 제 1 전압 레벨(V1)은 배터리(BT)로부터 제공되는 특정 전압 레벨, 예를 들면, 배터리의 전압이나 설정된 값을 가질 수 있다. 다른 실시예에서, 제 1 전압 레벨(V1)은 가열 부재(50)의 저항 측정값으로부터 가변적으로 정의될 수 있다. 전술한 바와 같이, 예를 들면, 사용자가 자신에게 적합한 것이라고 맞추어 놓은 무화기에 인가되는 전력 조건의 저항 값(기준 저항값이라 함)보다 작은 경우에, 저항 측정부(71)는 가열 부재(30)의 저항을 감지하고, 전압 보정부(74)는 상기 감지된 가열 부재(30)의 측정 저항 값에 근거하여 출력 신호(S2)의 제 1 전압 레벨(V1)을 기 설정 값보다 낮게 보정할 수 있다. 반대로, 가열 부재(50)의 저항 측정값이 상기 기준 저항값보다 큰 경우에는, 출력 신호(S2)의 제 1 전압 레벨(V1)을 기 설정 값보다 높게 보정할 수 있다.

[94] 일부 실시예에서는, 제어부(100)는 측정된 저항값과 그에 따른 제 1 전압 레벨(V1)을 정의한 룩업 테이블을 참조할 수 있다. 룩업 테이블은 데이터베이스화되어 있을 수 있으며, 전술한 기억부 또는 메모리에 저정될 수 있다.

[95] 표 1은 측정된 저항값과 제 1 전압 레벨의 예시적인 룩업 테이블이다.

[96] 표 1을 참조하면, 제어부(100)는 저항값을 측정하고, 측정된 저항값에 해당하는 제 1 전압 레벨을 찾아 전압 신호를 출력할 수 있다. 예를 들면, 측정된 저항값이 1 Ω이면, 제 1 전압 레벨은 2 V로 정의하여 출력할 수 있다. 측정된 저항값이 룩업 테이블에 없는 경우에는, 선형 보간법에 의해 중간값을 제 1 전압 레벨로 결정하거나, 근사에 의해 룩업 테이블에 있는 값을 제 1 전압 레벨로 할 수도 있다.

[97] 표 1

[Table 1]

일련 번호	측정된 저항값 (Ω)	제 1 전압 레벨(V)
1	1	2
2	1.5	2.5
3	2	3
:	:	:

[98] 다른 실시예에서는, 제어부(100)는 식 1 또는 식 2에 의해 측정된 저항값에 해당하는 제 1 전압 레벨을 계산하여 결정할 수도 있다.

[99] 수학식 1

NJOY Exhibit 1002.2336

$$V_{out}=R+A$$

[100] 여기서, V_{out}은 제 1 전압 레벨이고, R은 측정된 저항값이며, A는 1과 같은 임의의 상수이다.

[101] 식 1에서, 제 1 전압 레벨 V_{out}과 측정된 저항값 R의 단위는 각각 V와 Ω이지만, 식 1은 실제 컴퓨터에서 실행가능한 코드일 수 있으며, 이 경우, 제 1 전압 레벨의 출력을 계산하는 식은 단위에 무관하게 대수적으로만 결정될 수 있다.

[102] 수학식 2

$$V_{out}=K(R)^{\frac{1}{2}}$$

[103] 여기서, V_{out}은 제 1 전압 레벨이고, R은 측정된 저항값이며, K는 임의의 비례 상수이다. 식 1과 마찬가지로, 식 2는 실제 컴퓨터에서 실행가능한 코드일 수 있으며, 전력이 가열 부재의 주울 열을 결정하므로, 출력 전압 V_{out} 은 측정된 저항값의 제곱근에 비례하도록 하여 제 1 전압 레벨을 결정할 수도 있다.

[104] 전술한 룩업 테이블 방식 및 대수적 결정 방식은 예시적이며, 본 발명의 실시예가 이에 제한되는 것은 아니다. 예를 들면, 측정된 저항값 R에 따라 제 1 전압 레벨을 결정하는 다른 대수적 관계를 갖는 코드가 사용될 수도 있다.

[105] 다른 실시예에서, 전력 제어에 관한 테이블 또는 결정 방식들은 유선 또는 무선 네트워크를 통해서 제어부(100)로 다운로드될 수 있다. 또는, 액상 소스 재료의 상품, 규격, 종류에 따라 사용자가 선택하거나, 액상 소스 재료의 상품, 규격 또는 종류를 식별하기 위한 바코드, 데이터값과 같은 인식 정보와 상기 인식 정보로부터 측정된 저항값을 함께 고려하여 자동적으로 제 1 전압 레벨이 선택될 수 있도록 해당 액상 소스별로 복수개 마련될 수도 있다. 이를 위하여, 휴대용 무화 장치(200)는 데이터 스캐너, USB 인터페이스, 블루투스 또는 WiFi와 같은 유무선 인터페이스를 더 포함할 수도 있다.

[106] 배터리(BT)로부터의 전기적 신호(E)를 완전히 차단하여 가열 부재(30)의 과열을 방지하기 위해, 제 2 전압 레벨은 0 V이어서, 사용자가 감지부재를 지속적으로 누르는 동안 가열 부재측으로 공급되는 전력은 단속적으로 이루어질 수 있다. 일부 실시예에서는, O 아니고, 제 1 전압 레벨보다는 작도록 제 2 전압 레벨이 결정될 수도 있다.

[107] 일부 실시예에서, 출력 신호(S2)는 사용자의 지속적인 누름 동작의 시작 시점으로부터 일정 시간 동안 출력 신호(S2)가 턴 온되지 않는 가열 대기 구간(S2_t0)을 가질 수 있다. 예를 들면, 가열 대기 구간(S2_t0)이 0.5초로 설정된 경우, 사용자가 감지 부재(75)의 터치 버튼을 접촉한 채로 0.5 초를 초과하여 유지하고 있으면 0.5초 이후에 무화기로 제 1 절압 레벨(V1)을 갖는 출력 전압이 인가될 수 있다. 이러한 가열 대기 구간(S2_t0)은 0.01 초 내지 1 초 범위 내에서 결정될 수 있으며, 본 발명이 이에 의해 한정된 것은 아니다. 이러한 가열 대기

NJOY Exhibit 1002.2337

구간(S2_t0)은 감지부재에서 일어난 누름 이벤트가 사용자기 무화를 의도하고 누름 동작을 수행한 것인지를 판별하여, 사용자의 부주의한 터치 또는 사물과의 접촉에 의한 의도하지 않는 터치에 의해 출력 신호(S2)가 무화기에 전달되는 것을 방지한다.

[108] 제어부(100)는 사용자가 누름 동작 또는 터치를 유지하고 있는 동안 전압 출력 사이클을 반복하되, 가열 동작 구간(S2_t1)의 지속 시간은 일정할 수 있다. 예를 들면, 사용자가 터치를 해제하여 입력 신호(S1)의 입력이 중단되는 시점에서 출력 신호(S2)가 가열 동작 구간(S2_t1)에 위치한 경우, 해당 가열 동작 구간(S2_t1)의 지속 시간이 완료되는 시점에서 출력 신호(S2)의 출력이 중단될 수 있다. 이 경우, 입력 신호(S1)의 터치 온 구간(S1_t1)보다 출력 신호(S2) 전체 사이클이 더 길 수 있다. 그러나, 사용자에 의한 입력 신호(S1)의 입력이 중단되는 시점에서 출력 신호(S2)가 가열 대기 구간(S2_t0)에 위치한 경우, 동시적으로 출력 신호(S2)의 출력이 중단될 수 있다. 다른 실시예에서, 출력 사이클이 3 회 이상의 경우 사용자의 터치 습관 및 잔류 전압에 의해 1~2 회의 사이클이 추가될 수 있다.

[109] 전술한 바와 같이, 본 발명의 실시예에 따르면, 제 1 전압 레벨의 가열 동작 구간(S2_t1)과 제 1 전압레벨보다 낮은 제 2 전압 레벨의 가열 휴지 구간(S2_t2)을 갖는 출력 신호(S2)로 가열 부재(50)를 제어함으로써, 가열 부재(50)의 장시간 가열로 인한 무화기(30)의 손상과 소스 재료의 낭비를 방지할 수 있다. 또한, 가열 동작 구간(S2_t1)과 가열 휴지 구간(S2_t2)의 지속 시간을 사용자의 흡입 시간이나 흡입 습관에 맞추어 사용자가 직접 조절할 수 있도록 함으로써, 본인의 기호에 더욱 부합하는 연무 조건을 선택/조절하고 변화된 소스 재료의 맛, 향 및 흡입감을 취할 수 있다.

[110] 도 7은 최대 동작 시간 설정에 따른 출력 신호를 설명하기 위한 타이밍도이고, 도 8은 대기시간 설정에 따른 출력 신호를 설명하기 위한 타이밍도이다. 전술한 구성 요소와 동일한 참조 번호를 갖는 구성 요소에 관하여는 모순되지 않는 한 전술한 개시 사항을 참조할 수 있으며, 중복된 설명은 생략하기로 한다.

[111] 도 7을 참조하면, 무화기(30)의 과열 및 과도한 흡연 방지를 위해, 출력 신호(S2)는 미리 설정된 최대 동작 시간(S2_t4) 내로 출력이 제한될 수 있다. 사용자의 터치 입력에 의한 입력 신호(S1)의 터치 온 구간(S1_t1)이 최대 동작 시간(S2_t4)를 초과하여 지속되더라도 출력 신호(S2)의 총 출력 시간이 최대 동작 시간(S2_t4)에 도달하면 자동으로 출력 신호(S2)의 인가가 중단된다. 최대 동작 시간(S2_t4)은 0.15 초 내지 22 초, 바람직하게는, 9 초 내지 13 초의 범위 내일 수 있으며, 사용자에 의해 선택적으로 조절될 수 있다. 예를 들면, 최대 동작 시간(S2_t4)이 11 초로 설정된 경우, 입력 신호(S1)의 터치 온 구간(S1_t1)이 터치 시점으로부터 11 초를 넘어 지속되더라도, 출력 신호(S2)는 총 출력 시간이 11 초가 되는 시점에서 오프된다. 이에 의해, 가열 부재(50)의 장시간 가열로 인한 무화기(30)의 손상과 소스 재료의 낭비가 방지되고, 사용자의 조작에 상관없이

NJOY Exhibit 1002.2338

사용자의 담배 성분 또는 기회된 약리 활성 물질의 흡입 시간 및 용량을 제한하고, 흡입 습관도 제어할 수 있게 된다.

[112] 도 8을 참조하면, 제어부(100)는 감지 부재(75)의 누름 동작이 미리 설정된 대기시간(S1_w) 이상 중지될 경우, 이후 감지 부재(75)의 누름 동작(S1_A)에 의한 출력 신호(S2)는 가열 대기 구간(S2_t0)부터 출력할 수 있다. 예를 들면, 입력 신호(S1)의 터치 오프 구간(S1_t2)이 대기시간(S1_w)을 넘어선 경우, 이후 입력 신호(S1)가 온 되면 출력 신호(S2)는 입력 신호(S1)의 온 시점으로부터 일정 시간 동안 출력 신호(S2)가 턴 온되지 않는 가열 대기 구간(S2_t0)을 가질 수 있다. 반대로, 입력 신호(S1)의 터치 오프 구간(S1_t2)이 대기시간(S1_w) 이내에서 중단된 상태에서 입력 신호(S1)가 온 되면, 출력 신호(S2)는 가열 대기 구간(S2_t0) 없이 즉각적으로 턴 온되어 가열 동작 구간(S2_t1)부터 출력될 수 있다.

[113] 예를 들면, 가열 대기 구간(S2_t0)이 0.5초이고 대기시간(S1_w)이 3초로 설정된 경우, 감지 부재(75)의 터치가 지속되다가 3초간 터치 인식이 안될 경우 출력 신호(S2)는 초기화되어 대기모드로 전환하게 되고, 이후 터치가 인식되어 동작모드로 전환 시 터치 후 0.5초 경과 후 출력 신호(S2)가 턴 온되어 가열 동작 구간(S2_t1)과 가열 휴지 구간(S2_t2)가 교번하는 구간으로 진입될 수 있다.

[114] 전술한 바와 같이, 출력 신호의 최대 동작 시간(S2_max) 및 감지 부재의 누름 동작의 중지에 따른 대기시간(S1_w)을 설정함으로써, 가열 부재(50)에 공급되는 전력 소모가 줄어들고 결과적으로, 배터리 사용시간이 증가되는 이점을 가질 수 있다.

[115]

[116] 이상에서 설명한 본 발명이 전술한 실시예 및 첨부된 도면에 한정되지 않으며, 본 발명의 기술적 사상을 벗어나지 않는 범위 내에서 여러 가지 치환, 변형 및 변경이 가능하다는 것은, 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자에게 있어 명백할 것이다.

NJOY Exhibit 1002.2339

청구범위

[청구항 1] 배터리를 수납하는 배터리 케이스;
상기 배터리와 전기적으로 연결되고, 소스 재료를 무화시키는 열을 발생하는 가열부재를 포함하는 무화기;
상기 배터리 케이스 및 상기 무화기 사이에서 상기 배터리 케이스 및 상기 무화기와 결합되는 몸체 케이스;
상기 몸체 케이스의 내부에 수납되어 상기 배터리 및 상기 가열부재와 전기적으로 연결되고, 상기 배터리로부터 전력을 제공받아 상기 가열 부재 측으로 출력되는 출력 신호를 제어하는 제어부; 및
외부로부터 상기 무화기측으로 통하는 공기 유입구를 개방하거나 차폐하여, 상기 무화기 측으로 유입되는 공기의 양을 조절하는 흡입량 조절부를 포함하는 휴대용 무화 장치.

[청구항 2] 제 1 항에 있어서, 상기 제어부는,
상기 가열 부재의 저항의 크기를 감지하고, 상기 감지된 가열 부재의 저항의 크기에 근거하여 상기 출력 신호를 제어하는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 3] 제 2 항에 있어서, 상기 제어부는,
상기 가열 부재의 저항의 크기가 기 설정 값보다 큰 경우에, 상기 출력 신호의 출력 전압의 크기를 증가시키고,
상기 가열 부재의 저항의 크기가 기 설정 값보다 작은 경우에, 상기 출력 신호의 출력 전압의 크기를 감소시키는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 4] 제 1 항에 있어서, 상기 제어부는 상기 배터리의 전원 전압의 크기를 감지하고, 상기 감지된 전원 전압의 크기에 근거하여 상기 출력 신호를 제어하는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 5] 제 4 항에 있어서,
상기 제어부는 상기 전원 전압의 크기가 기 설정 값보다 작은 경우에, 상기 전원 전압을 승압하고,
상기 전원 전압의 크기가 기 설정 값보다 큰 경우에, 상기 전원 전압을 강하하는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 6] 제 2 항 또는 제 4 항에 있어서, 상기 제어부는,
상기 몸체 케이스의 내부에 수납되어 상기 배터리와 상기 가열부재와 전기적으로 연결되는 인쇄회로기판;
상기 인쇄회로기판 위에 실장되며, 상기 가열 부재의 저항을 측정하는 저항 측정부; 및
상기 인쇄회로기판 위에 실장되며, 상기 전원 전압을 보정하는

NJOY Exhibit 1002.2340

전압 보정 부를 포함하는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 7] 제 6 항에 있어서, 상기 제어부는,
상기 인쇄회로기판 위에 실장되어 상기 몸체 케이스의 외부로 노출되고, 터치 이벤트에 대응하여 입력 신호를 생성하는 스위치;
상기 인쇄회로기판 위에 실장되어 상기 입력 신호에 응답하여 상기 출력 신호를 제어하는 마이컴 소자; 및
상기 인쇄회로기판 위에 실장되어 상기 몸체 케이스에 형성된 개구부를 통해 외부로 노출되고, 상기 전원 전압의 크기, 상기 출력 신호의 전압의 크기, 상기 가열부재의 저항의 크기, 상기 배터리의 충전량, 상기 배터리의 충전량에 따른 경고 표시, 상기 가열부재의 온도, 상기 온도에 따른 경고 표시, 및 동작 모드 중 적어도 하나를 표시하는 디스플레이부를 더 포함하는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 8] 제 7 항에 있어서, 상기 동작 모드는 상기 입력 신호에 따라 제1 동작 모드 또는 제2 동작 모드로 구분되고,
상기 제1 동작 모드에서 상기 전원 전압의 크기 또는 상기 가열 부재의 저항의 크기에 근거하여 상기 출력 신호가 제어되고,
상기 제2 동작 모드에서 상기 마이컴 소자는 상기 입력 신호에 응답하여 상기 출력 신호를 제어하는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 9] 제 7 항에 있어서, 상기 저항 측정부 및 상기 전압 보정부는 상기 마이컴 소자에 내장된 것을 특징으로 하는 휴대용 무화 장치.

[청구항 10] 제 6 항에 있어서, 상기 몸체 케이스는 상기 무화기와 결합되는 부위에 배치되어 상기 출력 신호가 전달되는 출력 단자를 포함하고,
상기 인쇄회로기판은,
상기 배터리 케이스에 인접하는 일 측부 위에 형성되어 상기 배터리의 단자와 전기적으로 연결되는 제1 도전층; 및
상기 무화기에 인접하는 타 측부 위에 형성되어 상기 출력 단자와 전기적으로 연결되는 제2 도전층을 포함하는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 11] 제 10 항에 있어서, 상기 제1 도전층은 상기 배터리의 단자와 직접적으로 접촉되고, 상기 제2 도전층은 상기 출력 단자와 직접적으로 접촉되는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 12] 제 10 항에 있어서,
도전성 및 탄성을 갖고, 상기 출력 단자 및 상기 제2 도전층 사이에 개재되어 상기 출력 단자를 상기 제2 도전층에 전기적으로 연결시키는 탄성부재를 더 포함하고,

NJOY Exhibit 1002.2341

상기 제1 도전층은 상기 배터리 단자와 직접적으로 접촉되고, 상기 탄성부재는 상기 출력 단자 및 상기 제2 도전층과 직접적으로 접촉되는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 13] 제 1 항에 있어서, 상기 몸체 케이스는,
일 단부로부터 연장되어 상기 무화기와 결합되고, 측벽에 상기 공기 유입구가 형성된 결합부를 포함하고,
상기 흡입량 조절부는 상기 결합부의 길이 방향으로 이동하여 상기 공기 유입구를 개방시키거나 차폐하는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 14] 제 1 항에 있어서, 상기 소스 재료는 전자 담배용 액상 재료인 것을 특징으로 하는 휴대용 무화 장치.

[청구항 15] 소스 재료를 가열시키는 가열 부재를 갖는 무화기 및 배터리를 수납하는 배터리 케이스를 포함하는 휴대용 무화 장치의 무화 제어 유닛에 있어서,
일 측에서 상기 배터리 케이스와 결합되고, 타 측에서 상기 무화기와 결합되는 몸체 케이스;
상기 몸체 케이스의 내부에 수납되어 상기 배터리 및 상기 가열부재와 전기적으로 연결되고, 상기 배터리로부터 전원 전압을 제공받아 상기 가열부재 측으로 출력되는 출력 신호를 제어하는 제어부; 및
외부로부터 상기 무화기 측으로 통하는 공기 유입구를 개방하거나 차폐하여, 상기 무화기 측으로 유입되는 공기의 양을 조절하는 흡입량 조절부를 포함하는 무화 제어 유닛.

[청구항 16] 제 15 항에 있어서, 상기 제어부는,
상기 가열 부재의 저항의 크기를 감지하고, 상기 감지된 가열 부재의 저항의 크기에 근거하여 상기 출력 신호를 제어하는 것을 특징으로 하는 무화 제어 유닛.

[청구항 17] 제 15 항에 있어서, 상기 제어부는 상기 전원 전압의 크기를 감지하고, 상기 감지된 전원 전압의 크기에 근거하여 상기 출력 신호를 제어하는 것을 특징으로 하는 무화 제어 유닛.

[청구항 18] 제 16 항 또는 제 17 항에 있어서, 상기 제어부는,
상기 몸체 케이스의 내부에 수납되어 상기 배터리와 상기 가열부재와 전기적으로 연결되는 인쇄회로기판;
상기 인쇄회로기판 위에 실장되며, 상기 가열 부재의 저항을 측정하는 저항 측정부; 및
상기 인쇄회로기판 위에 실장되며, 상기 전원 전압을 보정하는 전압 보정 부를 포함하는 것을 특징으로 하는 무화 제어 유닛.

[청구항 19] 제 18 항에 있어서, 상기 제어부는,

NJOY Exhibit 1002.2342

상기 인쇄회로기판 위에 실장되어 상기 몸체 케이스의 외부로 노출되고, 터치 이벤트에 대응하여 입력 신호를 생성하는 스위치;
상기 인쇄회로기판 위에 실장되어 상기 입력 신호에 응답하여 상기 출력 신호를 제어하는 마이컴 소자; 및
상기 인쇄회로기판 위에 실장되어 상기 몸체 케이스에 형성된 개구부를 통해 외부로 노출되고, 상기 전원 전압의 크기, 상기 출력 신호의 전압의 크기, 상기 가열부재의 저항의 크기, 상기 배터리의 충전량, 상기 충전량에 따른 경고 표시, 상기 가열부재의 온도, 상기 온도에 따른 경고 표시, 및 동작 모드 중 적어도 하나를 표시하는 디스플레이부를 더 포함하는 것을 특징으로 하는 무화 제어 유닛.

[청구항 20] 제 19 항에 있어서, 상기 동작 모드는 상기 입력 신호에 따라 제1 동작 모드 또는 제2 동작 모드로 구분되고,
상기 제1 동작 모드에서 상기 전원 전압의 크기 또는 상기 가열 부재의 저항의 크기에 근거하여 상기 출력 신호가 제어되고,
상기 제2 동작 모드에서 상기 마이컴 소자는 상기 입력 신호에 응답하여 상기 출력 신호를 제어하는 것을 특징으로 하는 무화 제어 유닛.

[청구항 21] 제 18 항에 있어서, 상기 인쇄회로기판은,
상기 배터리 케이스에 인접하는 일 측부 위에 형성되어 상기 배터리의 단자와 전기적으로 연결되는 제1 도전층; 및
상기 무화기에 인접하는 타 측부 위에 형성되어 상기 무화기와 전기적으로 연결되는 제2 도전층을 포함하는 것을 특징으로 하는 무화 제어 유닛.

[청구항 22] 제 18 항에 있어서, 상기 저항 측정부 및 상기 전압 보정부는 상기 마이컴 소자에 내장된 것을 특징으로 하는 무화 제어 유닛.

[청구항 23] 제 15 항에 있어서, 상기 몸체 케이스는,
일 단부로부터 연장되고, 측벽에 상기 공기 유입구가 형성되어 상기 무화기와 결합되는 결합부를 포함하고,
상기 흡입량 조절부는 상기 결합부의 길이 방향으로 이동하여 상기 공기 유입구를 개방시키거나 차폐하는 것을 특징으로 하는 무화 제어 유닛.

[청구항 24] 배터리와 전기적으로 연결되고, 소스 재료를 무화시키는 열을 발생하는 가열 부재를 포함하는 무화기; 및
사용자의 지속적인 누름 동작을 인식할 수 있는 감지 부재를 포함하며, 상기 감지 부재의 누름 동작이 지속되는 동안 제 1 전압 레벨을 갖는 가열 동작 구간과 상기 제 1 전압 레벨보다 작은 제 2 전압 레벨을 갖는 가열 휴지 구간이 적어도 1회 이상 교번하는

출력 신호를 상기 가열 부재로 출력하는 제어부를 포함하는 휴대용 무화 장치.

[청구항 25] 제 24 항에 있어서,
상기 감지 부재는, 버튼식 또는 터치식인 것을 특징으로 하는 휴대용 무화 장치.

[청구항 26] 제 24 항에 있어서, 상기 제어부는,
상기 가열 부재의 저항 측정값으로부터 상기 제 1 전압 레벨을 정의하는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 27] 제 24 항에 있어서, 상기 제어부는,
상기 제 2 전압 레벨은 0 V인 것을 특징으로 하는 휴대용 무화 장치.

[청구항 28] 제 24 항에 있어서,
상기 가열 동작 구간은 상기 가열 휴지 기간보다 더 긴 것을 특징으로 하는 휴대용 무화 장치.

[청구항 29] 제 24 항에 있어서,
상기 가열 동작 구간은 0.1 초 내지 20 초 범위 내의 지속 시간을 가지며, 상기 가열 휴지 구간은 0.05 초 내지 5 초 범위 내의 지속 시간을 갖는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 30] 제 24 항에 있어서,
상기 사용자의 지속적인 누름 동작의 시작 시점으로부터 일정 시간 동안 상기 출력 신호가 턴 온되지 않는 가열 대기 구간을 갖는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 31] 제 30 항에 있어서,
상기 가열 대기 구간은 0.01 초 내지 1 초 범위 내의 지속 시간을 갖는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 32] 제 24 항에 있어서,
상기 가열 동작 구간과 상기 가열 휴지 구간 중 어느 하나 또는 이들 모두를 설정하기 위한 사용자 설정 인터페이스를 표시하는 디스플레이부를 더 포함하며,
상기 제어부는 상기 감지 부재를 사용자 입력 인터페이스로 사용하여 상기 사용자의 누름 동작에 따라 상기 가열 동작 구간 및 상기 가열 휴지 구간의 값을 조절하는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 33] 제 24 항에 있어서,
상기 출력 신호는 미리 설정된 최대 동작 시간 내로 출력이 제한되는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 34] 제 33 항에 있어서,
상기 최대 동작 시간은 0.15 초 내지 25 초 범위 내인 것을 특징으로

NJOY Exhibit 1002.2344

하는 휴대용 무화 장치.

