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(54) Title: ELECTROMAGNETIC SHIELDING MATERIAL

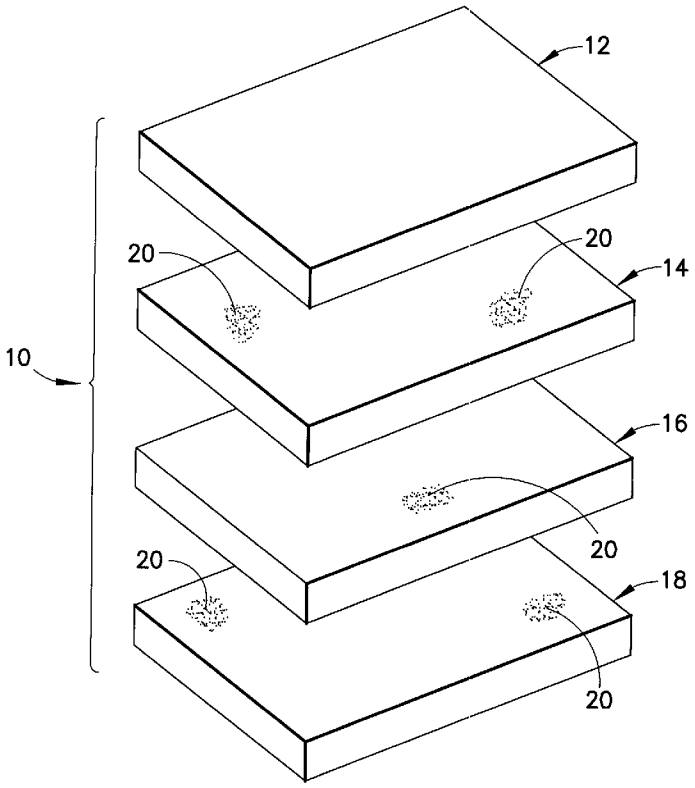

FIG.1

(57) Abstract: An electromagnetic shielding material includes a paper web and a conductive layer adhered to an adjacently positioned surface of the paper web. This arrangement defines a laminate structure that, when interposed between a receiving antenna of an RFID smart chip and a transmitting antenna of a signal generator, prevents the reading of the chip. A security device capable of electromagnetically shielding an RFID smart chip includes an electromagnetic shielding material having at least one conductive layer and at least one adjacently positioned substrate. A method of electromagnetically shielding an RFID smart chip includes providing and placing an electromagnetic shielding material proximate an RFID smart chip and preferably between the RFID smart chip and a transmitting antenna of an RFID signal generator.

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ELECTROMAGNETIC SHIELDING MATERIAL

Technical Field

The present invention is generally directed to materials that are electromagnetically opaque and, more particularly, to materials that provide electromagnetic shielding to devices capable of reading electromagnetic frequencies such as radio frequency identification devices (RFID).

Background of the Invention

Systems that incorporate RFID technology typically include an RFID "tag" that is readable using any suitable reading device. The tag comprises one or more computer chips ("smart chips") and an associated antenna that allows information encoded onto the smart chip to be transmitted to the reading device. Because the smart chips used are becoming smaller and smaller, RFID technology is being incorporated into an increasing number of devices, particularly with regard to consumer industries. Furthermore, because RFID technology is becoming more and more cost effective for different types of businesses that need to maintain, distribute, and track inventory, RFID systems are becoming more and more prevalent in everyday life.

Radio frequency identification technology is also increasingly being used in the tracking and identification of people. Efforts are being made to incorporate RFID tags into passports, identification cards, banking cards, and transportation passes allegedly in order to more efficiently process people as they travel through ports. In fact, checking in at an airport for an upcoming flight is now done by swiping a credit card at an airline's kiosk, even though the particular bank card was not used to purchase the airline ticket.

The "efficiency" that comes with the RFID system is also typically accompanied by mistakes, misuse, or even outright theft of sensitive information. When charges can be made to a bank card account simply by waving a smart chip-containing card or wand over a surface behind which is positioned an RFID reading device, the potential for a reading being mistakenly taken when a user inadvertently leaves their purse or wallet too near such a surface is increased. Also, when one bank card is used to authorize a charge, it is possible that another smart chip-containing bank card can be read also (either intentionally or accidentally), thereby resulting in more than one charge for a single purchase.

Furthermore, when considering the number of reading devices and the accessibility thereto, unscrupulous individuals can read sensitive information on a smart chip-containing

card without the card owner's knowledge. For instance, the use of miniature cameras at automated teller machines (ATM) is well known to capture video of a person entering a PIN. It is possible that miniature readers can be similarly located to capture information encoded onto chips. Particularly given the fact that most people will face an ATM and open and look through their purse or wallet so as to prevent a person behind them from looking into the purse or wallet, a reading device inconspicuously located on the ATM or above it and remotely operated can allow unshielded encoded information to be directly and easily read when a person thinks that he is safely shielding his belongings from prying eyes.

What is needed is a device that allows a user to controllably interrupt or prevent the reading of chip-encoded information using RFID technology.

Summary of the Invention

In one aspect, the present invention is directed to an electromagnetic shielding material. This material includes a first paper web and a conductive layer adhered to an adjacently positioned surface of the first paper web. A polymeric film may be adhered to an adjacently positioned surface of the conductive layer. This arrangement defines a laminate structure that, when interposed between a receiving antenna of an RFID smart chip and a transmitting antenna of an RFID signal generator, prevents the reading of the RFID smart chip.