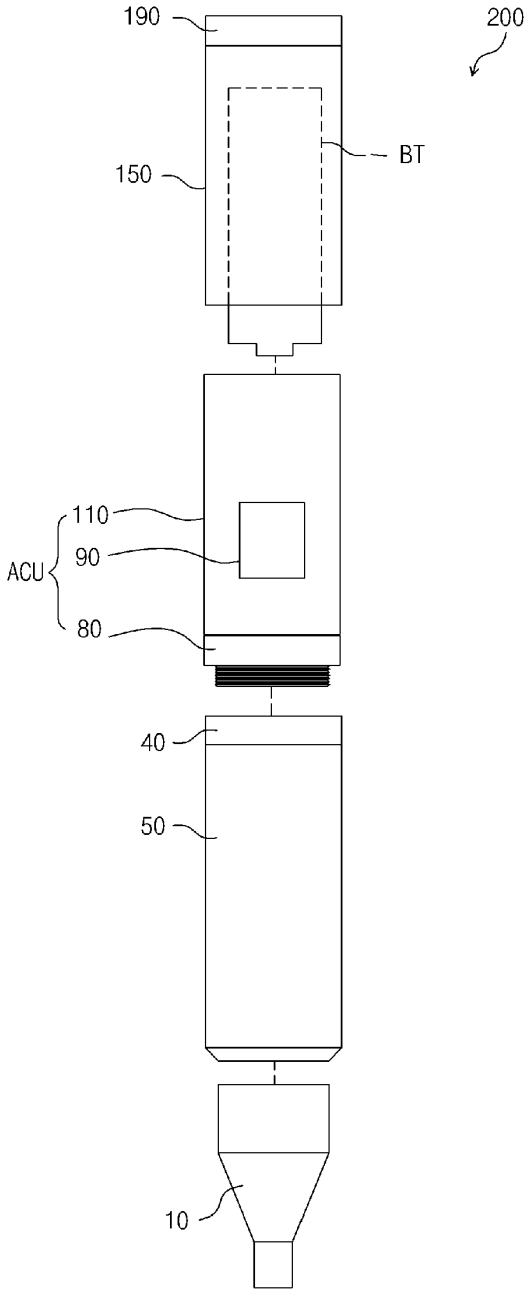
[청구항 35] 제 24 항에 있어서,
상기 배터리를 수납하는 배터리 케이스;
상기 배터리 케이스 및 상기 무화기 사이에서 상기 배터리 케이스 및 상기 무화기와 결합되는 몸체 케이스; 및
외부로부터 상기 무화기 측으로 통하는 공기 유입구를 개방하거나 차폐하여, 상기 무화기 측으로 유입되는 공기의 양을 조절하는 흡입량 조절부를 더 포함하는 것을 특징으로 하는 휴대용 무화 장치.

[청구항 36] 제 24 항에 있어서,
상기 휴대용 무화 장치는, 전자 담배, 향기 발생기, 향기 치료기, 살균기, 살충기 및 호흡기 치료기 중 어느 하나인 것을 특징으로 하는 휴대용 무화 장치.

[청구항 37] 배터리와 전기적으로 연결되고, 소스 재료를 가열시키는 가열 부재를 갖는 무화기를 포함하는 휴대용 무화 장치의 무화 제어 유닛에 있어서,
사용자의 지속적인 누름 동작을 인식할 수 있는 감지 부재를 포함하며, 상기 감지 부재의 누름 동작이 지속되는 동안 제 1 전압 레벨을 갖는 가열 동작 구간과 상기 제 1 전압 레벨보다 작은 제 2 전압 레벨을 갖는 가열 휴지 구간이 적어도 1회 이상 교번하는 출력 신호를 상기 가열 부재로 출력하는 제어부를 포함하는 무화 제어 유닛.

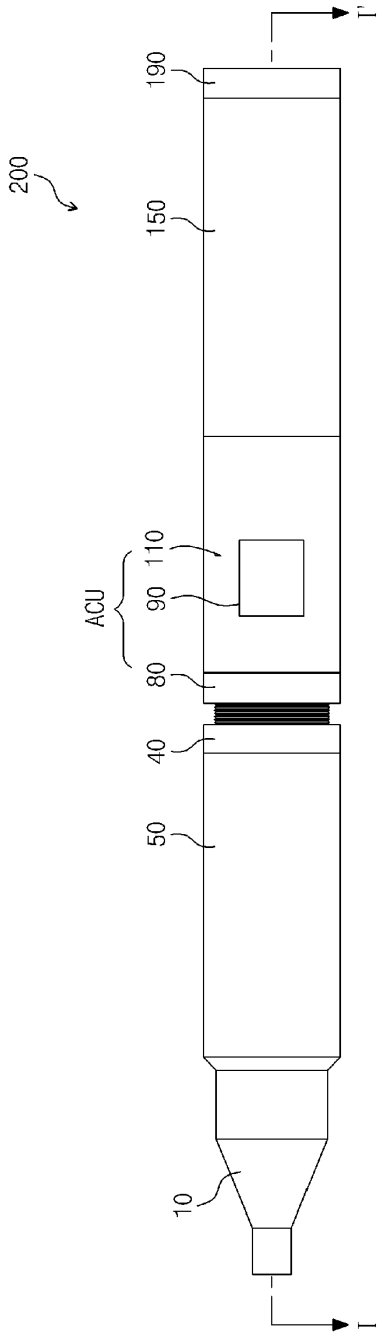
NJOY Exhibit 1002.2345

[Fig. 1a]



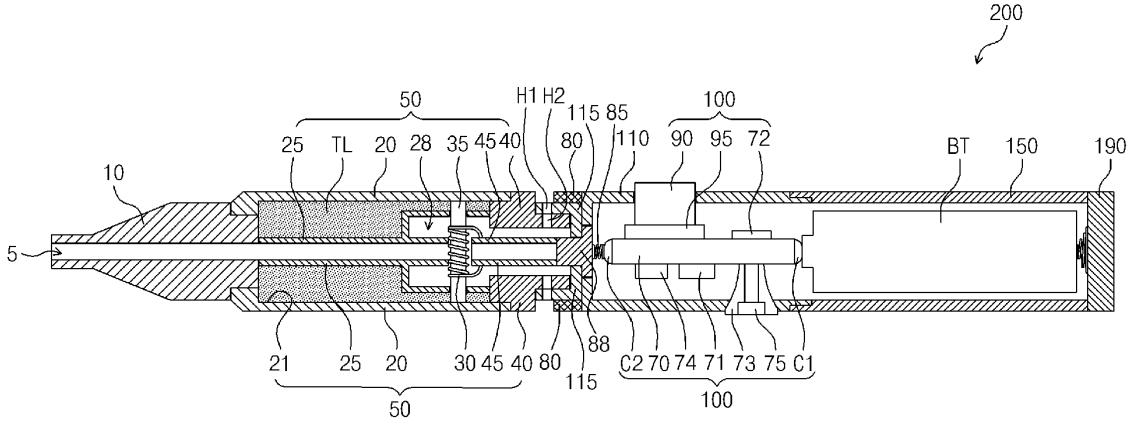
NJOY Exhibit 1002.2346

[Fig. 1b]

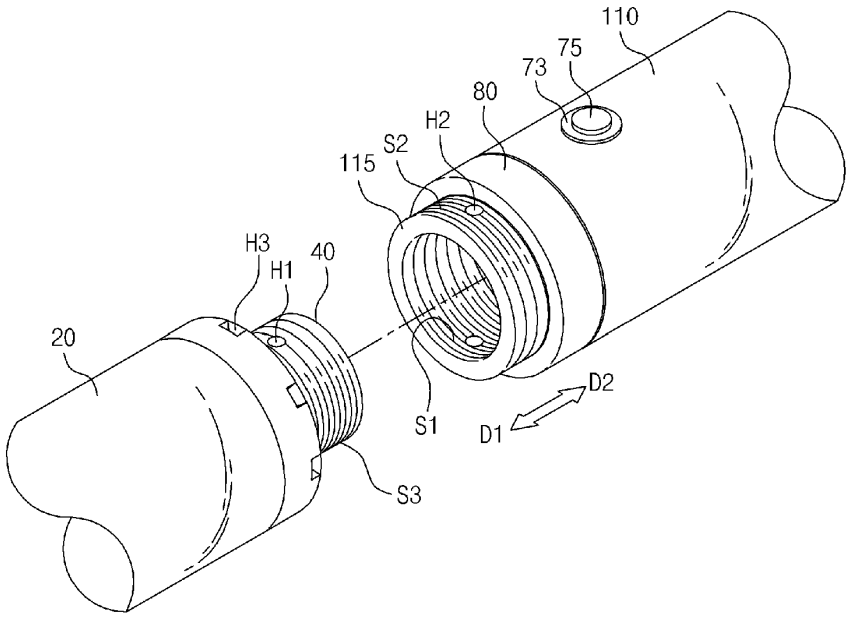


NJOY Exhibit 1002.2347

[Fig. 2a]

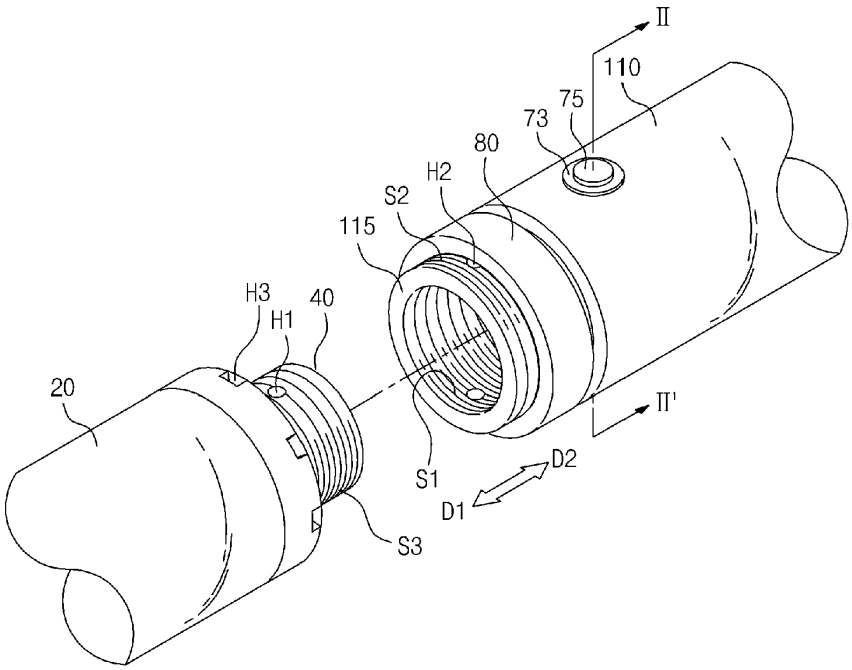


[Fig. 2b]

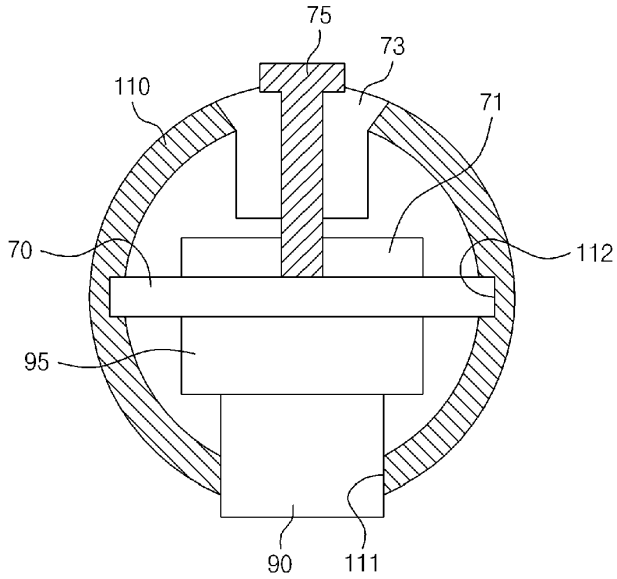


NJOY Exhibit 1002.2348

[Fig. 2c]

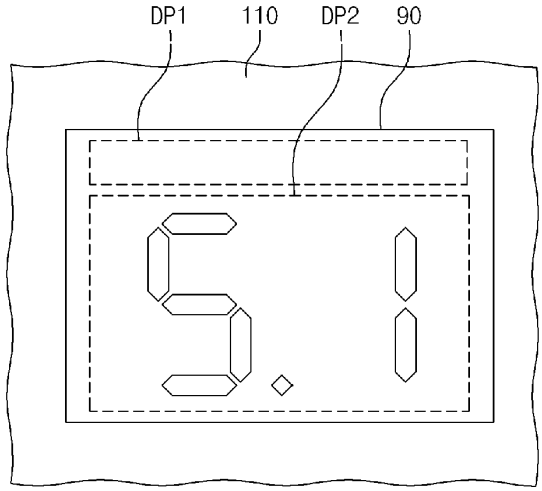


[Fig. 3]

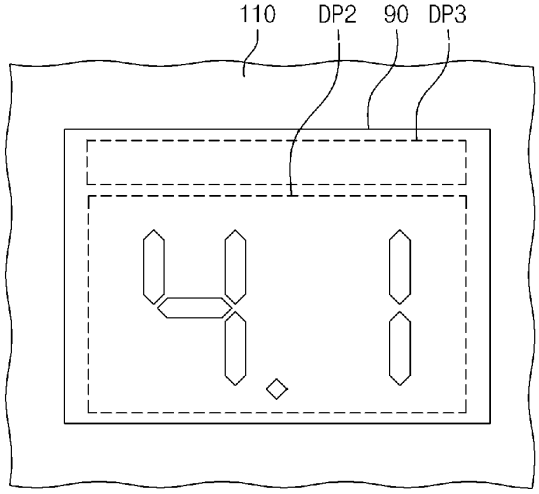


NJOY Exhibit 1002.2349

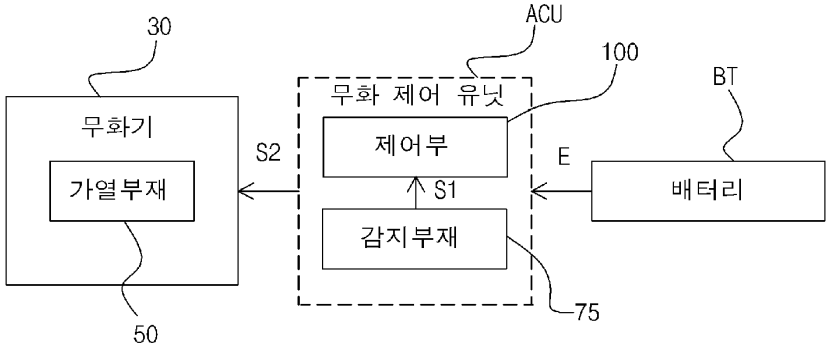
[Fig. 4a]



[Fig. 4b]

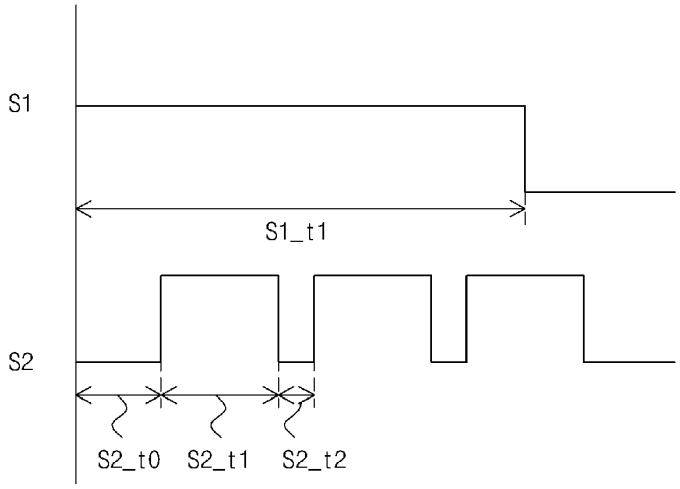


[Fig. 5]

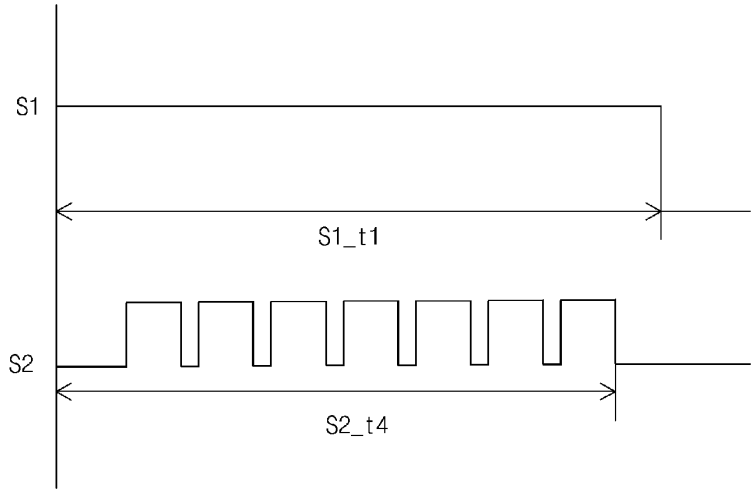


NJOY Exhibit 1002.2350

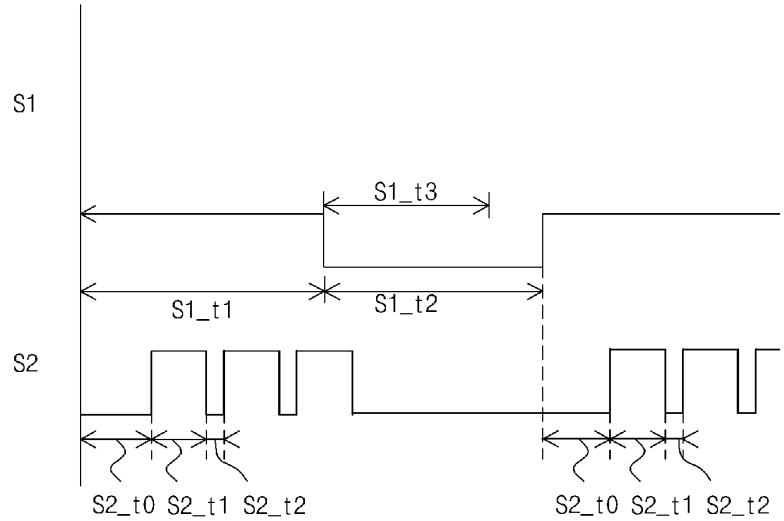
[Fig. 6]



[Fig. 7]



[Fig. 8]



NJOY Exhibit 1002.2351

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2013/002497

A. CLASSIFICATION OF SUBJECT MATTER

A24F 47/00(2006.01)i, A61M 15/06(2006.01)i, G09F 9/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24F 47/00; A61M 15/06; A24D 1/14; G09F 9/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & Keywords: cigarette, smoking, nicotine, induction, suction, intake, atomization, evaporation, adjustment, control, control, air, voltage, electric power, pulse, sensor

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 20-2011-0006928 U (NAM, Dong Hwan) 07 July 2011 See abstract, claims 1-5, paragraphs 0018-0031 and figures 1-3.	1-5,13-17,24-37
A	KR 20-2011-0006928 U (NAM, Dong Hwan) 07 July 2011 See abstract, claims 1-5, paragraphs 0018-0031 and figures 1-3.	6-12,18-23
Y	JP 2011-024430 A (TAGOMORI, Minoru) 10 February 2011 See abstract, claims 1-3, paragraphs 0007-0014 and figures 1, 2.	1-5,13-17,24-37
A	JP 2011-024430 A (TAGOMORI, Minoru) 10 February 2011 See abstract, claims 1-3, paragraphs 0007-0014 and figures 1, 2.	6-12,18-23
Y	KR 10-2010-0097807 A (DNC ENGINEERING CO., LTD.) 06 September 2010 See abstract, claims 1-10, paragraphs 0033-0048 and figure 2.	24-37
A	KR 10-2010-0097807 A (DNC ENGINEERING CO., LTD.) 06 September 2010 See abstract, claims 1-10, paragraphs 0033-0048 and figure 2.	1-23

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published 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
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 JULY 2013 (02.07.2013)	**02 JULY 2013 (02.07.2013)**

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701,
Republic of Korea

Authorized officer

NJOY Exhibit 1002.2352

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2013/002497

Patent document cited in search report	Publication date	Patent family member	Publication date
KR 20-2011-0006928 U	07.07.2011	NONE	
JP 2011-024430 A	10.02.2011	NONE	
KR 10-2010-0097807 A	06.09.2010	NONE	

NJOY Exhibit 1002.2353

국 제 조 사 보 고 서

국제출원번호
PCT/KR2013/002497

A. 발명이 속하는 기술분류(국제특허분류(IPC))

A24F 47/00(2006.01)i, A61M 15/06(2006.01)i, G09F 9/00(2006.01)i

B. 조사된 분야

조사된 최소문헌(국제특허분류를 기재)

A24F 47/00; A61M 15/06; A24D 1/14; G09F 9/00

조사된 기술분야에 속하는 최소문헌 이외의 문헌

한국등록실용신안공보 및 한국공개실용신안공보: 조사된 최소문헌란에 기재된 IPC
일본등록실용신안공보 및 일본공개실용신안공보: 조사된 최소문헌란에 기재된 IPC

국제조사에 이용된 전산 데이터베이스(데이터베이스의 명칭 및 검색어(해당하는 경우))

eKOMPASS(특허청 내부 검색시스템) & 키워드: 담배,흡연,니코틴,흡입,흡인,흡기,무화,기화,조절,컨트롤,제어,공기,전압,전력,펄스,센서

C. 관련 문헌

카테고리*	인용문헌명 및 관련 구절(해당하는 경우)의 기재	관련 청구항
Y	KR 20-2011-0006928 U (남동환) 2011.07.07 요약, 청구항 1-5, 단락 0018-0031 및 도면 1-3 참조.	1-5,13-17,24-37
A	KR 20-2011-0006928 U (남동환) 2011.07.07 요약, 청구항 1-5, 단락 0018-0031 및 도면 1-3 참조.	6-12,18-23
Y	JP 2011-024430 A (TAGOMORI MINORU) 2011.02.10 요약, 청구항 1-3, 단락 0007-0014 및 도면 1, 2 참조.	1-5,13-17,24-37
A	JP 2011-024430 A (TAGOMORI MINORU) 2011.02.10 요약, 청구항 1-3, 단락 0007-0014 및 도면 1, 2 참조.	6-12,18-23
Y	KR 10-2010-0097807 A (디엔씨엔지니어링 주식회사) 2010.09.06 요약, 청구항 1-10, 단락 0033-0048 및 도면 2 참조.	24-37
A	KR 10-2010-0097807 A (디엔씨엔지니어링 주식회사) 2010.09.06 요약, 청구항 1-10, 단락 0033-0048 및 도면 2 참조.	1-23

☐ 추가 문헌이 C(계속)에 기재되어 있습니다.

☒ 대응특허에 관한 별지를 참조하십시오.

* 인용된 문헌의 특별 카테고리:

"A" 특별히 관련이 없는 것으로 보이는 일반적인 기술수준을 정의한 문헌

"E" 국제출원일보다 빠른 출원일 또는 우선일을 가지나 국제출원일 이후에 공개된 선출원 또는 특허 문헌

"L" 우선권 주장에 의문을 제기하는 문헌 또는 다른 인용문헌의 공개일 또는 다른 특별한 이유(이유를 명시)를 밝히기 위하여 인용된 문헌

"O" 구두 개시, 사용, 전시 또는 기타 수단을 언급하고 있는 문헌

"P" 우선일 이후에 공개되었으나 국제출원일 이전에 공개된 문헌

"T" 국제출원일 또는 우선일 후에 공개된 문헌으로, 출원과 상충하지 않으며 발명의 기초가 되는 원리나 이론을 이해하기 위해 인용된 문헌

"X" 특별한 관련이 있는 문헌. 해당 문헌 하나만으로 청구된 발명의 신규성 또는 진보성이 없는 것으로 본다.

"Y" 특별한 관련이 있는 문헌. 해당 문헌이 하나 이상의 다른 문헌과 조합하는 경우로 그 조합이 당업자에게 자명한 경우 청구된 발명은 진보성이 없는 것으로 본다.

"&" 동일한 대응특허문헌에 속하는 문헌

국제조사의 실제 완료일	국제조사보고서 발송일
2013년 07월 02일 (02.07.2013)	2013년 07월 02일 (02.07.2013)

ISA/KR의 명칭 및 우편주소

대한민국 특허청
(302-701) 대전광역시 서구 청사로 189,
4동 (둔산동, 정부대전청사)

심사관

장낙용

전화번호 82-42-481-8151

NJOY Exhibit 1002.2354

국 제 조 사 보 고 서
대응특허에 관한 정보

국제출원번호
PCT/KR2013/002497

국제조사보고서에서 인용된 특허문헌	공개일	대응특허문헌	공개일
KR 20-2011-0006928 U	2011.07.07	없음	
JP 2011-024430 A	2011.02.10	없음	
KR 10-2010-0097807 A	2010.09.06	없음	

NJOY Exhibit 1002.2355

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 October 2013 (24.10.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/155645 A1

(51) International Patent Classification:
A24F 47/00 (2006.01)

(21) International Application Number:
PCT/CN2012/000530

(22) International Filing Date:
18 April 2012 (18.04.2012)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **RUYAN INVESTMENT(HOLDINGS) LIMITED** [GB/GB]; Beaufort House, P.O. Box 438, Road Town, Tortola (VG).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **HON, Lik** [CN/CN]; Room 1101, 11/F, China United Centre, 28 Marble Road, North Point, Hong Kong (CN).

(74) Agent: **BEIJING JANLEA PATENT AGENCY CO.,LTD.**; 15th Floor, Tower A, Wuhua Mansion, A4 Chegongzhuang Avenue, Xicheng District, Beijing 100044 (CN).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: ELECTRONIC CIGARETTE

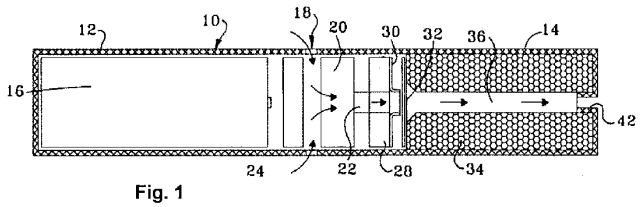


Fig. 1

(57) **Abstract**: an electronic cigarette, a mesh element (32) is in contact with liquid storage (34). A heater (40) is spaced apart from the mesh element (32) and positioned to heat air which flows through the mesh element (34). The heated air vaporizes the liquid in or on the mesh element (34). The vapor is inhaled by the user. A method of vaporizing a liquid in an electronic cigarette includes conducting liquid from a liquid storage (34) to a mesh element (32). Electric current is supplied to a heater (40), optionally in response to sensing inhalation on the outlet or mouthpiece of the electronic cigarette. The heater (40) heats air and the heated air is conducted through the mesh element (32), with the heated air vaporizing liquid on or in the mesh element (32). The vaporized liquid is entrained with the heated air and may then flow through or around the liquid storage to the mouthpiece.

WO 2013/155645 A1

NJOY Exhibit 1002.2356

ELECTRONIC CIGARETTE

BACKGROUND

[0001] Electronic cigarettes are increasingly used by smokers as a substitute for real tobacco cigarettes. In general, electronic cigarettes use a wire coil heater to vaporize liquid nicotine, or other liquid substances. The user's inhalation on a mouthpiece may be detected by a sensor, causing an electronic circuit to supply electrical current from a battery to the heater. The liquid contacts the wire coil heater, which creates the vapor or mist. The user's inhalation typically also draws ambient air into one or more inlets in the electronic cigarette housing. The vapor is entrained in the air flow moving through the housing and is inhaled by the user.

[0002] Electronic cigarettes have many advantages over real tobacco cigarettes. Initially, the risks of lung cancer associated with real tobacco cigarettes is largely avoided, as the tar and other chemicals in tobacco linked to lung cancer are simply not present in an electronic cigarette. Electronic cigarettes generate vapor or mist, and not smoke. Consequently, there is no comparable second-hand smoke problem with use of electronic cigarettes. In addition, since there is no burning material in electronic cigarettes, the risk of fire is eliminated.

[0003] Many electronic cigarette designs have been proposed and used, with varying degrees of success. Existing designs though have various disadvantages, including short life, poor atomization, nonuniform vapor caused by different sizes of liquid drops, and overheated vapor. Accordingly, there is a need for an improved electronic cigarette.

SUMMARY OF THE INVENTION

[0004] A new electronic cigarette has now been invented that provides significant improvements over existing designs. In this new electronic cigarette, a mesh element is in contact with liquid storage. A heater is spaced apart from the mesh element and positioned to heat air which flows through the mesh element. The heated air vaporizes the liquid in or on the mesh. The vapor is inhaled by the user.

NJOY Exhibit 1002.2357

[0005] In another aspect, the heater may be positioned within a heater housing having an air passageway aligned with a central opening extending through the liquid storage. Alternatively, an annular flow path around the outside of the liquid storage may be used.

[0006] The present electronic cigarette may include a battery in the housing electrically connected to a flow sensor, a circuit board and the heater. A flow path through the housing may be formed via one or more inlets in the housing, a passageway containing the heater, and a central opening extending through the liquid storage to an outlet.

[0007] In a separate aspect, a method of vaporizing a liquid in an electronic cigarette includes conducting liquid from a liquid storage to a mesh element. Electric current is supplied to a heater, optionally in response to sensing inhalation on the outlet or mouthpiece of the electronic cigarette. The heater heats air and the heated air is conducted through the mesh element, with the heated air vaporizing liquid on or in the mesh element. The vaporized liquid is entrained with the heated air and may then flow through or around the liquid storage to the mouthpiece.

[0008] Other and further objects and advantages will become apparent from the following detailed description which is provide by way of example, and is not intended as a statement of the limits of the invention. The invention resides as well in sub-combinations of the elements and steps described.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] In the drawings, the same reference number indicates the same element in each of the views.

[0010] Fig. 1 is a section view of an electronic cigarette.

[0011] Fig. 2 is an enlarged detail view of components of the electronic cigarette shown in Fig. 1.

[0012] Fig. 3 is a schematic section view of an alternative embodiment.

[0013] Fig. 4 is a perspective view of a component of the design shown in Fig. 3.

NJOY Exhibit 1002.2358

DETAILED DESCRIPTION

[0014] Turning now in detail to the drawings, as shown in Figs. 1 and 2, and electronic cigarette has a housing 10 which optionally may be provided with a front section 12 attached to a back section 14 via screw threads or other attachment. A battery 16 and a circuit board 24 may be contained within the front section, with the circuit board electrically connected to a flow sensor 20 and to a heater coil 40, as further described in U.S. Patent Application No. 13/208,257, incorporated herein by reference. A liquid storage 34 is contained within the back section 14 of the housing 10. The liquid storage 34 may be a fiber material, provided loose in bulk directly into the back section 14 of the housing, or it may be provided in or as part of a separate component or cartridge. The liquid storage may contain liquid nicotine, or another liquid for vaporization and inhalation. Other materials such as foam or porous metals or ceramics may optionally be used as the liquid storage 34.

[0015] The heater coil 40 may be positioned within a passageway 38 extending through a heater support 28. The heater housing, for example, a ceramic material, is fixed in place within the housing. An optional collector 30 may be attached to the back end of the heater support 28, with the passageway also extending centrally through the collector 30. The collector 30, if used, may be made of Silastic® silicone elastomers, or other high temperature inert silicon elastomers or plastic materials.

[0016] A mesh element or screen 32 on the front end of the liquid storage 34 is spaced slightly apart from the back end of the collector 30, by a dimension BB ranging from about 0.5 to 2 or 4 mm, and typically about 1 mm. The mesh 32 may be fiberglass, or other porous material, which the liquid in the liquid storage, such as liquid nicotine, can wick onto or through. The mesh 32 may have a thickness or dimension AA in Fig. 2 ranging from about 0.1 to 2 mm, 0.2 to 1mm, or 0.3 to 0.6 mm, with a 4 mm thickness typical.

[0017] An opening 36 extends from the mesh 32 centrally through the liquid storage 34 to an outlet 42 at the back end of the housing 10. A flow path may be formed through the housing 10 via one or more inlets 18, a through opening in the sensor 20, the flow tube 22, the passageway 38 and the opening 36 leading to the

NJOY Exhibit 1002.2359

outlet 42. Except as specified, the positions of the elements shown in the drawings is not critical, and the elements may be rearranged as needed or desired.

[0018] Referring still to Figs. 1 and 2, in an example of use, the user inhales on the outlet 42. The sensor 20 detects the inhalation and supplies electrical current to the heater coil 40. Air is drawn into the flow path in the housing through the inlets 18. The flowing air passes through the passageway 38 and is heated by the heater coil 40. The amount of heating may vary by design. Air temperatures of 200 to 300 °C at the exit of the passageway, as one example, may be used by adjusting the power of the heater and the air flow characteristics through or past the heater. The collector 30, if used, may help to collect and direct the heated air to the mesh 32. The collector 30 may also be used to space the heater coil 40 and the heater support 28 apart from the mesh 32. The collector may optionally be made part of the heater support 28.

[0019] The mesh 32 is provided as a thin sheet or layer, and has a sufficiently open structure, so that the heated air can pass through without excessive flow resistance. The mesh 32 may be a sheet or layer of loose fiberglass, fiberglass fabric or similar material that can wick and hold liquid on the surface of the fibers, and/or in the gaps between the fibers, and also allow air to flow through. A heat resistant foam material may alternatively be used in place of the mesh.

[0020] The heated air flows through the mesh 32. This heats liquid in or on the mesh, which atomizes or vaporizes the liquid. The vapor is entrained in the heated air, which continues flowing from the mesh 32 through the opening 36 and the outlet 42, with the mixture of air and vapor inhaled by the user. The heated air may cool considerably as it passes through the mesh 32 and the opening 36, so that the user inhales air from the outlet at a comfortable temperature of e.g., 25 to 50 °C.

[0021] Figs. 3 and 4 show an alternative design having a similar operation, but with the airflow path extending around the outside of a liquid storage element 54, rather than through the liquid storage, as in Figs. 1 and 2. In the alternative design of Figs. 3 and 4, the liquid storage is surrounded by an annular passage 56, leading from a woven or mesh tube 52 to the outlet 42. As also shown in Figs. 3 and 4, the mesh tube 52 has a plate section 62 in contact with the liquid storage. A neck section 64 of the mesh tube 52 extends from the plate section 62 towards the heater

NJOY Exhibit 1002.2360

28. Liquid in the liquid storage 54 wicks through the plate section and into the neck section 64. Heated air diffusing radially outwardly through the neck section vaporizes the liquid creating a mist or vapor, which is drawn through the flow path 56 and inhaled by the user. The woven tube 62 may be produced by twill weave, and then cut with a hot blade, to prevent unraveling of cut end. Of course, the thin flat mesh component 32 shown in Fig. 2 may also be used in an embodiment having the annular passage 56 as shown in Fig. 3.

[0022] In the designs described above the liquid does not come into direct contact with the heater coil. This avoids the loss of heating efficiency resulting from deposits and liquid residue collecting on the heater coil 40. It also allows for longer heater coil life, as thermal shock to heater coil, and corrosion are reduced. Vaporization is also improved because the liquid is vaporized at lower temperatures. The heater coil itself may operate at temperatures in the range of 500 °C. This can cause chemical changes in the liquid as it is vaporized. By avoiding contact between the heater coil and the liquid, and by vaporizing the liquid using heated air, chemical changes occurring during vaporization may be reduced.

[0023] In addition, since the heater coil 40 does not come into contact with the liquid, the heater coil may be plated with corrosion resistant materials, such as silver or nickel-chromium. Use of these types of materials, which would be degraded if contacted by the liquid, prolongs the life of the heater coil. Since the life of the heater coil can be much longer, the heater coil can be made as a reusable component, rather than be a disposable item as is common with existing designs. This allows for reduced costs.

[0024] With existing known electronic cigarettes, the heating device or coil must heat the nicotine liquid first, before the liquid can be vaporized. The present electronic cigarettes omit this initial step, as the heater coil 40 heats air, and not liquid. Consequently, the new designs described here also achieve faster vaporization in comparison to known designs.

[0025] Thus, novel designs have been shown and described. Various changes and substitutions may of course be made without departing from the spirit and scope of the invention. The invention, therefore, should not be limited, except by the following claims and their equivalents.

NJOY Exhibit 1002.2361

CLAIMS

1. An electronic cigarette comprising:

a housing;

liquid storage within the housing;

a mesh element in contact with the liquid storage; and

a heater spaced apart from the mesh element and positioned to heat air which flows through the mesh element.

2. The electronic cigarette of claim 1 with the heater within a heater support having an air passageway aligned with a central opening extending through the liquid storage.

3. The electronic cigarette of claim 2 further including a collector on the heater support, with the collector spaced apart from the mesh element by less than 4 mm.

4. The electronic cigarette of claim 2 with the heater support having tubular front end contacting the mesh element.

5. The electronic cigarette of claim 4 further comprising an annular flow path around the outside of the liquid storage.

6. The electronic cigarette of claim 1 with the mesh element comprising a fiber material having a thickness less than 2 mm.

7. The electronic cigarette of claim 1 further comprising a battery in the housing electrically connected to a flow sensor, a circuit board and the heater coil.

8. The electronic cigarette of claim 1 further comprising a flow path through the housing including one or inlets in the housing, a passageway containing the heater, and a central opening extending through the liquid storage to an outlet.

9. An electronic cigarette comprising:

a housing;

NJOY Exhibit 1002.2362

a battery electrically connected to a flow sensor and an electronic circuit in the housing;

a liquid storage section within the housing;

a mesh screen in contact with a front end of the liquid storage section;

a heater coil on a heater support spaced apart from the mesh screen, with the heater coil electrically connected to the electronic circuit; and

an air flow path in the housing including a passageway in the heater support and a central opening extending through the liquid storage section to an outlet.

10. The electronic cigarette of claim 9 with the air flow path further comprising one or inlets in the housing and an opening in the flow sensor.

11. A method of vaporizing a liquid in an electronic cigarette, comprising:

conducting liquid from a liquid storage to a mesh element;

sensing inhalation;

providing electric current to a heater in response to sensing inhalation;

heating air via the heater;

conducting the heated air through the mesh element, with the heated air vaporizing liquid on or in the mesh element.

12. The method of claim 11 further comprising entraining the vaporized liquid into the heated air to form a mixture of vaporized liquid and heated air, and flowing the mixture through a central opening in the liquid storage to an outlet.

13. The method of claim 12 further including positioning the heater within a passageway in a heater housing, and drawing ambient air into the housing via an inlet in the housing, with the air passing through the passageway.

14. The method of claim 12 further including a passageway in the heater

NJOY Exhibit 1002.2363

support, with the central opening in the liquid storage having a length at least five times greater than the length of the passageway in the heater support.

15. The method of claim 11 with the air heated to 200 to 300 °C as it is conducted through the mesh element.

16. The method of claim 11 further comprising conducting the heated air through an annular passage surrounding the liquid storage, after the heated air passes through the mesh element.

17. The electronic cigarette of claim 9 with the liquid storage section including a separate component or cartridge containing a liquid.

NJOY Exhibit 1002.2364

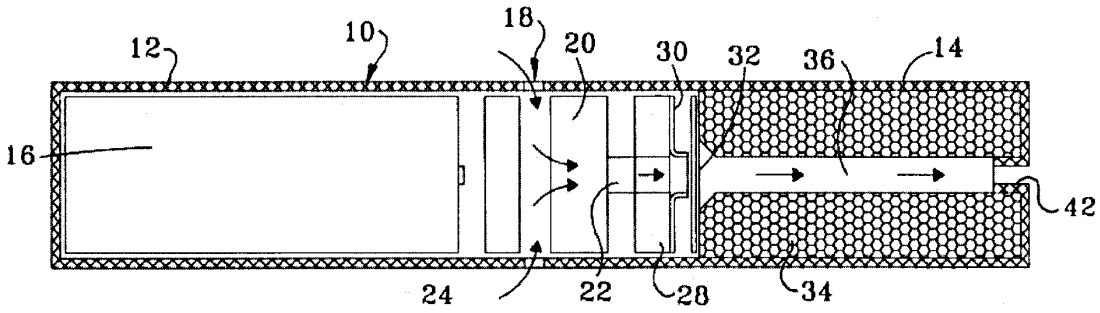


Fig. 1

NJOY Exhibit 1002.2365

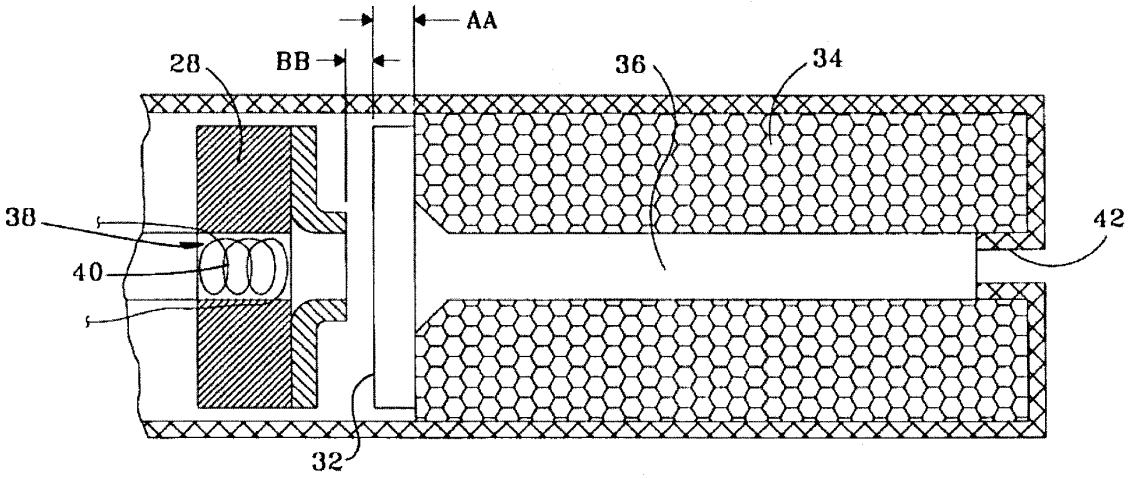


Fig. 2

NJOY Exhibit 1002.2366

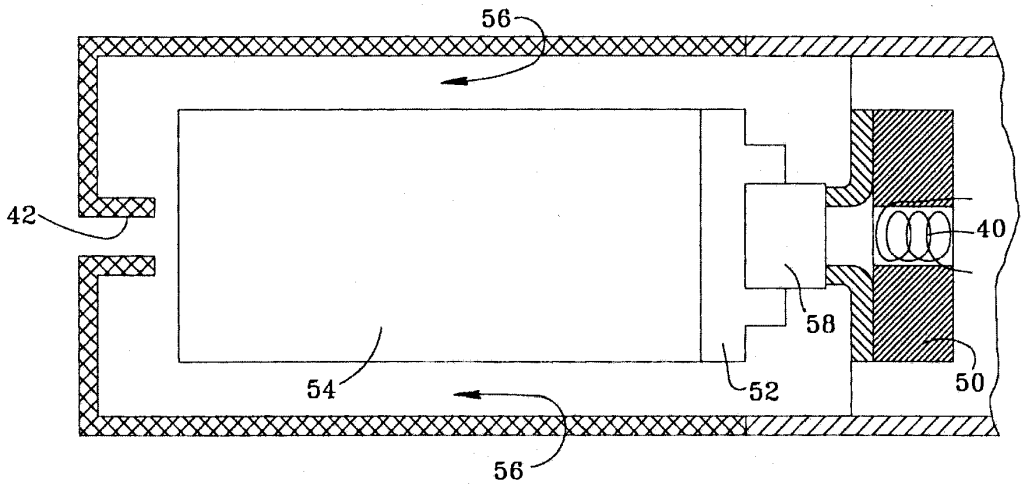


Fig. 3

NJOY Exhibit 1002.2367

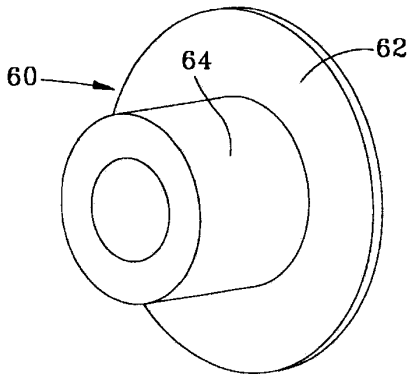


Fig. 4

NJOY Exhibit 1002.2368

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/000530

A. CLASSIFICATION OF SUBJECT MATTER

A24F47/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A24

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, WPI, EPODOC: mesh, porous, fiber, foam

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN101228969A(LONG, Gongyun),30 Jul.2008(30.07.2008),	1,6
Y	pages 3-6 of description and figures 1-4	2-5,7-17
Y	CN201379072Y(HAN,Li),13 Jan.2010(13.01.2010), pages 4-7 of description and figures 1-6	2-5,7-17
A	WO2009155734A1(MAAS, Bernard),30 Dec.2009(30.12.2009), the whole document	1-17

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 Jan.2013(10.01.2013)	**31 Jan. 2013 (31.01.2013)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer HE, Wen jing Telephone No. (86-10)62085686

Form PCT/ISA /210 (second sheet) (July 2009)

NJOY Exhibit 1002.2369

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/000530

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN101228969A	30.07.2008	None	
CN201379072Y	13.01.2010	WO2010091593A1	19.08.2010
		AU2010213270A1	19.08.2010
		CA2752255A1	19.08.2010
		EP2404515A1	11.01.2012
		KR20120012961A	13.02.2012
		MXPA11008503A	31.01.2012
		CN102387719A	21.03.2012
		US2012111347A1	10.05.2012
		VN28832A	27.02.2012
		JP2012517229A	02.08.2012
		US2012279512A1	08.11.2012
		SG174233A	28.10.2011
		EA201171031A	30.01.2012
WO2009155734A1	30.12.2009	US2011232654A1	29.09.2011
		CN202197836U	25.04.2012
		EP2443946A1	25.04.2012

NJOY Exhibit 1002.2370

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 October 2013 (24.10.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/155654 A1

(51) International Patent Classification:
H04W 74/08 (2009.01) *H04W 52/02* (2009.01)

(21) International Application Number:
PCT/CN2012/070810

(22) International Filing Date:
20 April 2012 (20.04.2012)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)** [SE/SE]; S-164 83 Stockholm (SE).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **LU, Qianxi** [CN/CN]; Nanhuxiyuan 226, Room 2-101, Chaoyang District, Beijing 100102 (CN). **FAN, Rui** [CN/CN]; No. 5 Lize East Street, Chaoyang District, Beijing 100102 (CN).

(74) Agent: **CHINA PATENT AGENT (HK) LTD**; 22/F., Great Eagle Center, 23 Harbour Road, Hong Kong (CN).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: METHODS AND APPARATUSES FOR COMMUNICATION BETWEEN A MOBILE TERMINAL AND A BASE STATION DURING A RANDOM ACCESS PROCEDURE

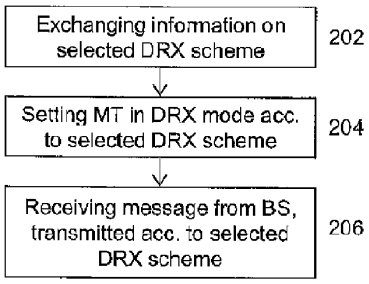


Fig. 5

(57) **Abstract**: The disclosure relates to a method in a mobile terminal for communication with a base station in a wireless network during a random access procedure. The method comprises exchanging (202) between the mobile station and the base station, during the random access procedure, information on a selected DRX scheme to be used for communication between the mobile terminal and the base station in the random access procedure, setting (204) the mobile terminal in DRX mode according to the selected DRX scheme and receiving (206) at least one message from the base station during the random access procedure, wherein the at least one message was transmitted according to the selected DRX scheme. The disclosure also relates to a corresponding method in a base station, and to a mobile terminal and a base station. By such methods, base station and mobile terminals, battery power in a mobile terminal may be saved during a random access procedure.

WO 2013/155654 A1

NJOY Exhibit 1002.2371

METHODS AND APPARATUSES FOR COMMUNICATION BETWEEN A MOBILE TERMINAL AND A BASE STATION DURING A RANDOM ACCESS PROCEDURE

Technical field

[0001] The present disclosure relates generally to methods and an apparatuses for communication between a mobile terminal and a base station during a random access procedure.

Background

[0002] With an increased number of user equipments (UEs) such as smart phones in mobile networks, network operators are confronted with a number of new challenges. For example, users of smart phones require an experience of being always on-line, similar to the experience of being connected to the Internet via a personal computer. This always on-line experience means short reaction time for data arrival and data transmission. A natural way of solving this would be to let all smart phones in the network be always connected to the network, i.e. for a Long Term Evolution (LTE) network the smart phones would always be in the RRC_Connected state. Although, to let the smart phones be always connected consumes a lot of network resources and UE battery power.

[0003] One reason for high UE power consumption and consumption of network resources is the network controlled handover procedure for users in the RRC_Connected state. Such handover procedures cause UE random access procedure operations and RRC reconfiguration operations which increase UE power consumption and network signaling costs. This is especially true when there are many smart phones in a cell and many of them are moving with a high speed (e.g. on a train).

[0004] Figures 1a and 1b show simulation results for random access channel (RACH) failure and power consumption for mobile terminals travelling in a network, wherein the mobile terminals are simulated to have the same velocity at a simulation, but different velocity between each simulation. As could be seen in figure 1a, the number of random access failures, i.e. the number of times a

NJOY Exhibit 1002.2372

random access attempt does not succeed, would largely increase when the number of smart phones in a cell increases from around 2000 smart phones/cell when the smart phones travel at 120 km/h. The random access failures are caused by many simultaneous random access attempts, at the same time as there are a limited number of preambles dedicated for handover, which leads to random access channel decoding error and collisions. As could be seen in figure 1b, the increase in random access failures is followed by a similar increase in UE power consumption. This is at least partly because a UE consumes lots of power when it is performing a random access procedure and because the random access failure is followed by a new random access attempt until the random access procedure is succeeded.