In another aspect, the present invention is directed to an electromagnetic shielding material that includes first and second paper webs that sandwich a metalized polymeric film that forms a laminate. Again, when this laminate is interposed between a receiving antenna of an RFID smart chip and a transmitting antenna of an RFID signal generator, the reading of the RFID smart chip is prevented.

In another aspect, the present invention is directed to electromagnetic shielding materials in laminate forms. These laminates are combinations of paper, polymeric films, and/or conductive materials that prevent the reading of an RFID smart chip. In this aspect, as well as in all other aspects of the present invention, the paper may be printed on using any suitable means including, but not limited to, laser printing devices, ink jet printers, offset printers, digital printers, flexographic printers, and by hand using handwriting utensils.

In still another aspect, the present invention is directed to a security device capable of electromagnetically shielding an RFID smart chip. This security device includes an electromagnetic shielding material having at least one conductive layer and at least one adjacently positioned substrate. The device may be an envelope, a holder, a sheath, a sleeve,

a piece of paper or cardstock, wallpaper, or the like. The device may also be incorporated into a carrying device such as a wallet, a purse, a handbag, luggage, a computer carrying bag, a pocket protector, or the like. When the electromagnetic shielding material is interposed between a receiving antenna of the RFID smart chip and a transmitting antenna of an RFID signal generator, the electromagnetic shielding material is capable of preventing the reading of the RFID smart chip.

In still another aspect, the present invention is directed to a method of electromagnetically shielding an RFID smart chip. In this method, an electromagnetic shielding material comprising at least a conductive material is provided and placed proximate an RFID smart chip and preferably between the RFID smart chip and a transmitting antenna of an RFID signal generator. By doing so, the electromagnetic shielding material interrupts, impedes, or cancels the RFID signal from the signal generator to a receiving antenna of the RFID smart chip, thereby electromagnetically shielding the RFID smart chip.

One advantage of the present invention is that personal information encoded into a device readable via RFID (e.g., an RFID smart chip) cannot be read without the authorization of the owner of the personal information. In particular, the proximity of the electromagnetic shielding material to the smart chip causes sufficient interference with the transmission and receiving of a planewave field-propagated signal to negate the ability of a reader to ascertain the information contained in the smart chip. By negating this ability, a person carrying the device into which an RFID smart chip is incorporated (e.g., a passport, an identification card, a credit card, a transit card or a pre-paid pass, a gift card, or the like) is able to feel confident in his ability to thwart the unauthorized reading of his information encoded onto the device. Codes or information cannot be read without the explicit permission of the user.

In embodiments in which the smart chip is in a small device that can be carried by a person (e.g., in the form of a document), the electromagnetic shielding material of the present invention may be in the form of an envelope, a folder, a sleeve, or a similar paper product in which the device having the RFID smart chip can be held. Additionally, or in the alternative, the electromagnetic shielding material may be in sheet form and held in proximity to the smart chip. In any embodiment, the paper of the envelope, folder, sleeve, or the like can be printed, embossed, colored, cut, perforated and/or folded in any configuration. The paper can also be coated or uncoated. Given the lightweight nature of the paper, most papers are suitable for use in the present invention. In embodiments in which the electromagnetic material is used in an envelope or other document holder, a clear or translucent window may

be incorporated into the envelope of other document holder to allow documents to be manually read or viewed without being touched.

In embodiments in which the smart chip is in a device that is relatively large or not easily movable, the electromagnetic shielding material of the present invention may be used to shield packaging or even entire rooms. Particularly with regard to computer hard drives, computer media, and other types of electronics, the packaging thereof can be lined with, coated with, or otherwise incorporated with the electromagnetic shielding material. Such packaging includes, but is not limited to, computer cases, disc cases, boxes, and the like. Other packaging may include drums, totes, pallet wrapping devices, cargo containers, and the like. The electromagnetic shielding material may even be in the form of wallpaper or insulation or other paper that can be used to line ceilings and floors.

Brief Description of the Drawings

FIG. 1 is an exploded perspective view of an electromagnetic shielding material of the present invention.

FIG. 2 is an exploded perspective view of another embodiment of an electromagnetic shielding material of the present invention.

FIG. 3 is a side sectional view of another embodiment of an electromagnetic shielding material of FIG. 2.

FIG. 4 is a side sectional view of another embodiment of an electromagnetic shielding material of FIG. 2.

FIG. 5 is a perspective view of another embodiment of an electromagnetic shielding material of the present invention.

FIG. 6 is a side view of a 3-ply electromagnetic shielding material in which a polymeric film is sandwiched between layers of a conductive material.

FIG. 7 is a side view of the electromagnetic shielding material of FIG. 6 in which conductive material is incorporated into opposing surfaces of the polymeric film to form the three plies.

FIG. 8 is a schematic representation of an RFID reading of an electromagnetic shielding material of the present invention.

FIG. 9 is a schematic representation of a device incorporating the electromagnetic shielding material of the present invention.

FIG. 10 is a schematic representation of another embodiment of a device incorporating the electromagnetic shielding material of the present invention.