[0005] US2009457653 shows a procedure in which the UE is in sleep mode in a so called back-off period, which is a period between two consecutive random access procedures that may occur due to a random access failure. By setting the UE in sleep mode in the back-off periods, UE power consumption at random access procedures is decreased.

[0006] Although, there is still a need to decrease the UE power consumption at random access procedures.

Summary

[0007] It is an object of the invention to address at least some of the problems and issues outlined above. It is possible to achieve these objects and others by using a method and an apparatus as defined in the attached independent claims.

[0008] According to one aspect, a method is provided in a mobile terminal for communication with a base station in a wireless network during a random access procedure. The method comprises exchanging, between the mobile terminal and the base station, during the random access procedure, information on a selected DRX scheme to be used for communication between the mobile terminal and the base station in the random access procedure, setting the mobile terminal in DRX mode according to the selected DRX scheme and receiving at least one message from the base station during the random access procedure, wherein the at least

one message was transmitted according to the selected DRX scheme. When the mobile terminal is set in DRX mode it is set to be in sleep mode except for in certain time intervals when it is set to wake up and listen to signals sent from a BS. The DRX scheme defines at which time intervals the mobile terminal should be awake and listen to signals from the BS. When the BS and the MT has exchanged DRX scheme, the BS may only send signals destined to the MS at the time intervals defined by the DRX scheme. The method in the mobile terminal may further comprise the step of waking up from a sleep mode at time points or time intervals defined by the DRX scheme to receive messages from the base station during the random access procedure.

[0009] By exchanging information on DRX scheme to be used between the mobile terminal and the base station and by receiving messages from the base station according to the exchanged DRX scheme during the random access procedure, it is possible for the mobile terminal to be in sleep mode during the random access procedure and only wake up at time intervals when the base station may transmit according to the exchanged DRX scheme. Thereby, mobile terminal power may be saved during a random access procedure.

[00010] Also, by enabling DRX during a random access procedure, air interface resources are saved. Further, by enabling DRX during a random access procedure it is possible to prioritize between high and low priority users during a random access procedure. For example, low priority users may have DRX enabled during a random access procedure, and high priority users may monitor continuously during the response window and contention resolution timer. As another example, low priority user may be set with a DRX scheme with few and short awake periods for the receiver to listen to signals and high priority users may be set with a DRX scheme with more frequent and/or longer awake periods. Examples of low priority users are machine type communication or machine to machine communication, which are in general delay tolerant. Without applying embodiments of this disclosure, a scheduler cannot distinguish a low priority user from a normal UE and will handle the low priority user equal to the normal UE which affect normal UE performance. And even if a scheduler can distinguish a

NJOY Exhibit 1002.2374

low priority user from a normal UE, without applying embodiments of this disclosure, both low and high priority user will have to monitor continuously.

[00011] According to another aspect, a method in a base station is provided for communication with a mobile terminal in a wireless network during a random access procedure. The method comprises exchanging, during the random access procedure, between the mobile station and the base station, information on a selected DRX scheme to be used for communication between the mobile terminal and the base station in the random access procedure, setting the base station in a DRX mode according to the selected DRX scheme, and transmitting at least one message to the mobile terminal during the random access procedure, wherein the at least one message is transmitted according to the selected DRX scheme.

[00012] According to a third aspect, a mobile terminal is provided for communication with a base station in a wireless network during a random access procedure. The mobile terminal is arranged for exchanging, during the random access procedure, with the base station, information on a selected DRX scheme to be used for communication between the mobile terminal and the base station in the random access procedure. The mobile terminal further comprises a setting unit for setting the mobile terminal in DRX mode according to the selected DRX scheme, and a receiver for receiving at least one message from the base station during the random access procedure, wherein the at least one message was transmitted according to the selected DRX scheme.

[00013] According to a fourth aspect, a base station is provided for communication with a mobile terminal in a wireless network during a random access procedure. The base station is arranged for exchanging, during the random access procedure, with the mobile terminal, information on a selected DRX scheme to be used for communication between the mobile terminal and the base station in the random access procedure. The base station further comprises a setting unit for setting the base station in a DRX mode according to the selected DRX scheme, and a transmitter for transmitting at least one message to the

mobile terminal during the random access procedure, wherein the at least one message is transmitted according to the selected DRX scheme.

[00014] The above methods, mobile stations and base stations may be configured and implemented according to different optional embodiments. In one possible embodiment, the information on the selected DRX scheme is exchanged by the base station sending the information of selected DRX scheme to the mobile terminal. I.e. the selection of DRX scheme is controlled by the base station. In another embodiment, the information on the selected DRX scheme is exchanged by the mobile station selecting a preamble which is mapped to a certain DRX scheme, and thereafter sending the preamble to the base station. Since the mapping is known to both the mobile terminal and the base station, the base station will know the selected DRX scheme when receiving the preamble. I.e. this selection of DRX scheme is controlled by the mobile terminal.

[00015] Further possible features and benefits of this solution will become apparent from the detailed description below.

Brief description of drawings

[00016] The solution will now be described in more detail by means of exemplary embodiments and with reference to the accompanying drawings, in which:

[00017] Fig. 1a is a diagram showing the relation between system load and average number of RACH failures per UE per second for UEs having different velocities, in a prior art system.

[00018] Fig 1b is a diagram showing the relation between system load and average UE power consumption for UEs having different velocities, in a prior art system.

[00019] Fig. 2 is a signaling diagram of a random access procedure according to prior art.

[00020] Fig. 3 is a signaling diagram of a random access procedure according to a possible embodiment of the invention.

NJOY Exhibit 1002.2376

[00021] Fig. 4 is a signaling diagram of a random access procedure according to another possible embodiment of the invention.

[00022] Figures 5-7 are flow charts of methods in a mobile terminal according to possible embodiments.

[00023] Figures 8-10 are flow charts of methods in a base station according to possible embodiments.

[00024] Figure 11 is a schematic block diagram of a mobile terminal and a base station according to possible embodiments.

Detailed description

[00025] Based on the understanding that power consumption of a UE during a random access procedure may be a critical issue, especially for e.g. certain traffic cases resulting in many reoccurring random access procedures, the inventors have come up with different suggestions of how to enable DRX mode in an ongoing random access procedure.

[00026] Briefly described, a solution is provided for deceasing UE power consumption during a random access procedure. This is achieved by exchanging information on a DRX scheme to be used between the UE and the base station in communication with the UE during the random access procedure and setting the UE and the base station in DRX mode according to the exchanged DRX scheme. Thereafter the base station transmits at least one message during the random access procedure according to the exchanged DRX scheme. Since the UE and the BS have exchanged information on DRX scheme, the UE knows the moments in time when the at least one message may be transmitted and the UE only needs to wake up to listen for a message from the base station at the moments in time defined by the DRX scheme. Thereby, UE power is saved.

[00027] A random access procedure may be performed in e.g. the following situations: when performing an initial access when there is no RRC connection with the base station; upon initial access to a target cell while the UE is in a handover process; upon request by a command of the base station; during a

correction procedure when there is radio link failure or handover failure. A random access procedure can also be triggered to acquire a UL grant or a Timing Advance (TA) command etc.

[00028] The full random access procedure according to the current LTE protocol 3GPP TS 36.321, E-UTRA, Medium Access Control (MAC) protocol specification is shown in figure 2. According to the protocol, the UE 110 selects 2.1 a preamble (contention-based preamble), or use an indicated preamble (non contention-based preamble) and sends 2.2 the preamble to the eNodeB 120. Then the UE actively listens for a random access response message (MSG2) 2.3 from the eNodeB during a response time window. During this window the UE consumes power for the listening process. When the UE has received the random access response message, the information included in the random access response message is individually processed. If the random access procedure is a contention-based procedure, an uplink transmission 2.4 including a UE identifier is sent to the eNodeB. If the random access procedure is a non contention-based procedure, the process may end after step 2.3. Before receiving 2.5 the contention resolution message (MSG4) from the eNodeB, the UE actively listens for this message during a time period defined by a contention resolution timer. According to an embodiment, this invention is directed to decreasing power consumption during at least one of the response window and the contention resolution timer window.

[00029] According to the current 3GPP standard, a UE can be configured with DRX mode for saving power consumption. Although there is no suggestion to use DRX mode in a random access procedure. Also, the DRX can only be configured by RRC signaling, i.e. an RRC connection has to be set up before DRX can be applied. Therefore, during an initial random access procedure where no RRC connection exists, DRX cannot be applied. Also, the current LTE standard defines the intervals of Response Window Size and Contention Resolution Timer as an active time period, i.e. always-on monitoring is required. Thus, even if a random access procedure is initialized due to e.g. an out-of.sync state in RRC-Connected mode, DRX in a random access procedure cannot be applied.

[00030] To reduce power consumption at a random access procedure according to an embodiment of the invention, a DRX scheme is exchanged between the UE and the eNodeB during the random access procedure such that a message transmitted during the random access procedure may be transmitted to the UE according to the exchanged DRX scheme. The message transmitted according to the exchanged DRX scheme may be a random access response message (MSG2) and/or a contention resolution message (MSG4). According to an embodiment, the DRX scheme is exchanged by the eNodeB instructing the UE of the selected DRX scheme to use. According to another embodiment, the DRX scheme is exchanged by the UE selecting DRX scheme by selecting a preamble which has a predefined relationship to a certain DRX scheme, and sending the preamble to the eNodeB.

[00031] A signaling diagram describing signaling between a UE 110 and an eNodeB 120 during a random access procedure according to an embodiment is shown in figure 3. In this embodiment, a DRX scheme is selected by the UE for the reception of at least a contention resolution message. The signaling starts by the UE selecting 3.1 a random access preamble. Since there is a predefined mapping relationship between the random access preambles and different DRX schemes, the UE when selecting a preamble also selects a DRX scheme to be used for later transmission in DRX mode from the eNodeB to the UE. The selected DRX scheme defines e.g. the time intervals of active /inactive periods for the UE and time offset of the starting point for DRX transmission/reception. The UE transmits 3.2 the preamble to the eNodeB. Since the eNodeB knows the mapping between the preambles and the DRX scheme, the eNodeB would be informed of the selected DRX scheme when receiving the preamble.

[00032] The eNodeB then sends 3.3 a random access response (MSG2) to the UE. The information in the random access response may include a Time advance command, UL grant and a temporary Cell Radio Network Temporary Identity value (C-RNTI). If the UE and the eNodeB have been set in DRX mode according to the DRX scheme of the preamble, the MSG2 may be sent according to the DRX mode. In this case, the UE is in DRX mode during the response window when the MSG2

may be received, and only wakes up to listen to possible MSG2s at the active periods defined by the DRX scheme.

[00033] Thereafter, the UE sends 3.4 the UE identifier to the eNodeB in an uplink transmission (MSG3). As soon as the MSG3 is sent, the UE listens to a contention resolution message (MSG4) according to the selected DRX scheme. The eNodeB then responds 3.5 to the MSG3 with the MSG4. The MSG4 is sent in an active period as defined by the DRX scheme. The random access procedure succeeds after successful reception of MSG4. If not succeeded, the random access procedure and the DRX mode according to the selected DRX scheme is stopped in order to retry to access again.

[00034] The step of predefining a mapping relationship between the random access preambles and the DRX schemes may either be hardcoded, e.g. defined in a future specification, or broadcasted by the eNodeB beforehand, e.g. as system information. By predefining a mapping relationship between the preambles and the DRX schemes, no extra signaling is needed for UE UL transmission, i.e. there is no impact on coverage performance. The mapping may be defined for different values of response window size and/or contention resolution timer such that correct DRX scheme may be selected adapted to a certain response window size and/or contention resolution timer.

[00035] For the UE to select different DRX schemes, e.g. different DRX cycles and time offsets, different information could be taken into account, such as UL traffic Quality of Service information and UE power status.

[00036] According to an alternative embodiment, the eNodeB may control the usage of DRX scheme even in this UE controlled embodiment. In this case, the eNodeB sends an instruction to the UE to use the selected DRX scheme or another DRX scheme. This instruction may be sent in the random access response message. In case the eNodeB sends an instruction to use another DRX scheme, the UE is reset to the instructed DRX scheme.

NJOY Exhibit 1002.2380

[00037] In another UE controlled method, the UE may send information on DRX using the MSG3. Although, in that case extra information needs to be sent compared to the MSG3 of today. Also, then it is only possible to use DRX mode for MSG4 and not MSG2.

[00038] In the description, the eNodeB is said to be set in DRX mode using the selected DRX scheme for DL transmissions. Strictly speaking, the transmitter of the eNodeB is set in discontinuous transmission (TRX) mode with a TRX scheme that is in line with the selected DRX scheme. Although, to simplify, the eNodeB is said to be in DRX mode using the same DRX scheme as the receiver of the UE.

[00039] Figure 4 is a signaling diagram describing signaling between a UE and an eNodeB during a random access procedure according to another embodiment. In this embodiment, the eNodeB controls DRX scheme to be used. The signaling starts by the UE 110 selecting 4.1 a random access preamble and sending 4.2 the preamble to the eNodeB 120. The UE then actively listens for the Random Access Response (MSG2) during the response window. Before sending the MSG2, the eNodeB selects a DRX scheme to be used for communication in DRX mode between the eNodeB and the UE during the rest of the random access procedure. When deciding on which DRX scheme to select, the eNodeB may take into account e.g. UE priority level and/or system load status. Also, DRX scheme may be selected based on a value of the Contention resolution timer.

[00040] The eNodeB thereafter sends 4.3 the MSG2 to the UE. The MSG2 includes information on the selected DRX scheme. The MSG2 may also include information such as time advance command, UL grant and temporary C-RNTI. The UE and the eNodeB are then set in DRX mode according to the selected DRX scheme. Thereafter, the UE sends an uplink transmission including the UE identity. As soon as the MSG3 is sent, the UE wakes up and listen to a contention resolution message (MSG4) according to the selected DRX scheme. The eNodeB then responds 3.5 to the MSG3 with the MSG4. The MSG4 is sent in an active period as defined by the DRX scheme. The random access procedure succeeds after successful reception of MSG4. If not succeeded, the random access

NJOY Exhibit 1002.2381

procedure, and the DRX mode according to the selected DRX pattern is stopped in order to retry to access again.

[00041] In an alternative embodiment, information of the selected DRX scheme can be sent from the eNodeB to the UE in an implicit way. For example, a pre-defined rule can be employed as a mapping between a UL grant resource location or a temporary C-RNTI value and the selected DRX pattern. In this way, it is also possible for a legacy UE to decode the information in MSG2, even though a legacy UE will not use DRX mode, and at the same time more advanced UEs can apply the DRX scheme information for power saving.

[00042] In embodiments for implicitly sending information of the selected DRX scheme, already existing information, such as a UL grant resource location or a temporary C-RNTI value, in the random access response message is used. Then the temporary C-RNTI or the UL grant resource location value is an indicator of the selected DRX scheme. Some kind of mapping may be used to connect a certain existing information value with a certain DRX pattern. In alternatives when the information of the selected DRX scheme is sent explicitly it may be sent as new information bits in the random access response message.

[00043] According to an alternative embodiment, a DRX cycle can be aligned with an MSG3 retransmission period, i.e. the UE is only awake according to the DRX scheme, when MSG3 want to retransmit, in which case it would be awake anyway. Thereby, further UE battery power is saved.

[00044] Figure 5 describes an exemplary embodiment of a method in a mobile terminal 110 for communication with a base station 120 in a wireless network during a random access procedure. The method comprises exchanging 202, during the random access procedure, information on a selected DRX scheme to be used for communication between the mobile terminal and the base station in the random access procedure, setting 204 the mobile terminal in DRX mode according to the selected DRX scheme and receiving 206 at least one message from the base station during the random access procedure, wherein the at least one message was transmitted according to the selected DRX scheme.

[00045] Figure 6 describes another embodiment of a method in a mobile terminal for communication with a base station in a wireless network during a random access procedure. The method may start by in the mobile terminal predefining 212 a mapping relationship between preambles in a group of preambles and DRX schemes in a group of DRX schemes such that each DRX scheme is mapped to at least one preamble. The predefinition may be hardcoded or received in a message from the base station. Thereafter, information on the selected DRX scheme is exchanged between the mobile terminal and the base station by the mobile terminal selecting 214 DRX scheme out of the group of DRX schemes by selecting a preamble out of the group of preambles, which selected preamble is mapped to the selected DRX scheme. Then the selected preamble is transmitted 216 to the base station. The mapping between the selected preamble and the selected DRX scheme is known to the mobile terminal and the base station. Since the mapping is known also to the base station the base station can map the received preamble to the selected DRX scheme, and the base station can be set in DRX mode according to the selected DRX scheme. Further, the mobile terminal is set 204 in DRX mode according to the selected DRX scheme. Thereafter, a random access response message may be received 222 according to the selected DRX scheme. This means that the random access response message may be transmitted from the base station at time intervals defined by the DRX scheme, which time intervals are in line with the time intervals when the mobile terminal wakes up to listen to messages from the base station. Thereafter, a mobile terminal identifier may be transmitted 224 to the base station, followed by receiving 226 a contention resolution message from the base station, which contention resolution message may be transmitted according to the selected DRX scheme.

[00046] According to an embodiment, the mobile terminal selects 214 the DRX scheme based on UL traffic Quality of Service and/or mobile terminal power status. According to another embodiment, the mobile terminal may receive an instruction to use the selected DRX scheme or another DRX scheme from the base station in the random access response message (MSG2). In this embodiment the base station may control the final selection of DRX scheme even though the DRX scheme was originally selected by the mobile terminal. If this embodiment is used,

the base station and the mobile terminal will not be set in DRX mode until after receiving this instruction in MSG2. As a result, only MSG4 and not MSG2 can be sent according to the selected DRX scheme.

[00047] Figure 7 describes yet another embodiment of a method in a mobile terminal for communication with a base station in a wireless network during a random access procedure. The method comprises receiving 232 information on a selected DRX scheme from the base station, setting 234 the mobile terminal in DRX mode according to the selected DRX scheme and receiving 236 a contention resolution message from the base station, which contention resolution message was transmitted from the base station according to the selected DRX scheme. The step of receiving 232 information on a selected DRX scheme from the base station may be seen as an example of the step of exchanging 202 information on a selected DRX scheme to be used for communication between the mobile terminal and the base station in the random access procedure, in which example the selection of DRX scheme is controlled by the base station. The information on the selected DRX scheme may be received 232 from the base station in a random access response message.

[00048] According to an embodiment, in which the base station controls the selection of DRX scheme, the mobile terminal receives 232 the information on the selected DRX scheme by receiving an indication from the base station to use a preamble that is mapped to the selected DRX scheme. The mapping is known to the mobile terminal and the base station. This embodiment is directed to a non-contention based selection of preamble. Since the mobile terminal is instructed to select a preamble mapped to a selected DRX scheme, which mapping is known both to the mobile terminal and the base station, both the mobile terminal and the base station will know which DRX scheme to use.

[00049] Figure 8 describes an embodiment of a method in a base station for communication with a mobile terminal in a wireless network during a random access procedure. The method comprises exchanging 302, during the random access procedure, information on a selected DRX scheme to be used for communication between the mobile terminal and the base station in the random

access procedure, setting 304 the base station in a DRX mode according to the selected DRX scheme, and transmitting 306 at least one message to the mobile terminal during the random access procedure, wherein the at least one message is transmitted according to the selected DRX scheme.

[00050] Figure 9 describes another embodiment of a method in a base station for communication with a mobile terminal in a wireless network during a random access procedure. The method starts by the base station selecting 312 DRX scheme. The DRX scheme may be selected based on at least one of a mobile terminal priority level and a network load status. Alternatively, the DRX scheme may be selected to synchronize with Hybrid Automatic Repeat Request, HARQ, feedback. Further, information on the selected DRX scheme is exchanged between the mobile terminal and the base station by the base station transmitting 314 the information on the selected DRX scheme to the mobile terminal. The method may also comprise setting 304 the base station in DRX mode according to the selected DRX scheme and transmitting 306 a message to the mobile terminal according to the selected DRX scheme. In an embodiment, the information on the selected DRX scheme is transmitted 314 in a random access response message.

[00051] Figure 10 describes yet another embodiment of a method in a base station for communication with a mobile terminal in a wireless network during a random access procedure. The method may start by in the base station predefining 322 a mapping relationship between preambles in a group of preambles and DRX schemes in a group of DRX schemes such that each DRX scheme is mapped to at least one preamble. The predefinition may be hardcoded or received in a message from the network. Thereafter, information on the selected DRX scheme is exchanged between the mobile terminal and the base station by the base station receiving 324 a preamble from the mobile terminal, which preamble is mapped to the selected DRX scheme, wherein the mapping between the preamble and the selected DRX scheme is known to the mobile terminal and the base station. The method may further comprise setting 304 the base station in a DRX mode according to the DRX scheme mapped to the received preamble, and transmitting 330 a random access response message to

the mobile terminal. The random access response message may be transmitted according to the selected DRX scheme. Alternatively, the method further comprises transmitting an instruction to use the selected DRX scheme according to the preamble, or another DRX scheme to the mobile terminal in the random access response message. In that case, the random access response message may not be transmitted according to the selected DRX scheme. Further, the method may comprise receiving 332 a mobile terminal identifier from the mobile terminal, and transmitting 334 a contention resolution message to the mobile terminal, which contention resolution message is transmitted according to the selected DRX scheme.

[00052] Figure 11 describes a mobile terminal 110 and a base station 120 for mutual communication in a wireless network during a random access procedure. According to an embodiment, the mobile terminal is arranged for exchanging, during the random access procedure, with the base station 120, information on a selected DRX scheme to be used for communication between the mobile terminal and the base station in the random access procedure. Further, the mobile terminal 110 comprises a setting unit 113 for setting the mobile terminal in DRX mode according to the selected DRX scheme, and a receiver 116 for receiving at least one message from the base station during the random access procedure, wherein the at least one message was transmitted according to the selected DRX scheme. The setting unit 113 may be arranged in a processor 112.

[00053] According to an embodiment, for exchanging information on a selected DRX scheme with the base station during the random access procedure, the receiver 116 of the mobile terminal is arranged to receive the information on the selected DRX scheme from the base station. The information on the selected DRX scheme may be received in a random access response message. The information on the selected DRX scheme may be used by the setting unit when setting the mobile terminal in DRX mode according to the selected DRX scheme. The information on the selected DRX scheme may be stored in the database 115.

[00054] According to an embodiment, for exchanging information on a selected DRX scheme with the base station during the random access procedure, the

mobile terminal has a selection unit 114 and a transmitter 118. The selection unit 114 is arranged for selecting DRX scheme out of a group of DRX schemes by selecting a preamble out of a group of preambles, which selected preamble is mapped to the selected DRX scheme. The selection unit 114 may be arranged in the processor 112. The transmitter 118 is arranged for transmitting the selected preamble to the base station, wherein the mapping between the selected preamble and the selected DRX scheme is known to the mobile terminal and the base station. When the selecting unit 114 selects the preamble it may fetch a preamble in a database 115 of the mobile terminal. Also, a mapping relationship is predefined between each of the preambles in the database and each of the DRX schemes such that each DRX scheme is mapped to at least one preamble. The mapping relationship between the preambles and the DRX schemes may be received from the base station or hardcoded in the mobile terminal. The mapping relationship may be stored in the database where it is accessible for the selection unit. Also the selected DRX scheme may be stored in the database 115 or in a memory in the processor 112.

[00055] According to an embodiment, the base station 120 is arranged for exchanging, during the random access procedure, with the mobile terminal, information on a selected DRX scheme to be used for communication between the mobile terminal and the base station in the random access procedure. The base station comprises a setting unit 123 for setting the base station in a DRX mode according to the selected DRX scheme, and a transmitter 128 for transmitting at least one message to the mobile terminal during the random access procedure, wherein the at least one message is transmitted according to the selected DRX scheme. The setting unit 123 may be arranged in a processor 122. The information on the selected DRX scheme may be used by the setting unit when setting the base station in DRX mode according to the selected DRX scheme. The information on the selected DRX scheme may be stored in a database 125.

[00056] According to an embodiment, for exchanging information on a selected DRX scheme with the mobile terminal during the random access procedure, the transmitter 128 of the base station 120 is arranged to transmit the information on

NJOY Exhibit 1002.2387

the selected DRX scheme to the mobile terminal. The transmitter 128 may be arranged for transmitting the information on the selected DRX scheme in a random access response message. The base station may further comprise a selection unit 124 for selecting DRX scheme. The selection of DRX scheme may be based on at least one of a mobile terminal priority level and a network load status. The selection unit 124 may be arranged in the processor 122. The selection unit 114 may be arranged for selecting DRX scheme out of a group of DRX schemes, which group of DRX schemes may be stored in the database 125 or in an internal memory of the processor 122.