Detailed Description of the Invention

Referring to FIG. 1, one embodiment of an electromagnetic shielding material is shown generally at 10. The electromagnetic shielding material 10 is a four-ply laminate material comprising a first paper web 12, a polymeric film 14, a conductive layer 16, and a second paper web 18. Adjacently positioned surfaces of each of the first paper web 12, the polymeric film 14, the conductive layer 16, and the second paper web 18 are adhered to each other using an adhesive 20.

Both the first paper web 12 and the second paper web 18 comprise fibrous web materials. In one embodiment, such web materials are formulated with but are not limited to one or more of natural fiber (such as cotton), synthetic fiber, and/or recycled fiber. Also, such web materials include fillers that are suitable to provide at least some of the desired opacity. Coloring may be added to one or both of the first paper web 12 and the second paper web 18 as desired. The paper may also be synthetic or artificial paper or the like. The paper may be coated or uncoated.

The polymeric film 14 comprises any suitable polymeric material. Exemplary materials that may be used for the polymeric film 14 include, but are not limited to, polylactic acid (polylactide) (a polymer made from corn dextrose and known as PLA), polyesters, polypropylenes, combinations of the foregoing, and the like.

Some materials of the paper webs and the polymeric film are described in U.S. Patent No. 6,673,465 to Lordi and U.S. Patent No. 6,926,968 to Lordi, both of which are incorporated by reference herein in their entireties.

The conductive layer 16 comprises any suitable conductive material. In one embodiment, the conductive layer 16 comprises a metal foil in which the foil sheet is of a thickness suitable to cause the interruption, interference, or impedance of radio signals proximate thereto. The metal foil also imparts some degree of opacity to the electromagnetic shielding material 10. In such an embodiment, the metal used is aluminum, although other metals (e.g., copper, silver, nickel, and the like in elemental or alloy form) are within the scope of the present invention. The use of metal in foil form allows the electromagnetic shielding material 10 to better accommodate a folded configuration.

In another embodiment, the conductive layer 16 may comprise metallic particles deposited onto one or more of the polymeric film 14 and the second paper web 18. The metallic particles may be aluminum (e.g., elemental aluminum), aluminum alloys, or aluminum-containing compounds, or they may comprise other metals (e.g., copper, silver,

nickel, and the like). In still another embodiment, the conductive layer 16 may be woven or non-woven strands of metal.

In yet another embodiment, the conductive layer 16 may comprise a non-metallic material such as carbon, carbon-loaded matrix material, graphite, combinations of the foregoing, and the like. Carbon nanotubes may also be used either in single-walled form or double-walled form. In embodiments in which carbon nanotubes are used as the conductive layer 16, the carbon nanotubes can be deposited using any suitable technique such as chemical vapor deposition or the like to afford precise control of the thickness of the conductive layer.

In yet another embodiment, the adhesive 20 may be conductive in itself. In such an embodiment, the adhesive includes a suitable conductive material mixed therein. Such elements include, but are not limited to, metals in the forms of particles, powders, granules, beads, combinations of the foregoing, and the like. The metals may be aluminum (e.g., elemental aluminum), aluminum alloys, or aluminum-containing compounds, or they may be other metals (e.g., copper, silver, nickel, and the like).

The adhesive 20 used to adhere the first paper web 12, the polymeric film 14, the conductive layer 16, and the second paper web 18 into a laminated form may be a 100% solids adhesive. The present invention is not limited in this regard as other adhesives are within the scope of the present invention. In particular, the adhesive 20 may be solvent-based, water-based, a hot melt, ultraviolet radiation curable, electron beam curable, combinations of the foregoing, and the like.

When a 100% solids adhesive is used in laminating the first paper web 12, the polymeric film 14, the conductive layer 16, and the second paper web 18, a destructive bond is produced between the paper webs and the polymeric film. A destructive bond is one in which the paper web(s) and the polymeric film, after curing under a T Peel Adhesion Test, will not allow the paper web(s) to be separated from the polymeric film with the paper remaining intact.

When a 100% solids adhesive is used, such an adhesive is a low temperature (flowable at room temperature at about 100 degrees F), two-component adhesive. In the alternative, the adhesive may be a warm (gel at room temperature that is heated to permit flow) one-component adhesive. Either adhesive is selected based on the adhesive penetration and holdout (ability to retain the adhesive) of the paper web used. Generally, the warm temperature adhesive is used where the penetration and holdout of the paper is of concern, the low temperature adhesive is used when penetration and holdout are less of an issue. When a

100% solids adhesive is used, lamination is generally accomplished using standard lamination techniques.

Referring now to FIG. 2, another embodiment of an electromagnetic shielding material is shown generally at 110. The electromagnetic shielding material 110 is a laminate material comprising a first paper web 112, a polymeric film 114, a conductive material 116, and a second paper web 118. The first paper web 112 and the polymeric film 114 are adjacently positioned and adhered to each other using an adhesive 120. The conductive material 116 is impregnated into or otherwise incorporated into the polymeric film 114 to define a metalized polymeric film, which thereby obviates the need to adhere the conductive material to the polymeric film. The second paper web 118 is adhered to the polymeric film 114 (incorporating the conductive material 116) using the adhesive 120.

In the electromagnetic shielding material 110, both the first paper web 112 and the second paper web 118 comprise fibrous web materials (similar to the previous embodiment), and the polymeric film 114 is a polyester, polypropylene, or the like having sufficient dimensional stability, shrinkage characteristics, balance, ability to adhere to the paper web material, and heat resistance.