[00057] According to another embodiment, for exchanging information on a selected DRX scheme with the mobile terminal during the random access procedure, the base station 120 has a receiver 126 arranged to exchange the information on the selected DRX scheme by receiving a preamble from the mobile terminal 110, which preamble is mapped to the selected DRX scheme. The mapping between the preamble and the selected DRX scheme is known to the mobile terminal and the base station. Further, a mapping relationship is predefined between each of a group of preambles and each of a group of DRX schemes such that each DRX scheme is mapped to at least one preamble. The mapping relationship between the preambles and the DRX schemes may be received from the network or may be hardcoded in the base station. The mapping relationship may be stored in the database 125 where it is accessible for the processor 122. When receiving a preamble, the processor checks the mapping in e.g. the database and interprets that the received preamble is mapped to the selected DRX scheme. Also the selected DRX scheme may be stored in the database 125 or in an internal memory of the processor 122.

[00058] Further, the transmitter 128 may be arranged for transmitting, during the random access procedure, a random access response message and/or a contention resolution message to the mobile terminal according to the selected DRX scheme.

[00059] Although, the invention is described in terms of a 3GPP LTE-based system, it is not limited to such a system. It might as well be used for example for a HSPA based system, a W-CDMA based system etc.

[00060] The terms base station/eNodeB, and mobile terminal/user equipment are used in an interchangeable manner throughout this disclosure.

[00061] While the solution has been described with reference to specific exemplary embodiments, the description is generally only intended to illustrate the inventive concept and should not be taken as limiting the scope of the solution. The solution is defined by the appended claims.

NJOY Exhibit 1002.2389

CLAIMS

1. A method in a mobile terminal (110) for communication with a base station (120) in a wireless network during a random access procedure, the method comprising:

exchanging (202), during the random access procedure, between the mobile terminal and the base station, information on a selected discontinuous reception, DRX, scheme to be used for communication between the mobile terminal and the base station in the random access procedure;

setting (204) the mobile terminal in DRX mode according to the selected DRX scheme;

receiving (206) at least one message from the base station during the random access procedure, wherein the at least one message was transmitted according to the selected DRX scheme.

2. Method according to claim 1, wherein the information on the selected DRX scheme is exchanged (202) by the mobile terminal receiving (232) the information on the selected DRX scheme from the base station.

3. Method according to claim 2, wherein the information on the selected DRX scheme is received (232) from the base station in a random access response message.

4. Method according to claim 2, wherein the mobile terminal receives (232) the information on the selected DRX scheme by receiving an indication from the base station to use a preamble that is mapped to the selected DRX scheme, and wherein the mapping is known to the mobile terminal and the base station.

5. Method according to claim 1, wherein the information on the selected DRX scheme is exchanged (202) by the mobile terminal:

selecting (214) DRX scheme out of a group of DRX schemes by selecting a preamble out of a group of preambles, which selected preamble is mapped to the selected DRX scheme, and

transmitting (216) the selected preamble to the base station, wherein the mapping between the selected preamble and the selected DRX scheme is known to the mobile terminal and the base station.

6. Method according to claim 5, wherein receiving (206) at least one message from the base station during the random access procedure comprises receiving (222) a random access response message from the base station according to the selected DRX scheme.

7. Method according to claim 5 or 6, wherein the mobile terminal selects (214) the DRX scheme based on UL traffic Quality of Service and/or mobile terminal power status.

8. Method according to any of claims 5 or 7, further comprising receiving an instruction to use the selected DRX scheme or another DRX scheme from the base station in a random access response message.

9. Method according to any of claims 5-8, further comprising predefining (212) a mapping relationship between each of the preambles in the group of preambles and each of the DRX schemes in the group of DRX schemes such that each DRX scheme is mapped to at least one preamble.

10. Method according to any of the preceding claims, further comprising:

transmitting (224) a mobile terminal identifier to the base station, and

receiving (226) a contention resolution message from the base station, which contention resolution message was transmitted according to the exchanged DRX scheme.

11. A method in a base station (120) for communication with a mobile terminal (110) in a wireless network during a random access procedure, the method comprising:

exchanging (302), during the random access procedure, between the mobile terminal and the base station, information on a selected discontinuous reception, DRX, scheme to be used for communication between the mobile terminal and the base station in the random access procedure;

setting (304) the base station in a DRX mode according to the selected DRX scheme;

transmitting (306) at least one message to the mobile terminal during the random access procedure, wherein the at least one message is transmitted according to the selected DRX scheme.

12. Method according to claim 11, wherein information on the selected DRX scheme is exchanged (302) by transmitting (314) the information on the selected DRX scheme to the mobile terminal.

13. Method according to claim 12, wherein the information on the selected DRX scheme is transmitted (314) in a random access response message.

14. Method according to any of claims 11-13, further comprising: selecting (312) DRX scheme based on at least one of a mobile terminal priority level and a network load status.

15. Method according to claim 11, wherein the information on the selected DRX scheme is exchanged (302) by:

receiving (324) a preamble from the mobile terminal, which preamble is mapped to the selected DRX scheme, wherein the mapping between the preamble and the selected DRX scheme is known to the mobile terminal and the base station.

16. Method according to claim 15, wherein transmitting (306) at least one message to the mobile terminal during the random access procedure comprises transmitting (330) a random access response message from the base station according to the selected DRX scheme.

17. Method according to claim 15, further comprising transmitting an instruction to use the selected DRX scheme according to the preamble, or another DRX scheme to the mobile terminal in a random access response message.

18. Method according to any of claims 11-17, further comprising:

receiving (332) a mobile terminal identifier from the mobile terminal, and

transmitting (334) a contention resolution message to the mobile terminal, which contention resolution message is transmitted according to the selected DRX scheme.

19. Mobile terminal (110) for communication with a base station (120) in a wireless network during a random access procedure, the mobile terminal being arranged for exchanging, during the random access procedure, with the base station, information on a selected discontinuous reception, DRX, scheme to be used for communication between the mobile terminal and the base station in the random access procedure; the mobile terminal comprising:

a setting unit (113) for setting the mobile terminal in DRX mode according to the selected DRX scheme;

a receiver (116) for receiving at least one message from the base station during the random access procedure, wherein the at least one message was transmitted according to the selected DRX scheme.

20. Mobile terminal (110) according to claim 19, wherein the mobile terminal is arranged for exchanging the information on the selected DRX scheme by the receiver (116) being arranged to receive the information on the selected DRX scheme from the base station

21. Mobile terminal (110) according to claim 20, wherein the receiver (116) is arranged to receive the information on the selected DRX scheme from the base station in a random access response message.

22. Mobile terminal (110) according to claim 19, wherein the mobile terminal is arranged for exchanging the information on the selected DRX scheme by comprising:

a selection unit (114) for selecting DRX scheme out of a group of DRX schemes by selecting a preamble out of a group of preambles, which selected preamble is mapped to the selected DRX scheme, and

NJOY Exhibit 1002.2393

a transmitter (118) for transmitting the selected preamble to the base station, wherein the mapping between the selected preamble and the selected DRX scheme is known to the mobile terminal and the base station.

23. Mobile terminal (110) according to claim 22, wherein there is a mapping relationship between each of the preambles in the group of preambles and each of the DRX schemes in the group of DRX schemes such that each DRX scheme is mapped to at least one preamble, and wherein this mapping relationship is stored in the mobile terminal.

24. Mobile terminal (110) according to any of claims 19-23, wherein the receiver (116) is arranged for receiving, during the random access procedure, a random access response message and/or a contention resolution message transmitted from the base station according to the selected DRX scheme.

25. Base station (120) for communication with a mobile terminal (110) in a wireless network during a random access procedure, the base station being arranged for exchanging, during the random access procedure, with the mobile terminal, information on a selected discontinuous reception, DRX, scheme to be used for communication between the mobile terminal and the base station in the random access procedure, the base station further comprising:

a setting unit (123) for setting the base station in a DRX mode according to the selected DRX scheme;

a transmitter (128) for transmitting at least one message to the mobile terminal during the random access procedure, wherein the at least one message is transmitted according to the selected DRX scheme.

26. Base station (120) according to claim 25, wherein the transmitter (128) is arranged to exchange information on the selected DRX scheme by transmitting the information on the selected DRX scheme to the mobile terminal.

27. Base station (120) according to claim 26, wherein the transmitter (128) is further arranged for transmitting the information on the selected DRX scheme in a random access response message.

28. Base station (120) according to claim 26 or 27, further comprising a selection unit (124) for selecting DRX scheme based on at least one of a mobile terminal priority level and a network load status.

29. Base station (120) according to claim 25, further comprising a receiver (126) arranged to exchange the information on the selected DRX scheme by receiving a preamble from the mobile terminal, which preamble is mapped to the selected DRX scheme, wherein the mapping between the preamble and the selected DRX scheme is known to the mobile terminal and the base station.

30. Base station (120) according to any of claims 25-29, wherein the transmitter (128) is arranged for transmitting, during the random access procedure, a random access response message and/or a contention resolution message to the mobile terminal according to the selected DRX scheme.

NJOY Exhibit 1002.2395

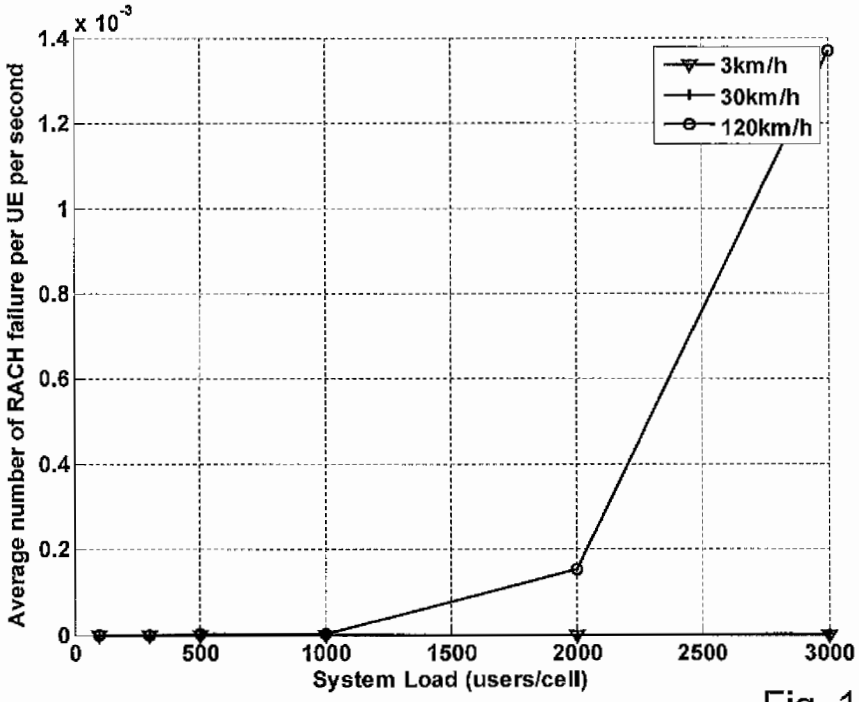


Fig. 1a

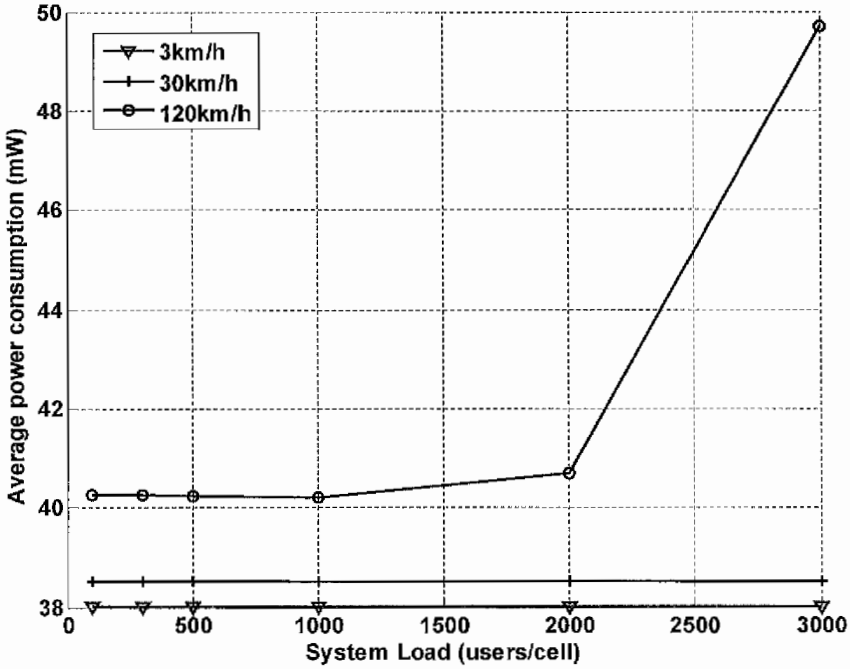


Fig. 1b

NJOY Exhibit 1002.2396

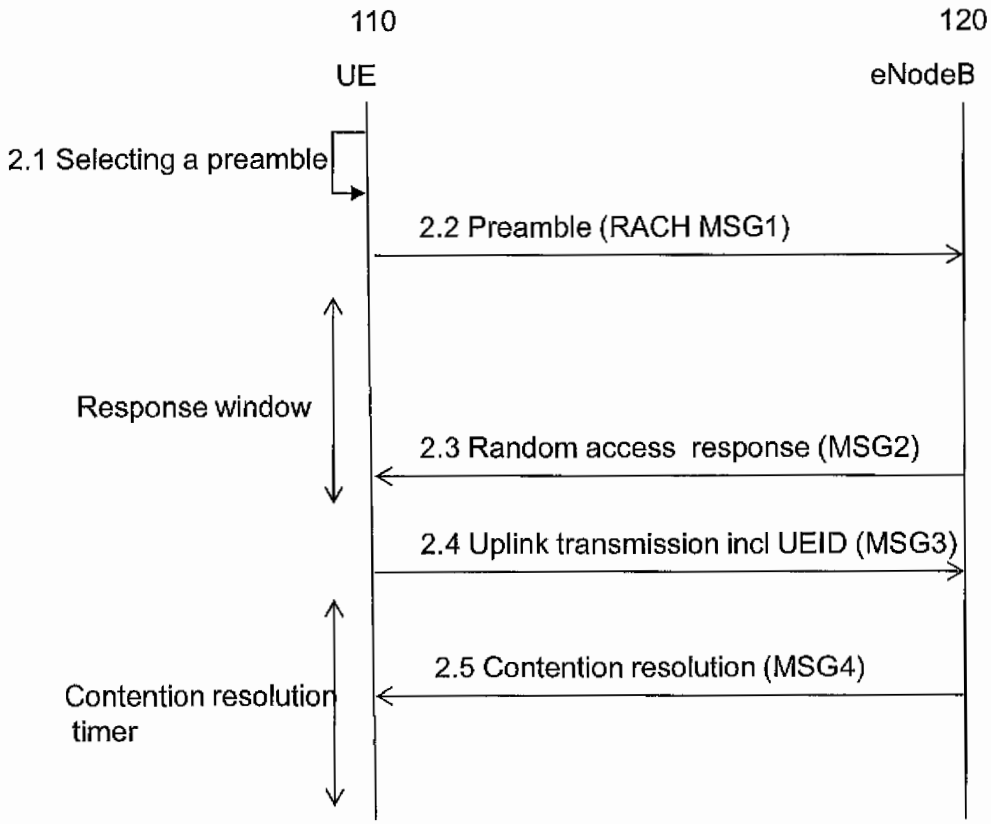


Fig. 2 (prior art)