The conductive material 116 in the electromagnetic shielding material 110, however, comprises particles of suitable conductive material such as aluminum, copper, silver, nickel, alloys thereof, or the like in powder form. Non-metallic materials such as carbon, carbon-loaded matrix material, graphite, carbon nanotubes, combinations of the foregoing, combinations of the foregoing with metal, and the like may also be used. In such an embodiment, the conductive material 116 may be dispersed uniformly throughout the polymeric film 114 as shown in FIG. 3, or it may be concentrated along one surface of the polymeric film as shown in FIG. 4.

Referring now to FIG. 5, another embodiment of an electromagnetic shielding material is shown generally at 210. The electromagnetic shielding material 210 is a three-ply laminate material comprising a paper web 212, a polymeric film 214, and a conductive material 216. The conductive material 216 is sandwiched between the paper web 212 and the polymeric film 214. The present invention is not limited in this regard, however, as either the paper web 212 or the conductive material 216 may be sandwiched between the other two layers. An adhesive is used to adhere the three plies of the electromagnetic shielding material 210 together. The conductive material 216 may be aluminum, copper, silver, nickel, alloys of the foregoing, combinations of the foregoing, or the like. The conductive material 216 may

also be carbon, carbon nanotubes, carbon-loaded matrix material, graphite, combinations thereof, combinations thereof with metal, or the like.

Referring now to FIGS. 6 and 7, another embodiment of an electromagnetic shielding material is shown generally at 310. This electromagnetic shielding material 310 is a three-ply laminate material comprising a polymeric film 314 sandwiched between a first conductive material 316 and a second conductive material 317. In the electromagnetic shielding material 310, both the first conductive material 316 and the second conductive material 317 are aluminum foils. The present invention is not limited in this regard, however, as the materials from which both the first conductive material 316 and the second conductive material 317 are fabricated may be any conductive material such as aluminum, copper, silver, nickel, alloys thereof, or the like in powder form. Non-metallic materials such as carbon, carbon-loaded matrix material, graphite, carbon nanotubes, combinations of the foregoing, and the like may also be used. In the electromagnetic shielding material 310, the first conductive material 316 and the second conductive material 317 may both be adhered to opposing surfaces of the polymeric film 314 as shown in FIG. 6, or they may be incorporated directly into the polymeric film and concentrated substantially along the facing surfaces thereof as shown in FIG. 7.

Referring now to FIG. 8, the shielding effectiveness of the electromagnetic shielding material 10 of RFID radiation is shown generally at 40. Although the electromagnetic shielding material is shown as being the four-ply laminate material comprising the polymeric film and the conductive layer clad in paper webs, the present invention is not limited in this regard as any of the other electromagnetic shielding materials disclosed herein can be used with the apparatus depicted.

To provide for effective shielding, the electromagnetic shielding material 10 is interposed between a transmitting antenna 42 and a receiving antenna 44. A signal generator 46 outputs an unmodulated sinusoidal RF signal at discrete frequencies into a power amplifier 48. The signal generator 46 is incremented at the discrete frequencies (13.56 MHz) with pre-determined amplitudes fed into the power amplifier 48 and through the transmitting antenna 42. The resulting planewave signal is field-propagated into the electromagnetic shielding material 10. Depending upon the exact configuration of a device into which the electromagnetic shielding material 10 is incorporated, the propagated signal is preferably not received by the receiving antenna 44 attached to an RFID receiving portion 50, which comprises a preamplifier 52 and an analyzer 54 located in a chip.

Referring now to FIGS. 9 and 10, a security device into which the electromagnetic shielding material 10 of the present invention is incorporated is shown generally at 60. In FIG. 9, the security device 60 may be an envelope (e.g., a secure mailing envelope, a fulfillment mailer, or the like), a protective sleeve, sheath, holder, wallpaper, RFID machine scannable cards (e.g., bank cards, transit cards, telephone cards, or the like), medical packaging, or the like. When the security device 60 is an envelope, protective sleeve, holder, etc., it may be fabricated from a piece of electromagnetic shielding material 10 that is cut, folded, and suitably glued.

In addition to the electromagnetic shielding material 10, the security device includes an adjacently-positioned substrate 62. The substrate 62 may be the paper, cardboard, polymer, or other material of the envelope, sleeve, sheath, holder, wallpaper, or the like that contains or shields a smart chip 66 of an RFID system. When the security device 60 is wallpaper, the wallpaper may be backed with vinyl or the like.

In another embodiment, as shown in FIG. 10, the substrate 62 may be an RFID machine scannable card or the like that directly incorporates the smart chip 66 of the RFID system. In any embodiment, the substrate 62 may be incorporated into the structure of another article 70. The article 70 may be a wallet, purse, handbag, pocket protector, article of clothing, suitcase, or computer bag. The article 70 may also be a room or an entire building. Also in any embodiment, the proximity of the electromagnetic shielding material 10 to the smart chip 66 provides effective shielding of the smart chip.

Example – Electromagnetic shielding material construction and effectiveness

Various arrangements of paper web material, polymeric film, and metal (in foil form or incorporated into the polymeric film) were constructed and tested for shielding effectiveness.

Sample	Construction	Thickness of metal (inches)	Reading using handheld reader/detector (readable/not readable)	Reading based on IEEE-299 shielding effectiveness (decibels) (13.56 MHz test frequency)
1	Paper/film/paper (3 ply)		Readable	Not tested
2	Paper/Al-coated film (2 ply)	$3x10^{-7}$	Readable	Not tested
3	Paper/Al-foil/film/paper (4 ply)	$3.5x10^{-4}$	Not readable	43
4	Paper/Al-foil/film (3 ply)	$1x10^{-3}$	Not readable	48.67
5	Al-foil/film/Al-foil (3 ply)	$3.5x10^{-4}$, $3.5x10^{-4}$	Not readable	61
6	Paper/Cu-foil/film (3 ply)	$7x10^{-4}$	Not readable	43

Although this invention has been shown and described with respect to the detailed embodiments thereof, it will be understood by those of skill in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiments disclosed in the above detailed description, but that the invention will include all embodiments falling within the scope of the appended claims.

What is claimed is:

1. An electromagnetic shielding material, comprising:
a first paper web; and
a conductive layer adhered to an adjacently positioned surface of said first paper web.

2. The electromagnetic shielding material of claim 1, further comprising a polymeric film adhered to an adjacently positioned surface of said conductive layer;
wherein said first paper web, said conductive layer, and said polymeric film form a laminate that, when interposed between a receiving antenna of an RFID smart chip and a transmitting antenna of an RFID signal generator, is capable of preventing the reading of said RFID smart chip.

3. The electromagnetic shielding material of claim 2, further comprising an adhesive that is used to adhere said conductive layer to said first paper web and said polymeric film to said conductive layer.

4. The electromagnetic shielding material of claim 3, wherein said adhesive is selected from the group consisting of 100% solids adhesive, solvent-based adhesive, water-based adhesive, hot melt adhesive, ultraviolet radiation curable adhesive, electron beam curable adhesive, and combinations of the foregoing.

5. The electromagnetic shielding material of claim 3, wherein said adhesive includes a conductive material.

6. The electromagnetic shielding material of claim 1, wherein said first paper web comprises a fibrous web material selected from the group consisting of natural fiber, synthetic fiber, and recycled fiber.

7. The electromagnetic shielding material of claim 2, wherein said polymeric film comprises a material selected from the group consisting of polylactic acid, polyester, polypropylene, and combinations of the foregoing.

8. The electromagnetic shielding material of claim 1, wherein said conductive layer comprises a material selected from the group consisting of metal foil, metallic particles, carbon, carbon nanotubes, and combinations of the foregoing.

9. The electromagnetic shielding material of claim 8, wherein a metal of at least one of said metal foil and said metallic particles is selected from the group consisting of aluminum, copper, silver, nickel, alloys of the foregoing, and combinations of the foregoing.

10. The electromagnetic shielding material of claim 2, further comprising a second paper web disposed on an adjacently positioned surface of said polymeric film.

11. An electromagnetic shielding material, comprising:

a first paper web;

a metalized polymeric film adhered to an adjacently positioned surface of said first paper web; and

a second paper web adhered to an adjacently positioned surface of said metalized polymeric film;

wherein said first paper web, said metalized polymeric film, and said second paper web form a laminate that, when interposed between a receiving antenna of an RFID smart chip and a transmitting antenna of an RFID signal generator, is capable of preventing the reading of said RFID smart chip.

12. The electromagnetic shielding material of claim 11, wherein said metalized polymeric film is adhered to said first paper web and said second paper web using an adhesive.

13. The electromagnetic shielding material of claim 11, wherein said adhesive is conductive.

14. The electromagnetic shielding material of claim 11, wherein said metalized polymeric film comprises particles of conductive material impregnated into polymeric film.

15. The electromagnetic shielding material of claim 12, wherein said particles of said conductive material are selected from the group consisting of aluminum, copper, silver, nickel, alloys of the foregoing, and combinations of the foregoing.

16. An electromagnetic shielding material, comprising:

a paper web;

a polymeric film; and

a conductive material sandwiched between said paper web and said polymeric film;

wherein said paper web, said polymeric film, and said conductive material form a laminate that, when interposed between a receiving antenna of an RFID smart chip and a transmitting antenna of an RFID signal generator, is capable of preventing the reading of said RFID smart chip.

17. The electromagnetic shielding material of claim 16, further comprising an adhesive used to adhere said paper web, said polymeric film, and said conductive material together.

18. The electromagnetic shielding material of claim 17, wherein said adhesive includes a conductive material.

19. The electromagnetic shielding material of claim 16, wherein said conductive material are selected from the group consisting of aluminum, copper, silver, nickel, alloys of the foregoing, and combinations of the foregoing.

20. An electromagnetic shielding material, comprising:

a first conductive material;

a second conductive material; and

a polymeric film sandwiched between said first conductive material and said second conductive material;

wherein said first conductive material, said second conductive material, and said polymeric film form a laminate that, when interposed between a receiving antenna of an RFID smart chip and a transmitting antenna of an RFID signal generator, is capable of preventing the reading of said RFID smart chip.

21. The electromagnetic shielding material of claim 20, wherein at least one of said first conductive material and said second conductive material is selected from the group consisting of aluminum, copper, silver, nickel, alloys thereof, and combinations of the foregoing.

22. The electromagnetic shielding material of claim 20, wherein at least one of said first conductive material and said second conductive material is selected from the group consisting of carbon, carbon-loaded matrix material, graphite, carbon nanotubes, and combinations of the foregoing.