NJOY Exhibit 1002.2397

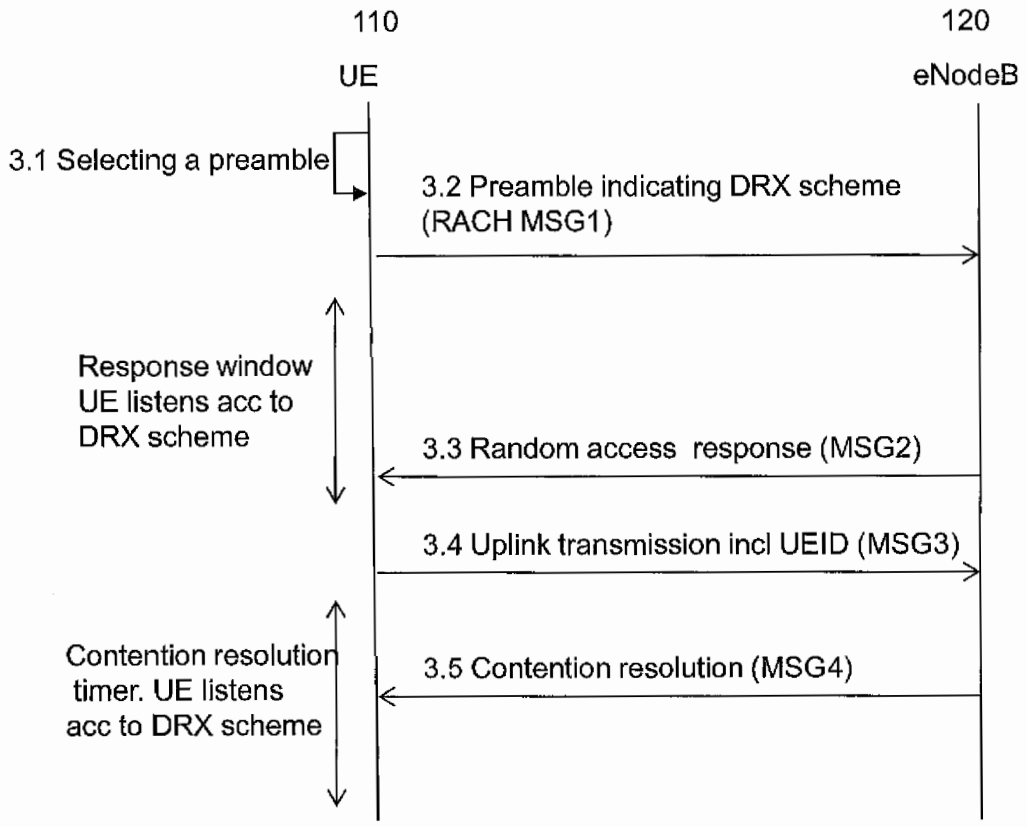


Fig. 3

NJOY Exhibit 1002.2398

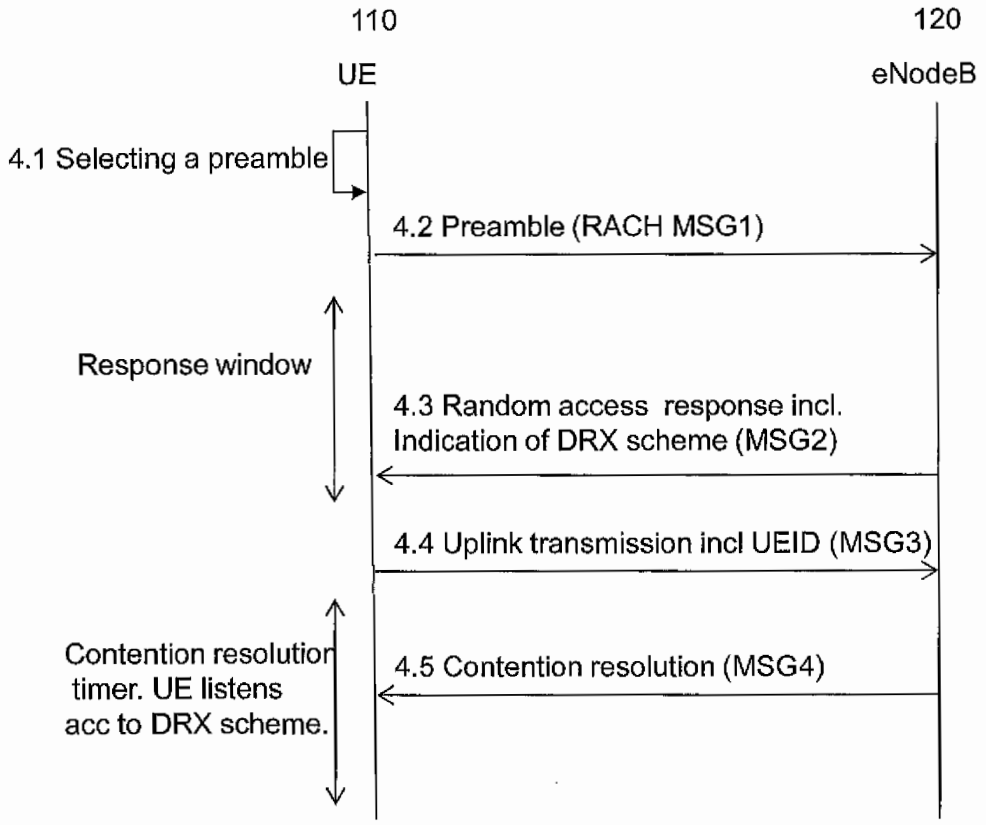


Fig. 4

NJOY Exhibit 1002.2399

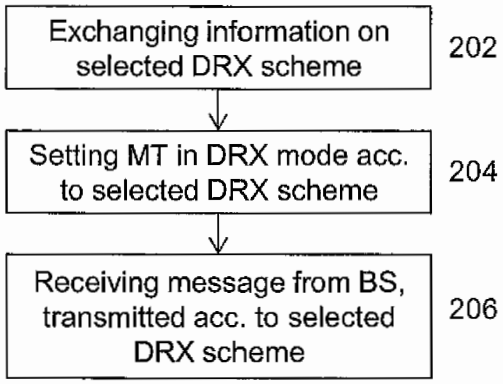


Fig. 5

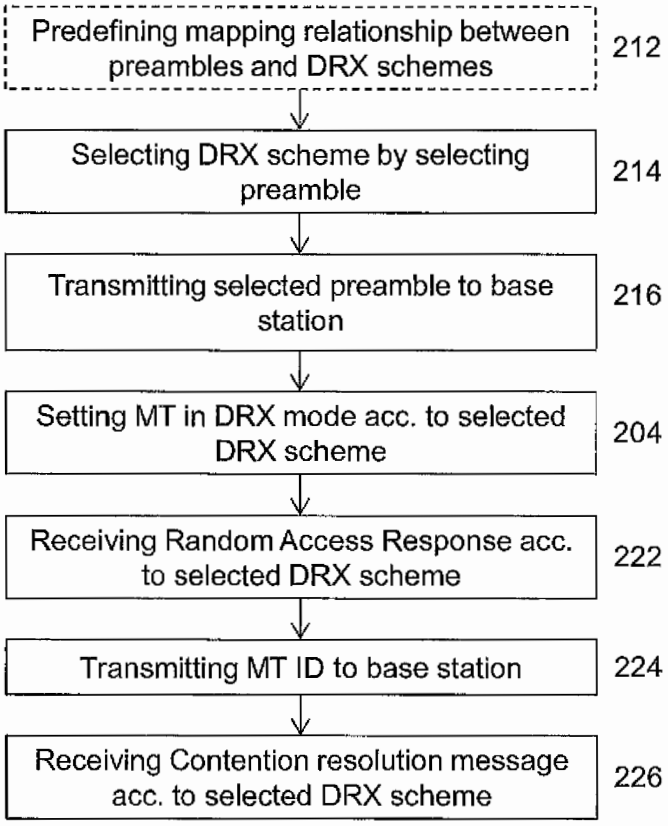


Fig. 6

NJOY Exhibit 1002.2400

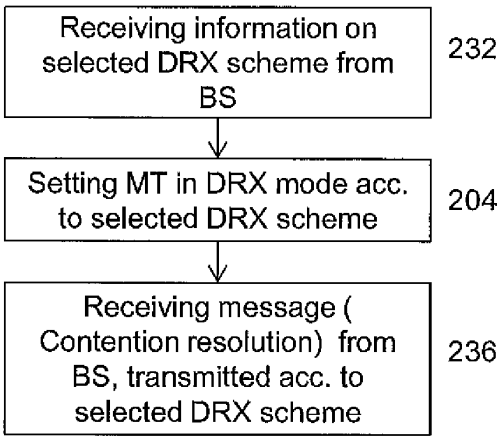


Fig. 7

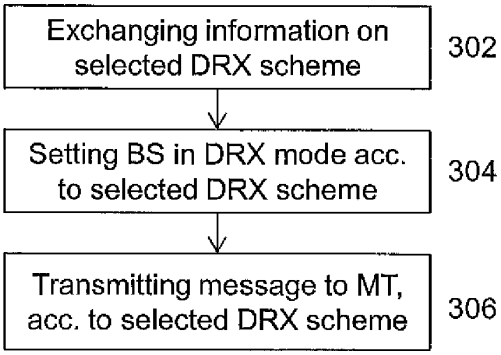


Fig. 8

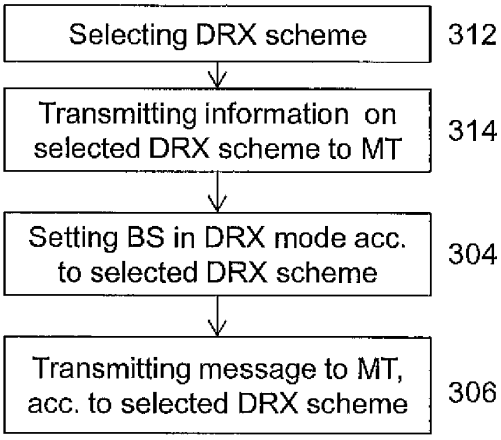


Fig. 9

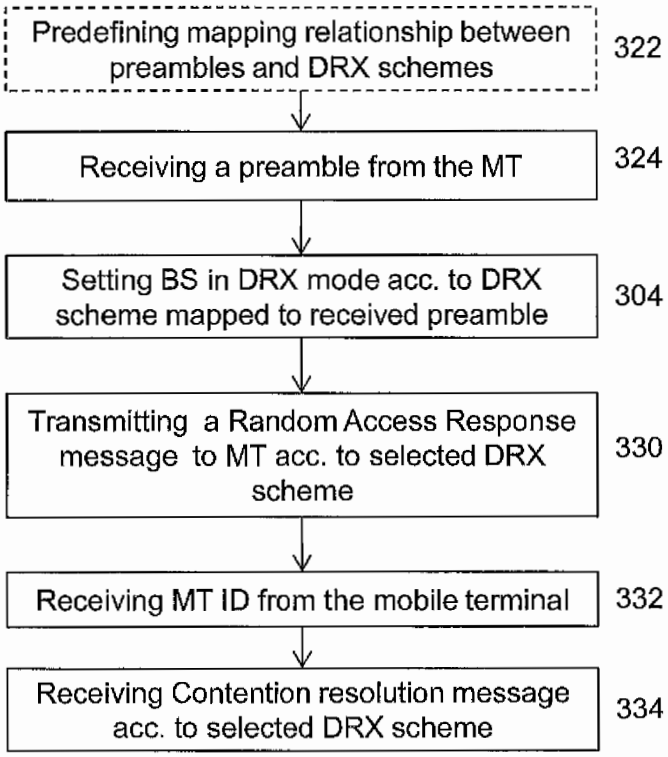


Fig. 10

NJOY Exhibit 1002.2402

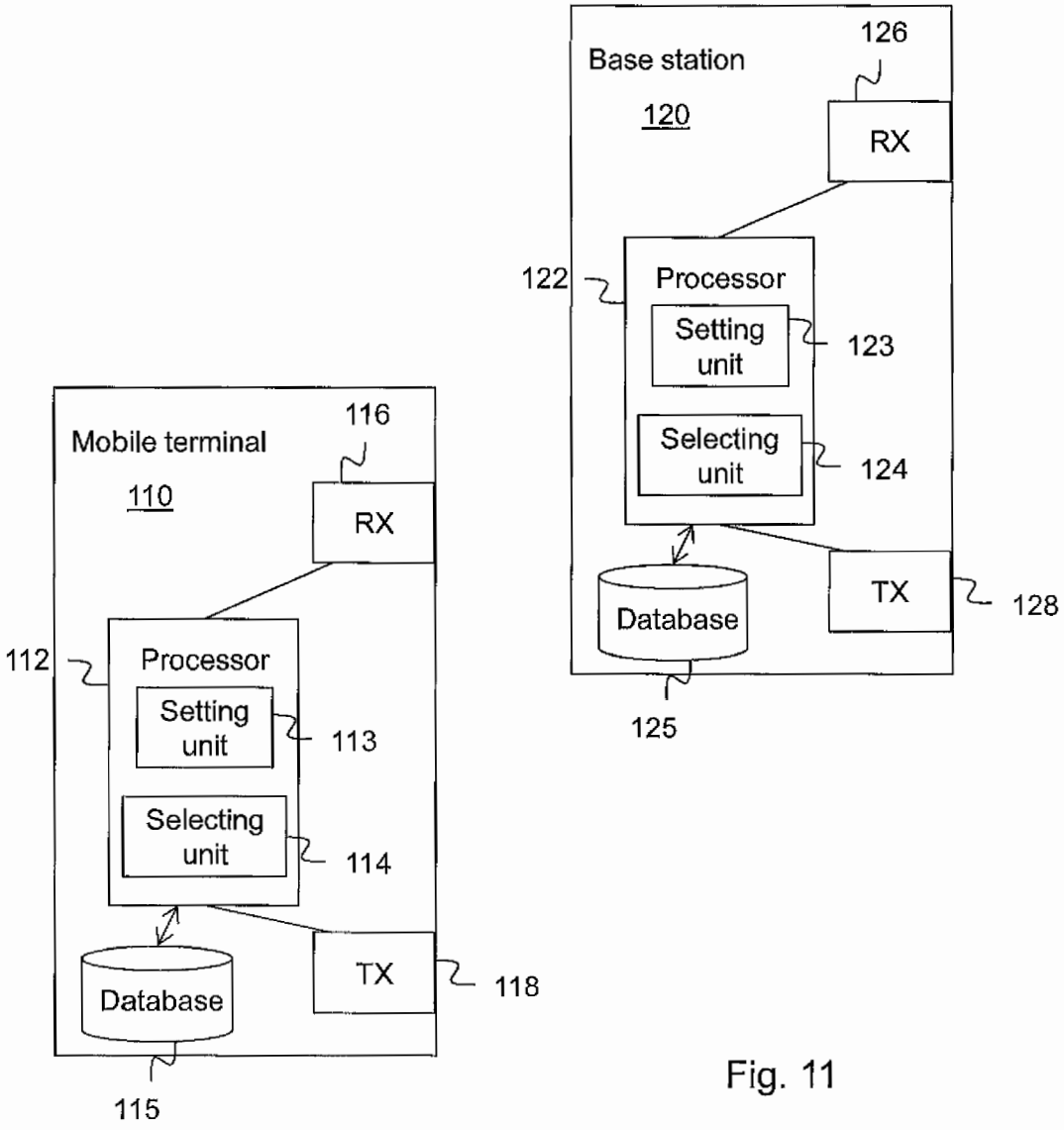


Fig. 11

NJOY Exhibit 1002.2403

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/070810

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H04W, H04L, H04Q, H04J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CPRSABS, CNTXT, CNKI, VEN: terminal equipment, UE, base station, BS, eNodeB, eNB, user equipment, discontinuous reception, DRX, random access, preamble

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO2010111820A1 (HUAWEI TECHNOLOGIES CO LTD) 07 Oct. 2010 (07.10.2010) see description page 5 lines 9-10, 21-22 and page 6 lines 9-10	1, 2, 11, 12, 19, 20, 25, 26
A	The same as above	3-10, 13-18, 21-24, 27-30
A	CN102300297A (DATANG MOBILE COMMUNICATIONS EQUIP CO) 28 Dec. 2011 (28.12.2011) the whole document	1-30

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06 Jan. 2013 (06.01.2013)	**31 Jan. 2013 (31.01.2013)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer SUN, Changlu Telephone No. (86-10)62411435

Form PCT/ISA /210 (second sheet) (July 2009)

NJOY Exhibit 1002.2404

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/070810

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
WO2010111820A1	07.10.2010	CN102246573 A	16.11.2011
CN102300297A	28.12.2011	NONE	

Form PCT/ISA /210 (patent family annex) (July 2009)

NJOY Exhibit 1002.2405

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/070810

A. CLASSIFICATION OF SUBJECT MATTER

H04W74/08 (2009.01) i

H04W52/02 (2009.01) i

NJOY Exhibit 1002.2406

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 October 2013 (31.10.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/159245 A1

(51) International Patent Classification:
A24F 47/00 (2006.01)

(21) International Application Number:
PCT/CN2012/000562

(22) International Filing Date:
26 April 2012 (26.04.2012)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **RUYAN INVESTMENT (HOLDINGS) LIMITED** [GB/GB]; Beaufort House, P.O. Box 438, Road Town, Tortola (VG).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **HON, Lik** [CN/CN]; Room1101, 11/F, China United Centre, 28 Marble Road, North Point, Hong Kong (CN).

(74) Agent: **BEIJING JANLEA PATENT AGENCY CO., LTD.**; 15th Floor, Tower A, Wuhua Mansion, A4 Chegongzhuang Avenue, Xicheng District, Beijing 100044 (CN).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: ELECTRONIC CIGARETTE WITH SEALED CARTRIDGE

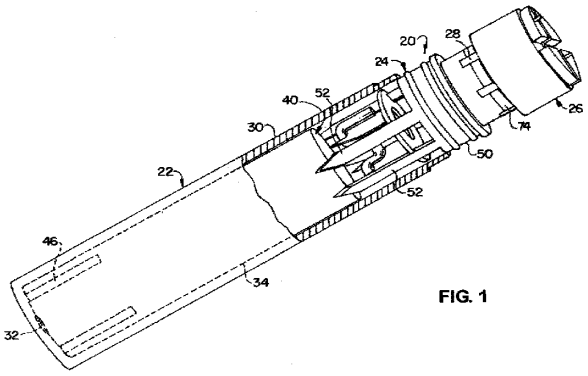


FIG. 1

(57) **Abstract**: An electronic cigarette (20) comprises separate cartridge unit (22) and vaporizer unit (24). The cartridge unit (22) may have a cartridge tube (34) containing a liquid with a seal (38) sealing the liquid within the cartridge tube (34). The vaporizer unit (24) may have a piercer (64) and a heater (66), with the front side of the vaporizer unit (24) moveable into engagement with the cartridge unit (22), causing the piercer (64) to pierce the seal (38) in preparation for use of the electronic cigarette (20). A battery may be connected to a back side of the vaporizer unit (24). The vaporizer unit (24) may also have an electronic circuit (62) electrically connected to the heater (66) and to an inhalation sensor (78).

WO 2013/159245 A1

NJOY Exhibit 1002.2407

ELECTRONIC CIGARETTE WITH SEALED CARTRIDGE

BACKGROUND OF THE INVENTION

[0001] Electronic cigarettes or vapor inhalers generally use a heater to vaporize liquid nicotine, or other liquid substances. The user inhales on the electronic cigarette drawing ambient air through the electronic cigarette housing. The vapor or mist mixes with the air flow moving through the housing and is inhaled by the user.

[0002] In comparison to real tobacco cigarettes, electronic cigarettes have many advantages. The risks of lung cancer associated with real tobacco cigarettes is largely avoided with electronic cigarettes because the tar and other chemicals in tobacco linked to lung cancer are not present in an electronic cigarette. Electronic cigarettes generate vapor or mist, and not smoke. Consequently, there is no comparable second-hand smoke problem with use of electronic cigarettes. In addition, since there is no burning material in electronic cigarettes, the risk of fire is eliminated.

[0003] The liquid in electronic cigarettes is stored in a bottle or in absorbent material within the housing. During storage and handling, the liquid may leak due to vibration, temperature variations, and other factors. The liquid may also be negatively affected by exposure to the environment. Accordingly, there is a need for an improved electronic cigarette.

SUMMARY OF THE INVENTION

[0004] In a new electronic cigarette, separate cartridge and vaporizer units are provided. The cartridge unit has a cartridge tube containing a liquid with a seal sealing the liquid within the cartridge tube. The vaporizer unit may have a piercer and a heater, with the front side of the vaporizer unit moveable into engagement with the cartridge unit, causing the piercer to pierce the seal in preparation for use of the electronic cigarette. A battery may be connected to a back side of the vaporizer unit via a connector. The vaporizer unit may also have and an electronic circuit electrically connected to the heater and to an inhalation sensor, or a switch activated by the user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] In the drawings, the same reference number indicates the same element in each of the views.

[0006] Fig. 1. is a perspective view of a new electronic cigarette.

[0007] Fig. 2 is a section view of the electronic cigarette shown in Fig. 1.

[0008] Fig. 3 is a perspective section view of the electronic cigarette shown in Fig. 1.

[0009] Fig. 4 is an enlarged perspective view of the vaporizer assembly shown in Figs. 1-3.

[0010] Fig. 5 is an enlarged perspective view of the vaporizer plate shown in Fig. 4.

[0011] Fig. 6 is an enlarged perspective view of the arm base shown in Figs. 1 and 3.

[0012] Fig. 7 in a perspective view of the cartridge tube shown in Figs. 1-3.

[0013] Fig. 8 is a perspective section view showing the arm base of Fig. 6 positioned in the over tube of Figs. 1-3, in a ready-to-use position.

DETAILED DESCRIPTION

[0014] As shown in Fig. 1 an electronic cigarette 20 has a cartridge unit 22, a vaporizing unit 24 and a connector 26. As shown in Figs. 1-3, the cartridge unit 22 includes an overtube 30 having an outlet 32 at the front end. A cartridge tube 34 within the overtube 30 has a closed front end and an open back end 40. Fiber material 36 containing a liquid, such as liquid nicotine, is sealed within the cartridge tube 34 by a foil or membrane seal 38 at the back end of the cartridge tube 34. The closed front end of the cartridge tube may be spaced apart from the front wall of the overtube 30 by standoffs 46.

[0015] As shown in Figs. 2 and 3, a flow path 44 is formed between the cartridge tube 34 and the over tube 30. As shown in Fig. 7, the cartridge tube may have flat sides so that crescent shaped flow paths are formed between the cartridge tube 34 and the over tube 34 when the cartridge tube is inserted into the over tube.

NJOY Exhibit 1002.2409

Alternatively, various other cartridge tube shapes may be used to provide one or more flow paths between the cartridge tube and the over tube. Although the Figures show the cartridge tube 34 centered within the overtube 30, in some designs, it may also be offset to one side. Inserts or baffles may also be used inside the overtube to create various other flow path shapes and configurations.

[0016] Turning to Figs. 4 and 5, the vaporizing unit 24 may have one or more piercing blades 64 attached to a plate 58 having a through hole 60. A heater tube 90 may be supported on cutouts in the blades 64. The heater tube may be made of quartz fiber, or other high temperature resistant wicking or absorbent material. A central section of the heater tube 90 extends within a heater coil 66. As shown in Figs. 1-3, 6 and 8, arms 52 are attached to the front side of an arm base 50, with socket slots 54 on the back side of the arm base 50. The tips of the arms are tapered into wedges 53. The design shown has four arms, although more or less arms may be provided as well. With the plate 58 assembled onto the arm base 50, the arms 52 may lie in recesses 59 in the plate 58, with the through hole 60 in the plate aligned with a corresponding through hole in the arm base 50. The wire lead of the heating coil 66 may connect to a circuit board or electronic chip directly or indirectly. It is also possible to connect the ends of the heating coil 66 to the blades 64, and with the blades electrically connected to the circuit board or electronic chip, which may be included in or on the plate 58, or located at another position within electronic cigarette 20.

[0017] As shown in Figs. 1 and 8, the connector 26 may have rings 28 that can plug into the slots 54 on the back side of the arm base 50. Alternatively, the connector 26 may screw or snap onto the vaporizing unit 24. The back end of the connector 26 is adapted to receive or plug into a battery 82.

[0018] As shown in Fig. 8, the arm base 50 has first and second spaced apart detent rings 96 and 98 adapted to snap into first and second semicircular grooves at the back end of the arm base. In the first detent position, the detent ring 96 is in the outer groove, closest to the back end of the arm base 50. In this position, the blades 64 are held away from the seal 38 on the cartridge tube 34. The electronic cigarette 20 is provided from the factory in this position. Consequently, the cartridge tube 34 remains sealed during shipping and storage. This avoids any leaking or evaporation of liquid, for example nicotine solution, from the cartridge tube during shipping and

NJOY Exhibit 1002.2410

storage. In addition, since the detent ring 96 firmly holds the arm base in position on the over tube 30, the seal 38 remains intact even with the vibration and shock impulses that typically occur during shipping and handling.

[0019] Turning once again to Figs. 1-3 and 8, when ready for use, the arm base 50 is pushed forward into the over tube 30, causing it to move into the position shown in Fig, 8. During this movement, the first detent ring 96 moves from the outer groove into the inner groove. The optional second detent ring 98, previously outside of the over tube 30, correspondingly moves into the outer groove. This longitudinal movement of the arm base 50 drives the front end of vaporizing unit 24 through the seal 38, with the heater tube 90 moving into the cartridge tube 34, as shown in Fig. 8. The spacing between the outer groove and the inner groove consequently determine the depth of insertion of the heater tube 90 into the fiber core 36 of the cartridge tube 34.

[0020] When the arm base 50 is pushed forward into the over tube 30, as described above, the wedge ends 53 on the arms move between the cartridge tube 34 and the inner walls of the over tube 30, to firmly hold the cartridge tube in place. At the same time, the blades 64 pierce and cut through the seal 38 and the heater tube 90 moves by the pre-set distance into the cartridge tube. As shown in Fig. 8. the heater tube 90 is then in direct contact with the liquid filled or liquid impregnated core 36 of the cartridge tube 34. Liquid from the core 36 wicks or otherwise moves into or onto the heater tube 90.

[0021] As shown in Fig. 8, the arm base 50 may include an annular ring chamber 102 around a chamber tube 104. After the seal is pierced, any liquid leaking out of the cartridge tube may collect in the ring chamber 102, rather than travel back through the chamber tube 104 to the battery. Similarly, as shown in Fig. 2, an annular liquid barrier 106 may be provided around the inlet 32 on the inner wall of the front end of the over tube 30, to help prevent any liquid from moving out of the inlet 32.

[0022] A battery is attached onto the connector 26, either before or after the forward piercing movement. The battery is electrically connected to the circuit board 62 via the metal rings on the connector 26 plugging into the sockets 54 having leads to the circuit board 62.

NJOY Exhibit 1002.2411

[0023] The user inhales on the front end of the overtube 30, drawing air out of the outlet 32. Air flows through the continuous central opening in the connector 26 and in the vaporizing unit 24. A sensor 78 shown in Fig. 8, either on or electrically connected to the circuit board 62, may be used to detect air flow through the central passageway in the vaporizing unit 24. Upon detection of air flow, the circuit board 62 switches on electric current to the heater coil 66. Alternatively, as shown in Fig. 8, a manual switch 82 may be provided on base, with the user activating the switch to turn the heater on while the user is inhaling. Liquid from the cartridge tube 34 is vaporized and mixed with the flowing air. The mixture of vapor and/or mist and air moves forward through the flow path 44, through the outlet 32, and is inhaled by the user.

[0024] As shown in Fig. 3, there is no opening at the front end of the cartridge tube 34. Accordingly, air cannot flow through the cartridge tube. Rather, upon inhalation, as shown by the arrows in Fig. 8, air flows through the vaporizing unit 24, but not through the cartridge tube 34. This makes the electronic cigarette 20 much more resistant to liquid leaking resulting from blowing into the outlet. In many existing designs, if the user blows into the outlet, instead of inhaling, liquid leaking may increase dramatically. With the present design, however, blowing into the outlet does not cause any great increase in leaking, because it does not create any positive pressure acting to push liquid out of the cartridge tube.

[0025] The cartridge tube 34 may be filled with a liquid saturated fiber or sponge-like or porous material, or another material capable of holding liquid. The arm base 50 and the electrical contacts 74 on the back of the arm base may be copper or other electrically conductive metal. The arm base 50 and may also be made of plastic or ceramic, with separate wire leads provided to make electrical connections. The blades 64 or other piercer may be metal, such as stainless steel, another metal, or a non-metal material such as plastic. A single blade or pointed piercer may be used. Optionally, the blades or piercer may be replaced by a projection on the heater tube 90, if used, or on the heater 66.

[0026] The blades 64 may optionally be attached to the arms 52, instead of the plate 58. The heater coil 66 may be a coil of wire, or other form of electrical heater, including heater wires in non-coil configurations. The seal 38 may be a metal foil seal,

NJOY Exhibit 1002.2412

or a seal of other material, such as plastic. The circuit board 62 may be replaced with an electronic chip or component package.

[0027] The cartridge unit 22, the vaporizing unit 24 and the connector 26 may be provided as separate units, or together in an un-assembled kit. With the cartridge unit 22 separate from the vaporizing unit 24, the seal 38 is intact and seals the liquid within the cartridge tube 34. This avoids leaking during storage and handling. The seal also seals the liquid from the environment, which may increase the storage life of the liquid. The vaporizing unit 24 is designed for repeated use, while the cartridge unit 22 is a consumable single use unit. By providing the cartridge unit 22 and the vaporizing unit 24 as separate units, the user can reuse the vaporizing unit 24 over and over again, while replacing the cartridge unit 22 as needed. The electronic cigarette 20 can therefore be provided at lower cost.

[0028] Thus, novel designs have been shown and described. Various changes and substitutions may of course be made without departing from the spirit and scope of the invention. The invention, therefore, should not be limited, except by the following claims and their equivalents.

NJOY Exhibit 1002.2413

CLAIMS

1. An electronic cigarette, comprising:

a cartridge unit including cartridge tube containing a liquid, and a seal on the cartridge tube sealing the liquid within the cartridge tube; and

a vaporizer unit having a piercer and a heater, with the vaporizer unit moveable into engagement with the cartridge unit, causing the piercer to pierce the seal.

2. The electronic cigarette of claim 1 further comprising a battery connected to the vaporizer unit.

3. The electronic cigarette of claim 1 with the vaporizer unit further including an electronic circuit electrically connected to the heater and to an inhalation sensor.

4. The electronic cigarette of claim 1 with the heater comprising a fiber heater tube and a wire coil around the heater tube.

5. The electronic cigarette of claim 1 with the vaporizer unit including arms attached to a base, with the arms having wedging tips for engaging the cartridge unit.

6. The electronic cigarette of claim 1 with the vaporizer unit having a base, with the piercer and the heater on a front side of the base, and a connector on the back side of the base, with the connector adapted to connect with a battery.

7. The electronic cigarette of claim 1 with the cartridge tube inside of an overtube and a flow path formed between the cartridge tube and the overtube, with the flow path leading to an outlet at a front end of the over tube.

8 The electronic cigarette of claim 1 further including a chamber tube extending into a ring chamber in the arm base, for trapping liquid.

9. An electronic cigarette, comprising:

a cartridge unit including cartridge tube containing a liquid, and a seal on the cartridge tube sealing the liquid within the cartridge tube;

NJOY Exhibit 1002.2414

a vaporizer unit having a piercer, a heater coil around a heater tube, and an electronic circuit electrically connected to the heater coil and to an inhalation sensor, with the vaporizer unit moveable from a first detent position wherein the heater tube is spaced apart from the seal, to a second detent position, wherein the heater tube is moved through the seal and into the cartridge unit; and

a connector attached to the vaporizer unit.

10. A cartridge unit for use with an electronic cigarette, comprising:

an overtube including an outlet at a front end of the overtube;

a cartridge tube within the overtube, the cartridge tube having a closed front end and an open back end;

a liquid saturated material within the cartridge tube;

a seal at the back end of the cartridge tube sealing the liquid saturated material within the cartridge tube; and

at least one air flow pathway between the overtube and the cartridge tube.

11. The cartridge unit of claim 10 with the material comprising fibers saturated with a nicotine solution.

12. A vaporizing unit for use in an electronic cigarette, comprising:

an arm base;

two or more arms on a front side of the base;

a heater between the arms; and

a piercer between the arms extending forward of the heater.

13. The vaporizing unit of claim 12 further including a circuit board on the base electrically linked to the heater.

14. The vaporizing unit of claim 13 further including a hole in the circuit board

NJOY Exhibit 1002.2415

aligned with the heater, and further including a flow sensor positioned to sense air flow past the heater.

15. The vaporizing unit of claim 14 further comprising a socket on a back side of the base adapted to connect with a battery.

16. The vaporizing unit of claim 12 further including a fiber heater tube supported on the piercer, and with the heater surrounding the heater tube.

17. The vaporizing unit of claim 12 further including a chamber tube extending into a ring chamber in the arm base, for trapping liquid.

NJOY Exhibit 1002.2416

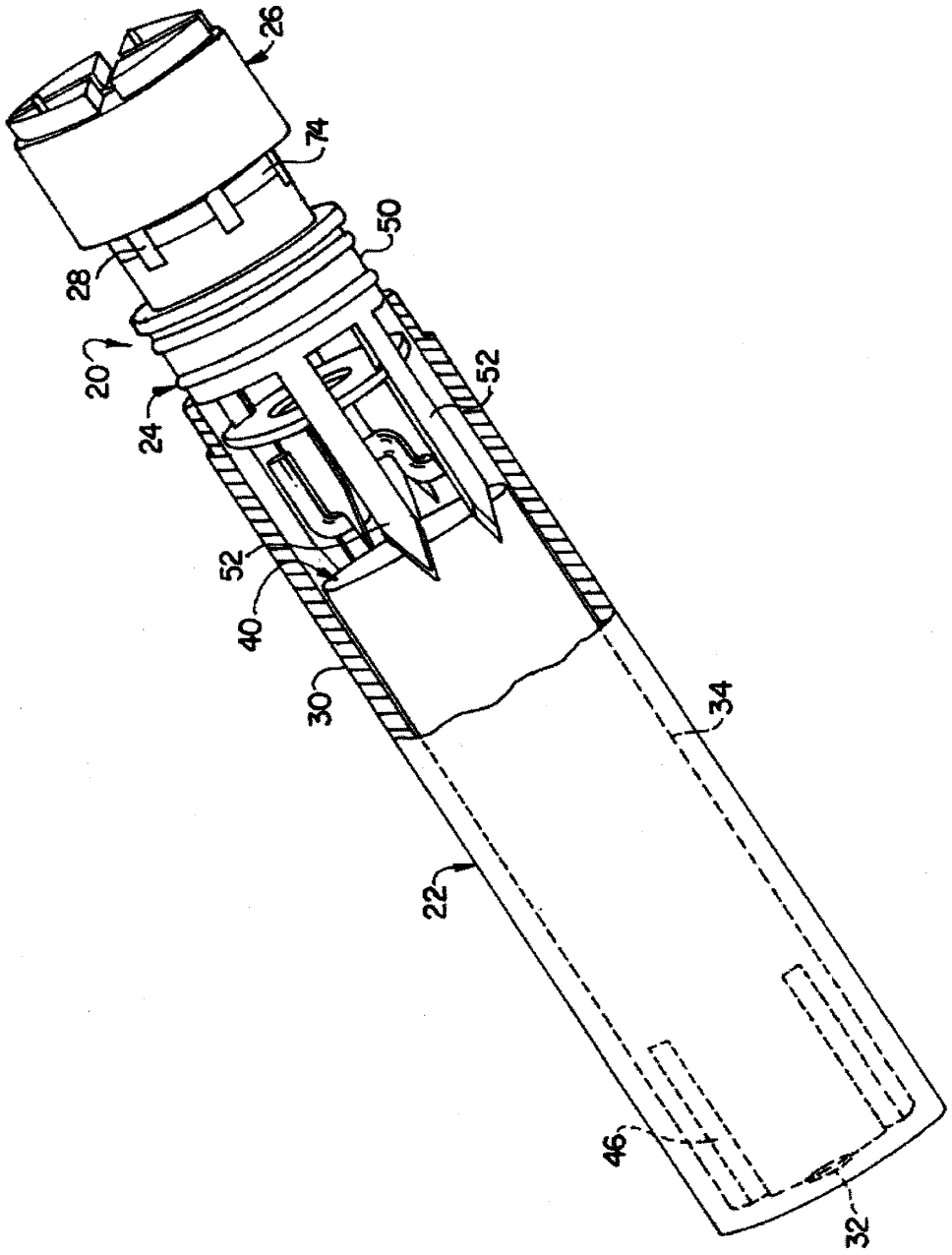


FIG. 1

NJOY Exhibit 1002.2417

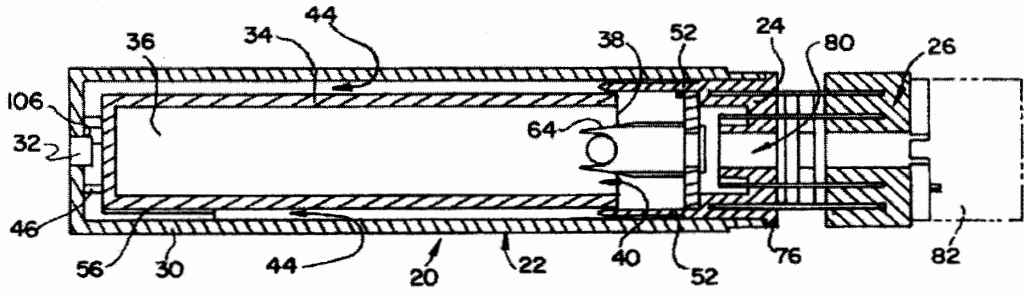


FIG. 2

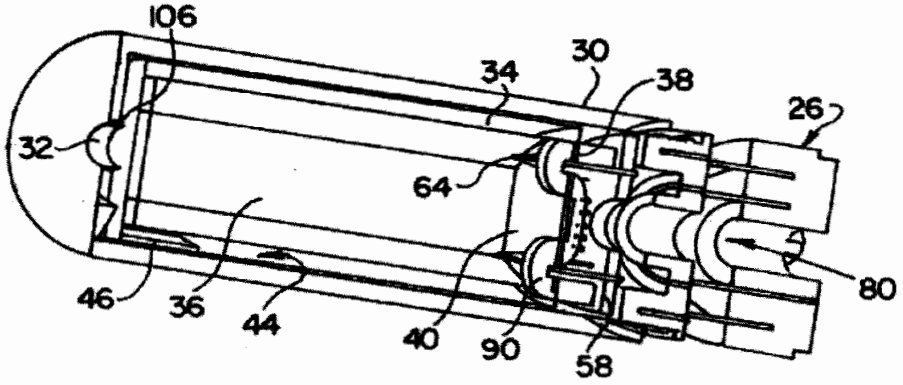


FIG. 3

NJOY Exhibit 1002.2418

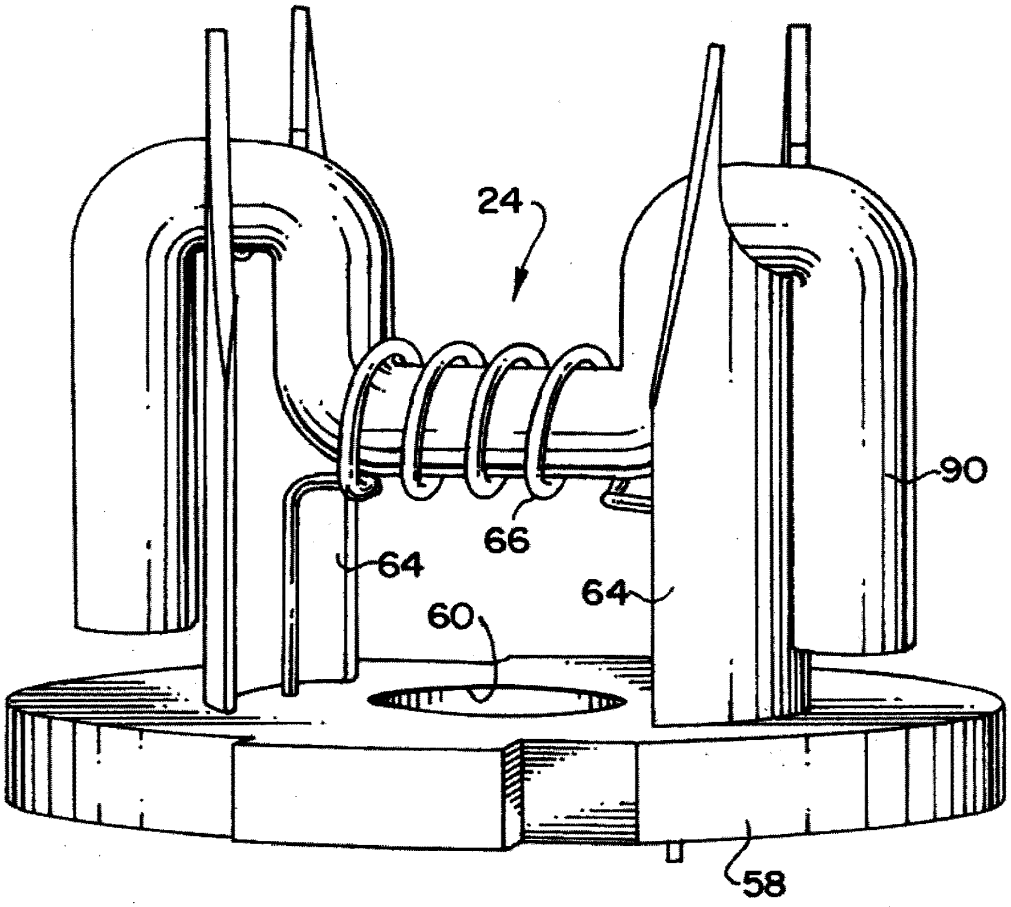


FIG. 4

NJOY Exhibit 1002.2419

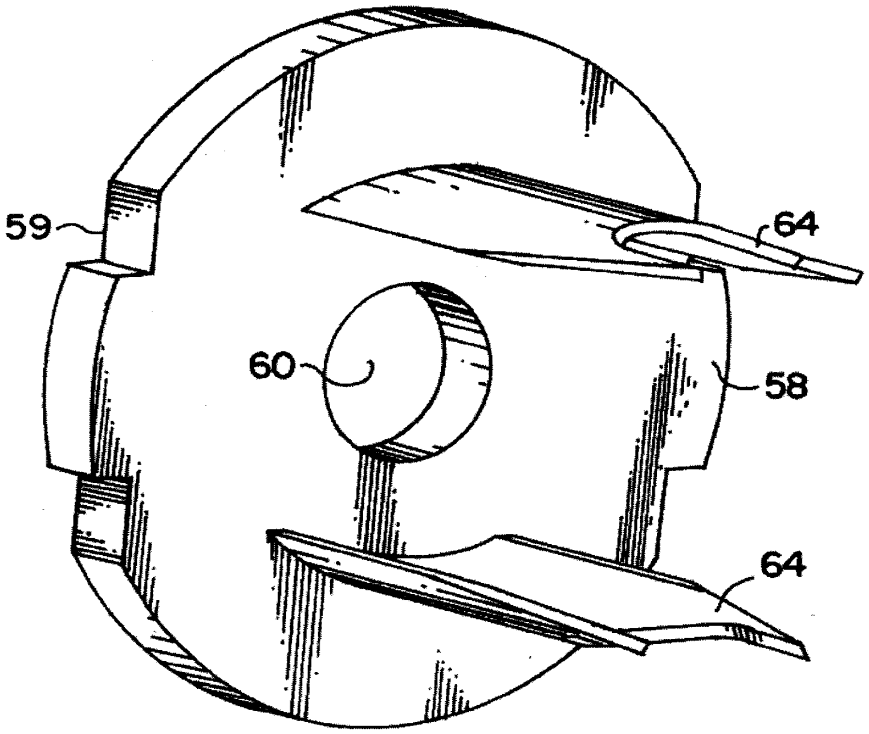


FIG. 5

NJOY Exhibit 1002.2420

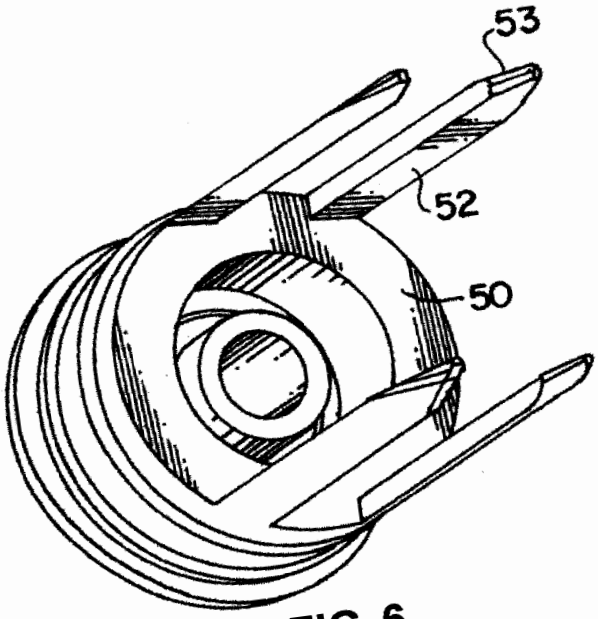


FIG. 6

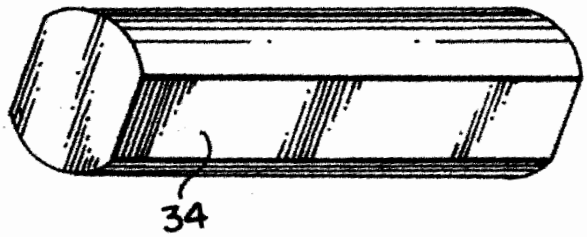


FIG. 7

NJOY Exhibit 1002.2421

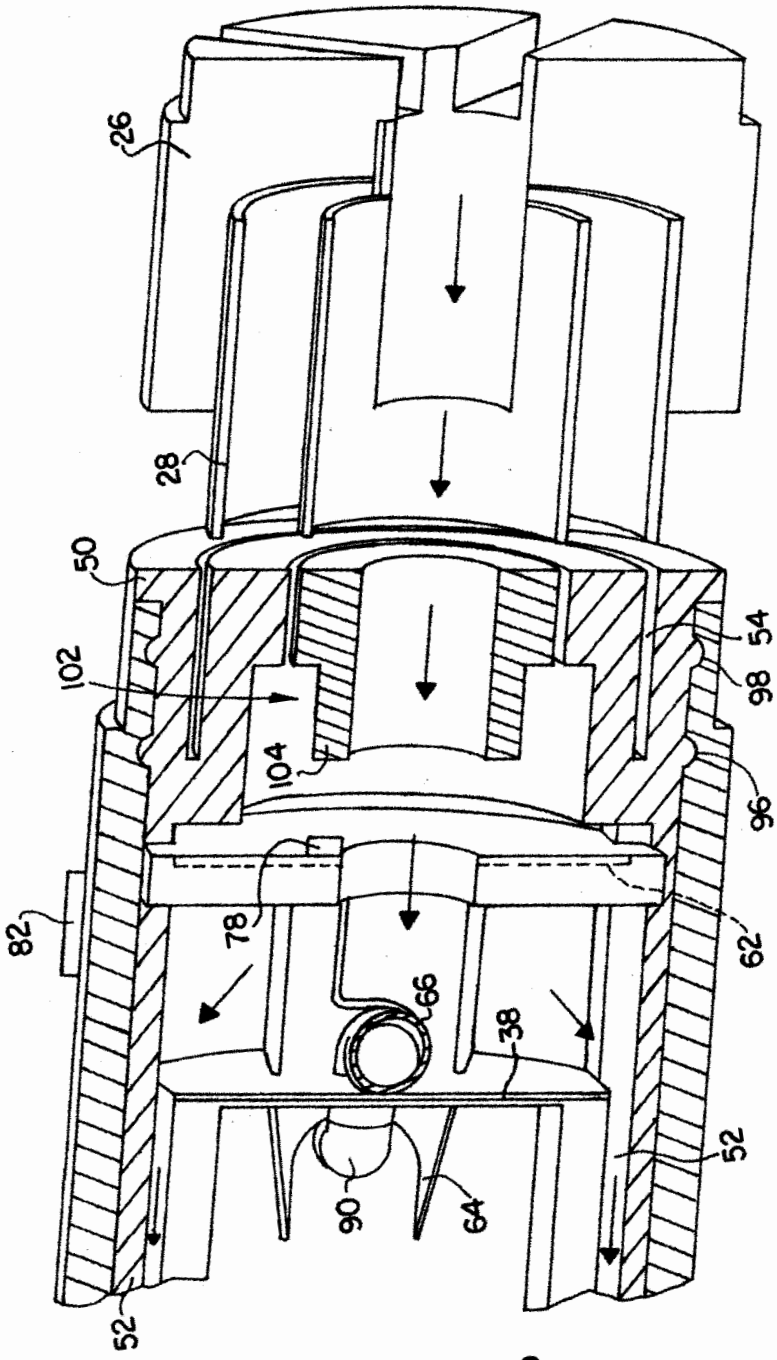


FIG. 8

NJOY Exhibit 1002.2422

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/000562

A. CLASSIFICATION OF SUBJECT MATTER

A24F47/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A24

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, WPI, EPODOC: MEMBRANE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN202052669U(WAN, Lilong),30 Nov.2011(30.11.2011), pages 2-4 of the description and figures 1-7	1-17
A	CN202197836U(MAAS, Bernard),25 Apr.2012(25.04.2012), the whole document	1-17
A	DE102007011120A1(BEL AIR INT CORP),11 Sep.2008(11.09.2008), the whole document	1-17

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 Jan.2013(10.01.2013)	**14 Feb. 2013 (14.02.2013)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer HE, Wen jing Telephone No. (86-10)62085686

Form PCT/ISA /210 (second sheet) (July 2009)

NJOY Exhibit 1002.2423

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/000562

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN202052669U	30.11.2011	None	
CN202197836U	25.04.2012	WO2009155734A1	30.12.2009
		US2011232654A1	29.09.2011
		EP2443946A1	25.04.2012
DE102007011120A1	11.09.2008	None	

NJOY Exhibit 1002.2424

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 November 2013 (21.11.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/171206 A1

(51) International Patent Classification:
A24F 47/00 (2006.01) *A61M 15/06* (2006.01)

(21) International Application Number:
PCT/EP2013/059932

(22) International Filing Date:
14 May 2013 (14.05.2013)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1208347.3 14 May 2012 (14.05.2012) GB

(71) Applicant: **BRITISH AMERICAN TOBACCO (NC) LIMITED** [GB/GB]; 4 Temple Place, London WC2R 2PG (GB).

(72) Inventor: **LORD, Christopher**; c/o British American Tobacco (NC) Limited, 4 Temple Place, London WC2R 2PG (GB).

(74) Agents: **READ, Matthew** et al.; Venner Shipley LLP, 20 Little Britain, London EC1A 7DH (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

WO 2013/171206 A1

(54) Title: ELECTRONIC VAPOUR PROVISION DEVICE

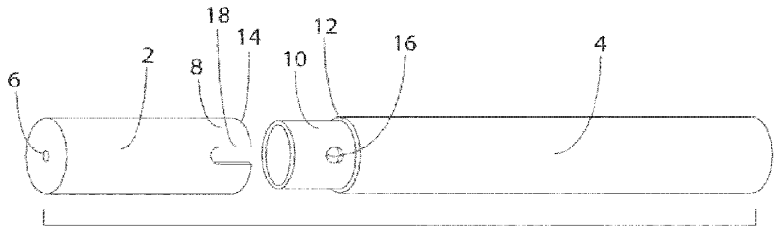


Figure 1

(57) Abstract: An electronic vapour provision device exemplified by an electronic cigarette comprises a body 4 and a mouthpiece 2, where the body 4 comprises a body connector 10, the mouthpiece 2 comprises a mouthpiece connector 8 and a store of liquid 33, and the mouthpiece connector 8 is connectable to the body connector 10 by an interference fit; wherein the mouthpiece 2 has a limited range of rotation about the longitudinal axis of the body 4 when connected to the body 4.

NJOY Exhibit 1002.2425

Electronic Vapour Provision Device

Field

The specification relates to an electronic vapour provision devices. More particularly, but not exclusively, the specification concerns electronic vapour provision devices in the form of an electronic cigarette.

Background

So-called smokeless cigarettes are typically cigarette-sized and function by allowing a user to inhale a nicotine vapour from a liquid store by applying a suction force to a mouthpiece. Some smokeless cigarettes have a separate cylindrical mouthpiece which can be pushed onto a body in any orientation and rotated freely relative to the body. Smokeless cigarettes include electronic cigarettes.

Summary

In an embodiment there is provided an electronic vapour provision device comprising a generally cylindrical body and a mouthpiece, where the body comprises a body connector, the mouthpiece comprises a mouthpiece connector and a store of liquid, and the mouthpiece connector is connectable to the body connector by an interference fit; wherein the mouthpiece has a limited range of rotation about the longitudinal axis of the body when connected to the body.

By limiting the range of rotation, the mouthpiece cannot be rotated freely relative to the body when connected to the body. When a mouthpiece is freely rotatable, a user who rotates the mouthpiece against the friction of the interference fit can cause damage to the connection means and break the device. Therefore, preventing this free rotation reduces the chances of potential damage.

The mouthpiece may be substantially not rotatable relative to the body when connected to the body.

If the mouthpiece cannot be rotated once connected, this further reduces the chances of damage.

NJOY Exhibit 1002.2426

The mouthpiece can be releasably-connectable to the body.

Having a mouthpiece that is releasably-connectable enables the mouthpiece to be replaced without replacing the entire device, causing less wastage. Also, a mouthpiece with a limited range of rotation can only be applied in particular configurations.

Where the mouthpiece is positioned in a fixed position relative to the body, the electronic vapour provision device can be advantageously configured. In an electronic vapour provision device having a vaporiser, where the vaporiser part is connected to the mouthpiece and a liquid bottle is contained in the mouthpiece, the vaporiser part becomes in fluid communication with the liquid bottle when the mouthpiece is connected. By fixing the position of the mouthpiece relative to the vaporiser, a preferable orientation can be selected which provides optimum alignment.

Fixing the position of the mouthpiece relative to the body has the advantage of enabling the mouthpiece to be connected to the body by the user in an orientation predefined by the manufacturer. Thus alignment features such as surfaces and printing can be aligned properly.

The body connector can comprise a body protuberance and the mouthpiece connector can comprise a mouthpiece receiving portion configured to receive the body protuberance.

Having a body protuberance has the advantage that it requires the mouthpiece to have a receiving portion. Generic mouthpieces without such a receiving portion will therefore not connect correctly to the body. The mouthpieces may also not have an airtight seal. This enables the manufacturer to control which mouthpieces can be used with the device, to control the quality and therefore improve the safety of the device.

The mouthpiece receiving portion may be a mouthpiece wall opening. Alternatively, the mouthpiece receiving portion may be a mouthpiece wall indentation. Alternatively, the mouthpiece receiving portion may be a mouthpiece wall flexible portion. Alternatively, the mouthpiece receiving portion may be a mouthpiece wall raised portion.

NJOY Exhibit 1002.2427

The mouthpiece connector can comprise a mouthpiece edge and the body connector can comprise a body edge, configured such that mouthpiece edge abuts the body edge when connected.

The body edge may comprise the body protuberance. Furthermore, the mouthpiece edge may comprise the mouthpiece receiving portion.

Alternatively, the mouthpiece connector may comprise a mouthpiece protuberance and the body connector may comprise a body receiving portion configured to receive the protuberance.

A mouthpiece edge may comprise the mouthpiece protuberance and a body edge may comprise the body receiving portion.

The body connector and mouthpiece connector may comprise non-circular cross sections.

Having non-circular cross sections has the advantage that it requires a mouthpiece with a non-circular cross section. Generic mouthpieces with a circular cross section will therefore not attach correctly to the body. The mouthpieces will also not have an airtight seal. This enables the manufacturer to control which mouthpieces can be used with the device, to control the quality and therefore improve the safety of the device.

The body can comprise one or more connected modules. Furthermore, the body can comprise a vaporiser module and a battery assembly module; where the battery assembly module comprises a power cell and an airflow sensor and the vaporiser module comprises a vaporiser. Moreover, the vaporizer module may be releasably-attachable to the battery assembly module. The body connector may form part of the vaporiser.

The body may further comprise a securing ring, the securing ring may comprise a securing ring edge and the securing ring edge may comprise the body edge.

This has the advantage that the securing ring is a part added to the device during manufacturing and containing the protuberance. Adding the protuberance to the

NJOY Exhibit 1002.2428

single securing ring part provides an easy method of manufacturing a device with a body protuberance.

The electronic vapour provision device may comprise an electronic cigarette.

In another embodiment there is provided a smokeless cigarette comprising a cigarette body and a mouthpiece, wherein the cigarette body comprises a cigarette body connection means, the mouthpiece comprises a mouthpiece connection means and the mouthpiece connection means is attachable to the cigarette body connection means by an interference fit; wherein the mouthpiece has a limited range of rotation about the longitudinal axis of the cigarette relative to the cigarette body when connected to the cigarette body.

As used herein, the term vapour includes an aerosol and other fluid streams for provision to a user by the electronic vapour provision device.

Brief Description of the Drawings

For a better understanding of the disclosure, and to show how example embodiments may be carried into effect, reference will now be made to the accompanying drawings in which:

Figure 1 is an exploded side perspective view of an electronic vapour provision device having separated mouthpiece and body, with a raised body protuberance;
Figure 2 is a side perspective view of the device of Figure 1 with connected mouthpiece and body;
Figure 3 is a side perspective view of a mouthpiece having an edge indentation;
Figure 4 is a side perspective view of a mouthpiece having a flexible portion;
Figure 5 is a side perspective view of a mouthpiece having a wall opening;
Figure 6 is a side perspective view of a mouthpiece having a raised portion;
Figure 7 is an exploded side perspective view of an electronic vapour provision device having separated mouthpiece and body, with a raised elongated body protuberance;
Figure 8 is a side perspective view of the device of Figure 7 with connected mouthpiece and body;
Figure 9 is an exploded side perspective view of an electronic vapour provision device having separated mouthpiece and body, with an edge elongated body protuberance;

NJOY Exhibit 1002.2429

Figure 10 is a side perspective view of the device of Figure 9 with connected mouthpiece and body;

Figure 11 is an exploded side perspective view of an electronic vapour provision device having separated mouthpiece and body, with a mouthpiece receiving portion larger than a body protuberance;

Figure 12 is a side perspective view of the device of Figure 11 with connected mouthpiece and body in a first position;

Figure 13 is a side perspective view of the device of Figure 11 with connected mouthpiece and body in a second position;

Figure 14 is an exploded side perspective view of battery assembly and vaporiser with a securing ring on the vaporiser having a body edge protuberance;

Figure 15 is a side perspective view of Figure 14 with connected battery assembly and vaporiser;

Figure 16 is a side perspective view of a body with body receiving portion;

Figure 17 is a side perspective view of a mouthpiece with mouthpiece protuberance;

Figure 18 is a side perspective view of a body with square cross section connection means;

Figure 19 is a side perspective view of a mouthpiece with inner square cross section and outer circular cross section;

Figure 20 is a side perspective view of a mouthpiece with inner square cross section and outer square cross section;

Figure 21 is a side perspective view of a body with hexagonal cross section connection means;

Figure 22 is a side perspective view of a mouthpiece with inner hexagonal cross section and outer circular cross section;

Figure 23 is a side perspective view of a mouthpiece with inner hexagonal cross section and outer hexagonal cross section; and

Figure 24 is a schematic sectional view of an electronic vapour provision device;

Figure 25 is a partially exploded schematic sectional view of the device of Figure 24;

Figure 26 is a schematic sectional view of another electronic vapour provision device; and

Figure 27 is a partially exploded schematic sectional view of the device of Figure 26.