23. The electromagnetic shielding material of claim 20, wherein at least one of said first conductive material and said second conductive material is adhered to said polymeric film.

24. The electromagnetic shielding material of claim 20, wherein at least one of said first conductive material and said second conductive material is incorporated into a surface of said polymeric film.

25. A security device capable of electromagnetically shielding an RFID smart chip, said security device comprising:

an electromagnetic shielding material having at least one conductive layer; and

at least one adjacently positioned substrate;

wherein when said electromagnetic shielding material is interposed between a receiving antenna of said RFID smart chip and a transmitting antenna of an RFID signal generator, said electromagnetic shielding material is capable of preventing the reading of said RFID smart chip.

26. The security device of claim 25, further comprising a non-conductive layer selected from the group consisting of paper, polymer, and combinations of the foregoing.

27. The security device of claim 25, wherein said at least one conductive layer comprises a material selected from the group consisting of aluminum, copper, silver, nickel, alloys thereof, carbon, carbon-loaded matrix material, graphite, carbon nanotubes, and combinations of the foregoing.

28. The security device of claim 25, wherein said at least one adjacently positioned substrate is the paper of an envelope, sleeve, sheath, holder, or folder into which said RFID smart chip can be inserted.

29. The security device of claim 25, wherein said at least one adjacently positioned substrate is wallpaper.

30. The security device of claim 25, wherein said substrate is incorporated into a structure of a wallet, purse, handbag, pocket protector, article of clothing, suitcase, or computer bag.

31. A method of electromagnetically shielding an RFID smart chip, said method comprising the steps of:

providing an electromagnetic shielding material comprising at least a conductive material;

placing said electromagnetic shielding material proximate an RFID smart chip; and

interposing said electromagnetic shielding material between said RFID smart chip and a transmitting antenna of an RFID signal generator.

32. The method of claim 31, wherein said electromagnetic shielding material comprises a laminate further comprising at least one paper web and at least one polymeric film.

33. The method of claim 31, wherein said step of providing said electromagnetic shielding material comprises incorporating said electromagnetic shielding material into a device used to contain documents containing said RFID smart chip.

34. The method of claim 33, wherein said device used to contain documents is selected from the group consisting of envelopes, protective sleeves, folders, wallets, purses, handbags, and rooms.

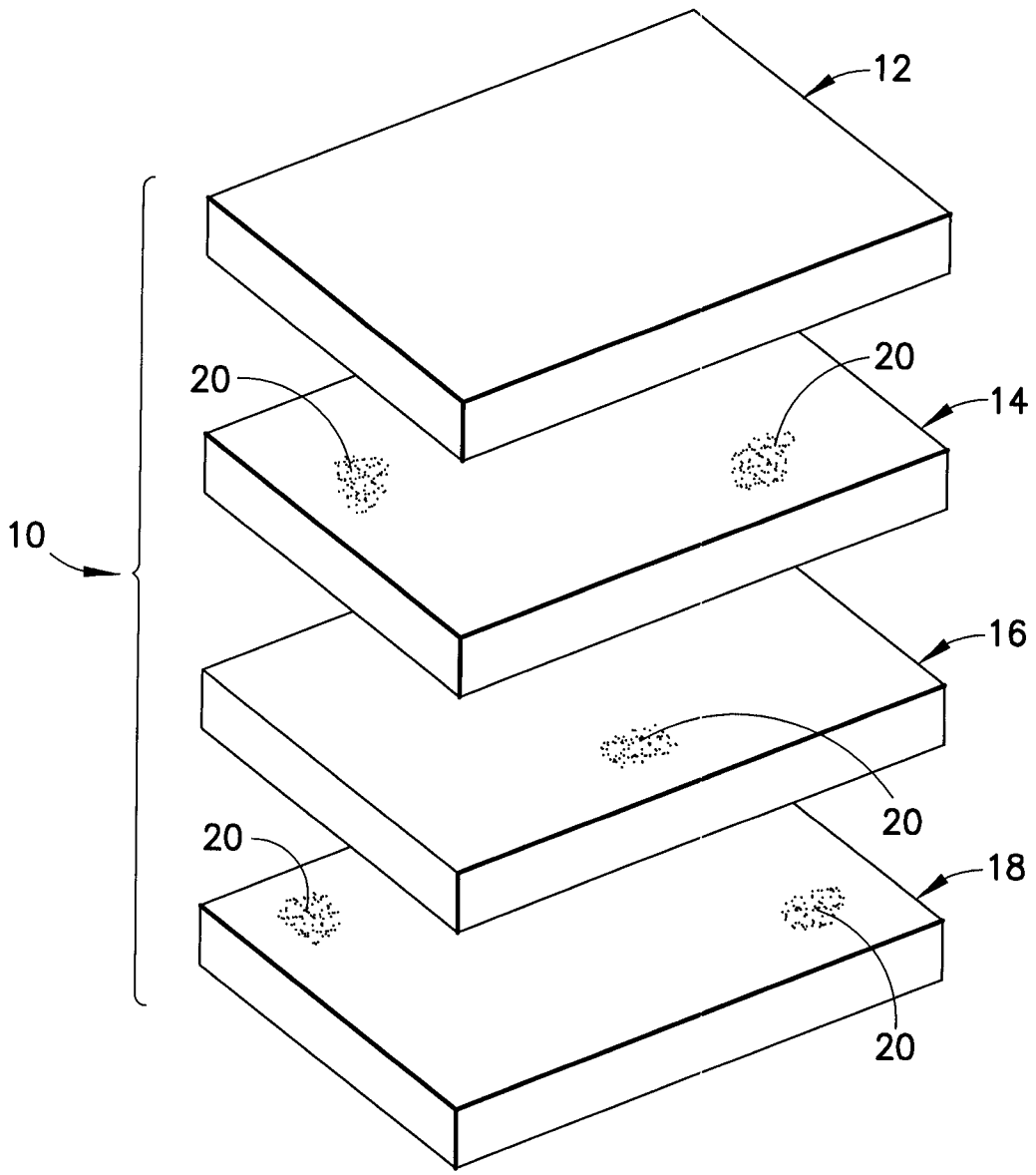

FIG. 1

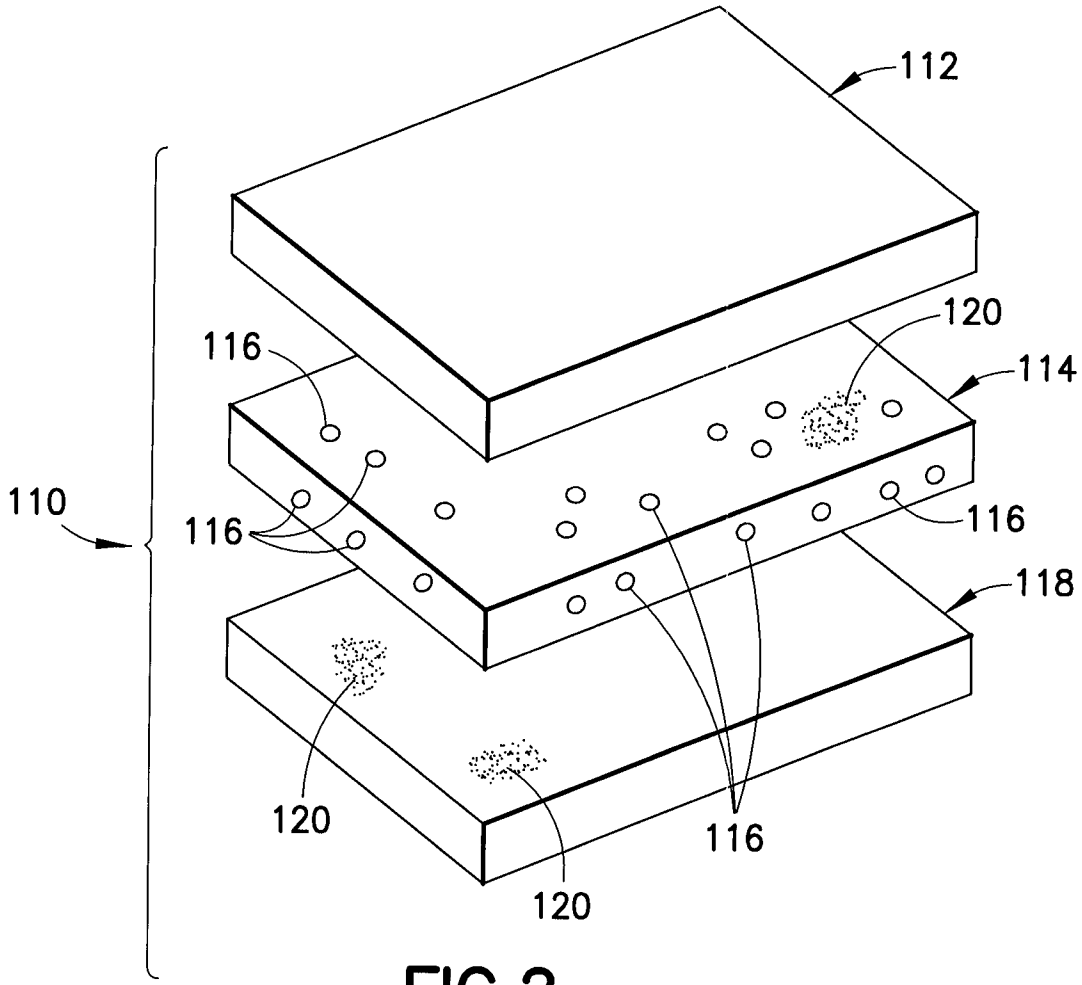

FIG.2

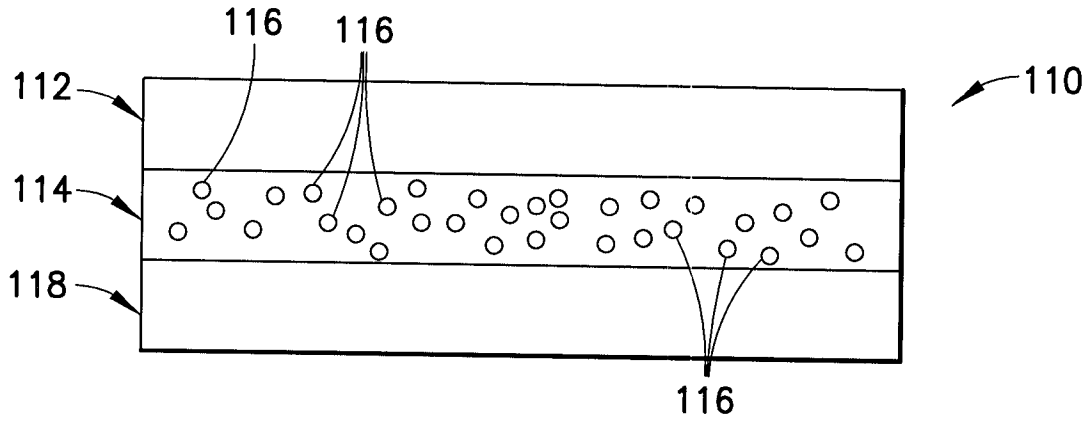

FIG.3