Detailed Description

NJOY Exhibit 1002.2430

Referring to Figures 1 to 3 of the accompanying drawings there is shown an electronic vapour provision device in the form of a smokeless cigarette having a mouthpiece 2 and a body 4. The smokeless cigarette has a shape similar to that of a conventional cigarette and the outer forms of the mouthpiece 2 and body 4 are therefore substantially cylindrical. The mouthpiece 2 has an airflow outlet 6 at one end and a mouthpiece connector 8 at the other. The body 4 has a tip at one end and a body connector 10 at the other. The mouthpiece 2 is shaped like a hollow cylinder, open at one end, the mouthpiece connector end. The closed end has an aperture being the airflow outlet 6. The cylindrical wall of the mouthpiece 2 is herein referred to as the mouthpiece wall. The mouthpiece connector 8 therefore comprises the region at the open end of the cylindrical of the mouthpiece 2. Moreover, the mouthpiece connector 8 is configured to receive the body connector 10 so as to form the connection between the body 4 and the mouthpiece 2.

The body 4 is substantially cylindrical. The body connector 10 comprises a region of reduced diameter at a first end of the body 4 and is therefore also substantially cylindrical. Moreover, the body connector 10 is configured to fit within the mouthpiece connector 8, having an outer diameter slightly larger than the inner diameter of the mouthpiece 2. Thus, the mouthpiece 2 can be pushed onto the body 4 and the difference between the inner diameter of the mouthpiece connector 8 and the outer diameter of the body connector 10 causes friction between the two connectors and acts as an interference fit. The friction is such that when pushed together, the two parts remain attached throughout use of the device. The friction is also such that the parts can be separated by pulling apart when required.

The outer diameter of the mouthpiece 2 is equal to the outer diameter of the body 4 such that the outer surfaces of the two parts are substantially flush with one another when the parts are connected. A body edge 12 is defined connecting the surface of the body connector 10 to the outer surface of the body 4. In other words, the reduction in the outer diameter of the body 4 at the body connector 10 comprises a step change in the outer diameter, which comprises the body edge 12. The mouthpiece 2 has a mouthpiece edge 14 being the edge of the cylinder at the open end. When the mouthpiece 2 is connected to the body 4, the mouthpiece edge 14 abuts the body edge 12, as shown in Figure 2.

NJOY Exhibit 1002.2431

The body connector 10 comprises a body protuberance 16 and the mouthpiece connector 8 comprises a mouthpiece receiving portion 18, wherein the mouthpiece receiving portion 18 is configured to receive the body protuberance 16 during connection of the body 4 and the mouthpiece 2.

The body protuberance 16 comprises a raised hemispherical bump on the surface of the region of reduced outer body diameter of the body connector. The mouthpiece 2 has a mouthpiece receiving portion 18 comprising a U-shaped indent, recess or cut-out in the mouthpiece wall leading back from the mouthpiece edge 14. The mouthpiece receiving portion 18 therefore comprises an indent in the mouthpiece 2 in a direction parallel to the longitudinal axis of the mouthpiece 2. The width, or circumferential extent, of the recess of the mouthpiece receiving portion 18 is substantially equal to the width, or circumferential extent, of the hemispherical bump of the body protuberance 16. The mouthpiece 2 can therefore only be fitted to the body 4 when the mouthpiece receiving portion 18 is aligned with the body protuberance 16. So, whilst the body connector 10 and the mouthpiece connector 8 are substantially cylindrical and the frictional force between the parts is such that the parts can be moved relative to one another, the mouthpiece 2 is prevented from being rotated relative to the body 4 due to the interaction of the body protuberance 16 and the mouthpiece receiving portion 18.

Figures 4 to 6 show alternative example mouthpieces to the mouthpiece shown in Figures 1 to 3, wherein the mouthpiece receiving portion 18 is altered.

Figure 4 shows a mouthpiece 2, wherein the mouthpiece receiving portion 18 is a flexible portion of the cylindrical wall of the mouthpiece 2. The mouthpiece connector 8 comprises a pair of splits in the wall of the mouthpiece 2 leading from the mouthpiece edge 14, defining a flexible portion of the mouthpiece wall between the splits. The mouthpiece 2 is configured to be connected to the body 4 by aligning the flexible portion with the body protuberance 16 and pushing the mouthpiece 2 onto the body 4 so that the flexible portion flexes on top of the body protuberance 16, therein receiving the body protuberance 16. The flexible portion of the mouthpiece receiving portion18 is therefore flexible in a direction perpendicular to the longitudinal axis of the mouthpiece 2.

NJOY Exhibit 1002.2432

In Figure 5, the mouthpiece receiving portion 18 comprises a wall opening, being a circular hole in the cylindrical wall of the mouthpiece, near to the mouthpiece edge 14. The wall opening is configured to at least partially receive the body protuberance 16. The mouthpiece 2 is therefore configured to be connected to the body 4 by aligning the hole with the body protuberance 16 and pushing the mouthpiece 2 onto the body 4 until the raised protuberance 16 is located within the hole.

In Figure 6, the mouthpiece receiving portion 18 comprises a raised wall portion, wherein a region of the mouthpiece wall and mouthpiece edge 14 has a radius larger than the radius of the remaining mouthpiece wall and edge to create the raised wall portion. In other words, the mouthpiece receiving portion 18 comprises a region of the mouthpiece wall extending back from the mouthpiece edge 14 comprising an outward radial deviation of the mouthpiece wall, forming a channel in the inner surface of the mouthpiece 2. Alternatively, the mouthpiece receiving portion 18 may be described as a mouthpiece wall raised portion which is raised in a direction perpendicular to the longitudinal axis of the mouthpiece 2. The channel is approximately parallel with the cylindrical axis of the mouthpiece 2 and is configured to receive the body protuberance 16. The raised wall portion runs part way down the length of the mouthpiece 2 and is a raised bump on the surface. The mouthpiece 2 is configured to be connected to the body 4 by aligning the raised wall portion, or channel, with the body protuberance 16 and pushing the mouthpiece 2 onto the body 4 until the raised portion covers the body protuberance 16.

Figures 7 and 8 show another example of an electronic vapour provision device in the form of a smokeless cigarette, similar to that of Figures 1 to 3. The difference is that the body protuberance 16 is elongated in a direction parallel to the lengthwise direction of the cigarette. The mouthpiece 2 is configured to be connected to the body 4 by aligning the mouthpiece receiving portion 18 with the body protuberance 16.

Figures 9 and 10 show another example of an electronic vapour provision device in the form of a smokeless cigarette, similar to that shown in Figures 1 to 3. The difference is that the body protuberance 16 extends longitudinally along the region of reduced body diameter of the body from the body edge 12 and is a flat U-shaped raised portion configured to be received by the profile of the U-shaped indent of the mouthpiece receiving portion 18 in the mouthpiece wall. In this sense, the profile of the body protuberance 16 can alternatively be described as finger-shaped. The mouthpiece 2 is

NJOY Exhibit 1002.2433

connected to the body 4 by aligning the body U-shaped raised portion with the U-shaped indent. The edge profile of the U-shaped raised portion matches the edge profile of the U-shaped indent such that the outer surfaces of the mouthpiece 2 and the body 4 are flush, level and at least substantially without gaps when connected. Another way of describing this is that the body edge 12 comprises the body protuberance 16 and the mouthpiece edge 14 comprises the mouthpiece receiving portion 18.

Figures 11 to 13 show another example of an electronic vapour provision device in the form of a smokeless cigarette, similar to that shown in Figures 9 and 10. However, the width of the U-shaped mouthpiece indent is wider than the width of the U-shaped raised portion of the body 4. Therefore the mouthpiece 2 can be attached to the body 4 such that the mouthpiece 2 can be rotated slightly, the U-shaped portion being moveable between the extremes of the U-shaped indent. Figure 12 shows the mouthpiece 2 connected to the body 4 in a first position with a first side of the U-shaped portion in contact with a first inner side of the U-shaped indent. In Figure 13, a second side of the U-shaped portion is in contact with a second inner side of the U-shaped indent.

Figures 14 and 15 show another example of an electronic vapour provision device in the form of a smokeless cigarette. Only the body 4 is shown, however the mouthpiece 2 may for example be substantially as described with reference to the smokeless cigarette of Figures 9 and 10. Moreover, the mouthpiece 2 comprises a store of liquid. This smokeless cigarette is an electronic cigarette and the body 4 comprises a vaporiser module 20 and a battery assembly module 22. The vaporiser module 20 can be connected to and disconnected from the battery assembly module 22. Both the vaporiser module 20 and the battery assembly module 22 are cylindrical in shape, and of the same cylindrical diameter. Moreover, the vaporiser module 20 is configured to connect to the battery assembly module 22 such that the cylindrical forms of both modules are substantially coaxial and flush with each other. The vaporiser module 20 comprises a heater coil 24, a mesh wick 26 and a securing ring 28. The securing ring 28 comprises a hollow cylindrical ring configured to fit tightly around the other components of the vaporiser module 20 so as to secure them together. In this way, the securing ring 28 provides the cylindrical outer surface of the vaporiser module 20. The battery assembly module 22 comprises a power cell and an airflow sensor. When connected, the vaporiser module 20 is situated at the end of the body 4 where the

body connector 10 is located and therefore the body connector 10 forms part of the vaporiser module 20. Moreover, the vaporiser module 20 is configured such that, upon connection of the mouthpiece 2 to the body 4, a fluid communication is established between the mesh wick 26 of the vaporiser module 20 and the store of liquid of the mouthpiece 2. The body connector 10 is similar to that shown in Figures 9 and 10 where a body protuberance 16 extends from a body edge 12. In this example, the body edge 12 is an edge of the securing ring 28. The securing ring 28 therefore comprises a hollow ring with a protrusion 16 from an edge of the ring in a direction parallel with the cylindrical axis of the ring 28, and configured to be received by the mouthpiece receiving portion 16. The body protuberance 16 is configured to slot into the mouthpiece receiving portion 16 when connected, in a similar fashion to the example device described in relation to Figures 9 and 10.

Figures 16 and 17 show another example of an electronic vapour provision device in the form of a smokeless cigarette. In this example, the mouthpiece connector 8 comprises a mouthpiece protuberance 30, being a raised surface on the inside of the wall of the mouthpiece 2 and running from the mouthpiece edge 14 lengthwise. The mouthpiece protuberance 30 is therefore elongated in a direction parallel to the longitudinal axis of the mouthpiece 2. The body connector 10 comprises a body receiving portion 32, being an indent in the surface of the region of reduced body diameter of the body connector 10. The mouthpiece 2 is configured to be connected to the body 4 by aligning the mouthpiece protuberance 30 with the body receiving portion 32 and pushing the parts together so that the raised surface on the inside wall of the mouthpiece 2 slots into the indent on the surface of the body connector 10.

Alternatively, a mouthpiece edge 14 may comprise the mouthpiece protuberance 30 and a body edge 12 may comprise a corresponding body receiving portion 32. For example, the mouthpiece protuberance 30 may comprise a deviation of the mouthpiece edge 14 in a direction parallel to the cylindrical axis of the mouthpiece 2, forming an extension of the wall of the mouthpiece 2 towards the body 4.

Previous examples have shown the mouthpiece connector 8 and the body connector 10 comprising substantially circular cross sections. However, the body connector 10 and mouthpiece connector 8 may comprise non-circular cross sections. These cross sections may comprise regular shapes. For example, the cross sections may comprise regular polygons or can be square. Moreover, the cross sections may have a discrete

NJOY Exhibit 1002.2435

rotational symmetry. Alternatively, the cross sections may be irregular shapes and/or may have no rotational symmetry.

Figures 18 to 23 show examples of electronic vapour provision devices in the form of a smokeless cigarettes with non-circular connector cross sections.

Figures 18 to 20 show an example of an electronic vapour provision device in the form of a smokeless cigarette where instead of the body connector 10 comprising a cylindrical area of reduced outer body diameter configured to fit within the mouthpiece connector 8, the cross sectional shape of the body connector 10 in this area is square and the cross sectional shape of the inner wall of the mouthpiece connector 8 is square. As with the other examples, the mouthpiece 2 forms an interference fit with the body 4 where the parts are held together by frictional force when connected. In this example, the mouthpiece 2 has a rotational symmetry of four and can be connected to the body 4 in four different orientations. In Figure 19 the cross sectional shape of the outer surface of the mouthpiece 2 is circular. In Figure 20 the cross sectional shape of the outer surface of the mouthpiece 2 is square.

Figures 21 to 23 show an example of an electronic vapour provision device in the form of a smokeless cigarette where the cross sectional shape of the body connector 10 is hexagonal and the cross sectional shape of the inner wall of the mouthpiece connector 8 is hexagonal. As with the other examples, the mouthpiece 2 forms an interference fit with the body 4 where the parts are held together by frictional force when connected. In this example, the mouthpiece 2 has a rotational symmetry of six and can be connected to the body 4 in six different orientations. In Figure 22 the cross sectional shape of the outer surface of the mouthpiece 2 is circular. In Figure 23 the cross sectional shape of the outer surface of the mouthpiece 2 is hexagonal.

As illustrated by Figures 14 and 15, any of the electronic vapour provision devices described herein may be electronic cigarettes, wherein for example the liquid to be vaporised is stored in the mouthpiece. Examples of such electronic vapour provision devices in the form of electronic cigarettes are described below with reference to Figures 24 to 27.

Figure 24 shows a schematic sectional view of an electronic cigarette similar to the smokeless cigarette shown in Figures 9 and 10, wherein the body protuberance 16 and

mouthpiece receiving portion 18 are as is described with reference to the cigarette of Figures 9 and 10.

Figure 25 shows a partially exploded schematic sectional view of the electronic cigarette of Figure 24.

With reference to the electronic cigarette of Figures 24 and 25, the mouthpiece 2 further comprises a store of liquid 33 to be vaporised. For example this may comprise foam partially saturated with liquid. Moreover, the body 4 further comprises a vaporiser arrangement 34, a battery 35, a controller 36 and an airflow sensor 37.

For example, the vaporiser arrangement 34 may comprise a heater coil and a mesh wick.

The vaporiser arrangement 34 is located at least partly within the body connector 10 and is configured such that when the mouthpiece 2 is connected to the body 4, the vaporiser arrangement 34 becomes in fluid communication with the store of liquid 33 of the mouthpiece 2. For example, a mesh wick of the vaporiser arrangement 34 may become in fluid communication with the store of liquid 33.

The airflow sensor 37 is configured to sense airflow resulting from use of the electronic cigarette by a user.

The battery 35 supplies the vaporiser arrangement 34 and the airflow sensor 37 with power.

The controller 36 controls the battery 35, the airflow sensor 37 and the vaporiser arrangement 34. For example, the controller 36 may be configured to receive information from the airflow sensor 37 indicating that a user is operating the electronic cigarette and, in response to this, to provide power from the battery 35 to the vaporiser arrangement 34.

Figure 26 shows a schematic sectional view of another electronic cigarette similar to the smokeless cigarette shown in Figures 14 and 15, wherein the body connector 10 and mouthpiece connector 8 are as is described with reference to the cigarette of Figures 14 and 15.

Figure 27 shows a partially exploded schematic sectional view of the electronic cigarette of Figure 26.

With reference to the electronic cigarette of Figures 26 and 27, the mouthpiece 2 further comprises a store of liquid 33 to vaporised.

The battery assembly module 22 comprises a battery 35, a controller 36 and an airflow sensor 37.

The airflow sensor 37 is configured to sense airflow resulting from use of the electronic cigarette by a user.

The battery 35 supplies the vaporiser module 20, the controller 36 and the airflow sensor 37 with power. The controller 36 controls the battery 35, the airflow sensor 37 and the vaporiser arrangement 34 of the vaporiser module 20. For example, the controller 36 may be configured to receive information from the airflow sensor indicating that a user is operating the electronic cigarette and, in response to this, provide power from the battery 35 to the vaporiser arrangement 34.

With regard to the electronic vapour provision devices described herein, in order to use the device, the user must suck on the mouthpiece 2.

With regard to the electronic vapour provision devices of Figures 14, 15 and 24 to 27, the electronic vapour provision device is configured such that the user sucking on the mouthpiece 2 causes a flow of air at the airflow sensor. The controller 36 therefore receives information from the airflow sensor indicating that a user is sucking on the device. In response to this information, the controller 36 controls the power cell 10 to power the vaporiser 20, 34. This causes the vaporisation of liquid communicated to the vaporiser 20, 34 from the liquid bottle 33. The provided vapour then passes to the user. Consequently, use of the device by a user comprises the user sucking on the device and the detection of this user interaction by the device so as to trigger the vaporisation of the liquid contained in the device.

With regard to the embodiments described herein, the following alternatives and variations will now be described.

The interference fit between the mouthpiece connector 8 and the body connector 4 may for example be a press-fit.

The electronic cigarettes may be substantially cigarette shaped.

The mouthpiece connector may be releasably-connectable to the body connector. Moreover, the mouthpiece may form an airtight seal with the body when connected to the body.

The mouthpiece can be configured such that it can be pushed onto the body and twisted to lock it in place. For example, the mouthpiece may comprises an L-shaped mouthpiece receiving portion. In other words, the mouthpiece receiving portion 18 may comprise a cut-out in the wall of the mouthpiece extending back from the mouthpiece edge and resembling an 'L' in its profile.

The body connector and the mouthpiece connector can comprise modified cylinders.

The U-shaped indent and portion described at least with reference to Figures 9 to 15 could easily take another form such as a rectangle.

Whilst both square and hexagonal connector cross sections have been described, other regular shapes and irregular shapes could be used.

As is described with reference to Figures 24 and 25, the electronic cigarettes may comprise a combined vaporiser and battery assembly. Alternatively, the body could form the battery assembly and the vaporiser could form part of the mouthpiece.

Although examples have been shown and described it will be appreciated by those skilled in the art that various changes and modifications might be made without departing from the scope of the invention.

In order to address various issues and advance the art, the entirety of this disclosure shows by way of illustration various embodiments in which the claimed invention(s) may be practiced and provide for superior smokeless cigarettes. The advantages and features of the disclosure are of a representative sample of embodiments only, and are

NJOY Exhibit 1002.2439

not exhaustive and/or exclusive. They are presented only to assist in understanding and teach the claimed features. It is to be understood that advantages, embodiments, examples, functions, features, structures, and/or other aspects of the disclosure are not to be considered limitations on the disclosure as defined by the claims or limitations on equivalents to the claims, and that other embodiments may be utilised and modifications may be made without departing from the scope and/or spirit of the disclosure. Various embodiments may suitably comprise, consist of, or consist essentially of, various combinations of the disclosed elements, components, features, parts, steps, means, etc. In addition, the disclosure includes other inventions not presently claimed, but which may be claimed in future. Any feature of any embodiment can be used independently of, or in combination with, any other feature.

NJOY Exhibit 1002.2440

Claims

1. An electronic vapour provision device comprising a generally cylindrical body and a mouthpiece, where the body comprises a body connector, the mouthpiece comprises a mouthpiece connector and a store of liquid, and the mouthpiece connector is connectable to the body connector by an interference fit; wherein the mouthpiece has a limited range of rotation about the longitudinal axis of the body when connected to the body.

2. The electronic device of claim 1, wherein the mouthpiece is substantially not rotatable relative to the body when connected to the body.

3. The electronic device of claim 1 or 2, wherein the mouthpiece is releasably-connectable to the body.

4. The electronic device of claim 1, 2 or 3, wherein the body connector comprises a body protuberance and the mouthpiece connector comprises a mouthpiece receiving portion configured to receive the body protuberance.

5. The electronic device of claim 4, wherein the mouthpiece comprises a mouthpiece wall and the receiving portion comprises an opening in the mouthpiece wall, an indent in the mouthpiece wall, a flexible portion of the mouthpiece wall or a raised portion of the mouthpiece wall.

6. The electronic device of claim 4 or 5, wherein the mouthpiece connector comprises a mouthpiece edge and the body connector comprises a body edge, configured such that mouthpiece edge abuts the body edge when connected.

7. The electronic device of claim 6, wherein the body edge comprises the body protuberance and the mouthpiece edge comprises the mouthpiece receiving portion.

8. The electronic device of claim 1, 2 or 3, wherein the mouthpiece connector comprises a mouthpiece protuberance and the body connector comprises a body receiving portion configured to receive the protuberance.

NJOY Exhibit 1002.2441

9. The electronic device of claim 8, wherein a mouthpiece edge comprises the mouthpiece protuberance and a body edge comprises the body receiving portion.

10. The smokeless device of any preceding claim, wherein the body connector and mouthpiece connector comprise non-circular cross sections.

11. The electronic device of claim 6 or 7, wherein the body comprises one or more connected modules.

12. The electronic device of claim 11, wherein the body comprises a vaporiser module and a battery assembly module; where the battery assembly module comprises a power cell and an airflow sensor and the vaporiser module comprises a vaporiser.

13. The electronic device of claim 12, wherein the vaporiser module is releasably-connectable to the battery assembly module.

14. The electronic device of claim 12 or 13, wherein the body connector forms part of the vaporiser.

15. The electronic device of claim 12, 13 or 14, wherein the vaporiser further comprises a securing ring, the securing ring comprises a securing ring edge and the securing ring edge comprises the body edge.

16. The electronic vapour provision device of any preceding claim comprising an electronic cigarette.

17. A smokeless cigarette comprising a cigarette body and a mouthpiece, where the cigarette body comprises a cigarette body connection means, the mouthpiece comprises a mouthpiece connection means and the mouthpiece connection means is attachable to the cigarette body connection means by an interference fit; wherein the mouthpiece has a limited range of rotation about the longitudinal axis of the cigarette relative to the cigarette body when connected to the cigarette body.

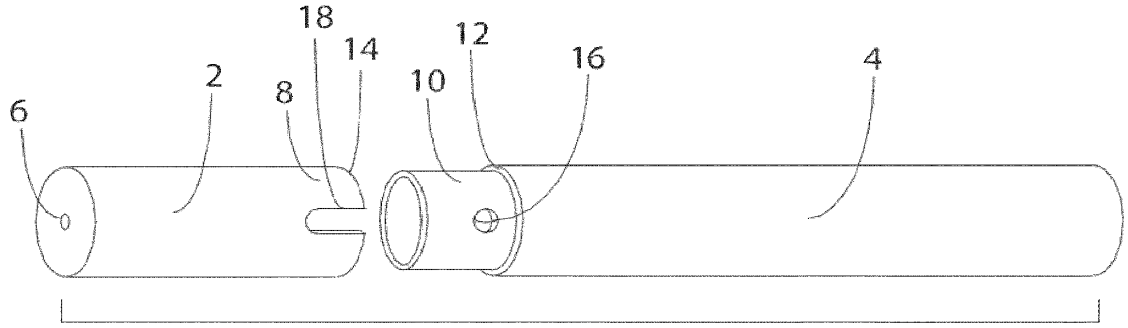


Figure 1

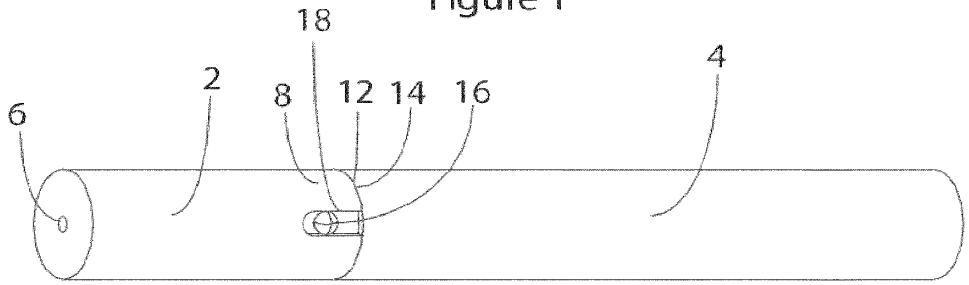


Figure 2

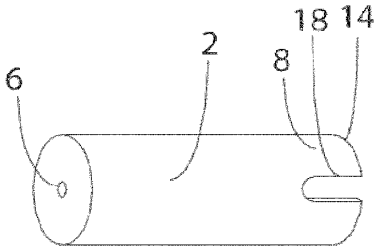


Figure 3

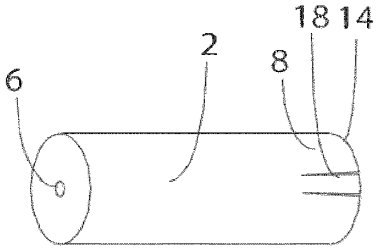


Figure 4

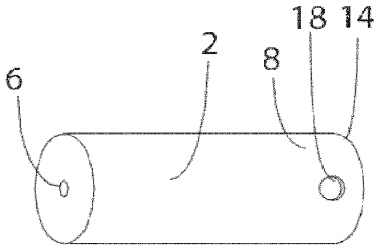


Figure 5

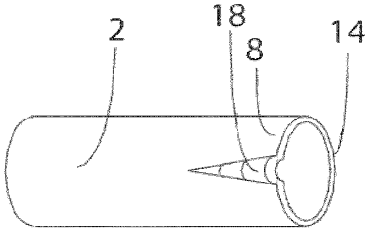


Figure 6

NJOY Exhibit 1002.2443