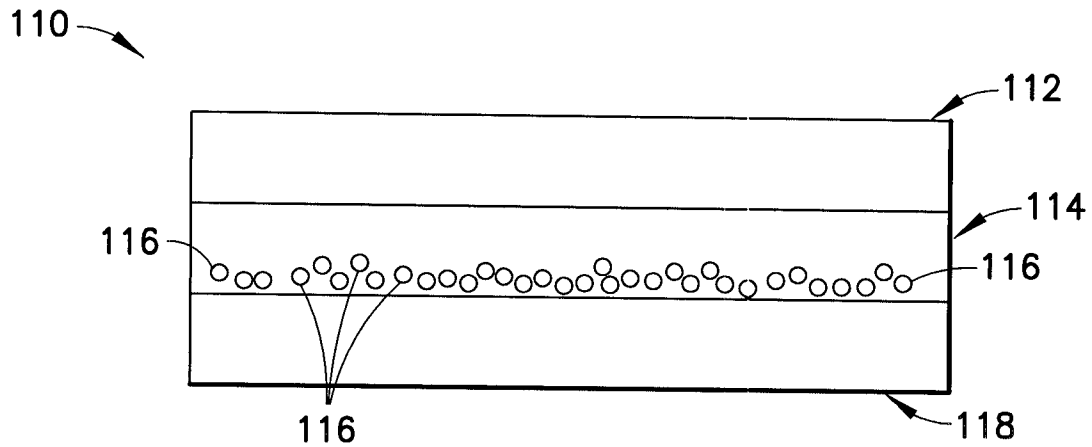

FIG.4

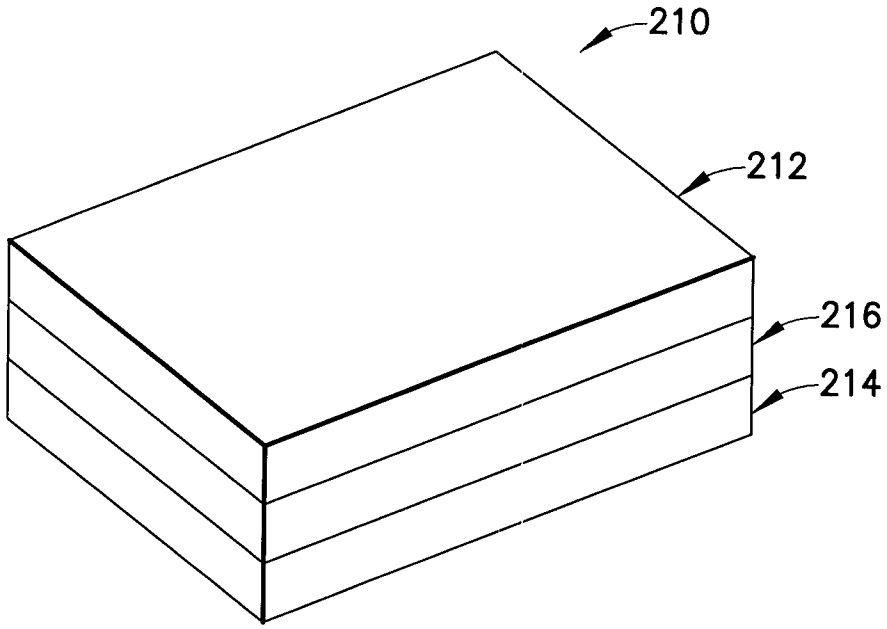

FIG.5

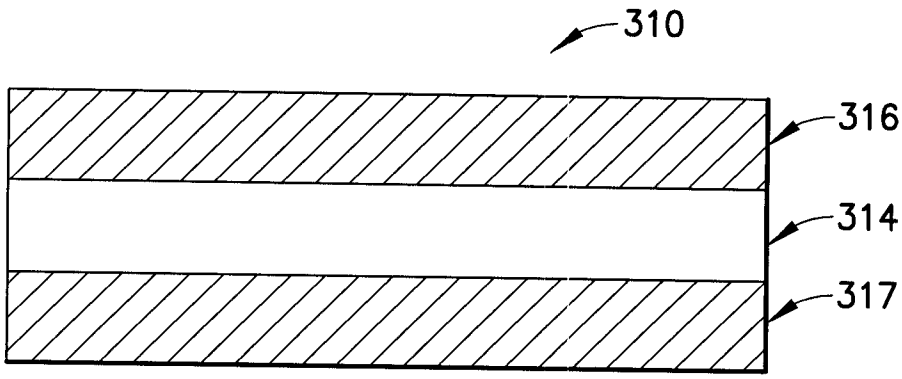

FIG.6

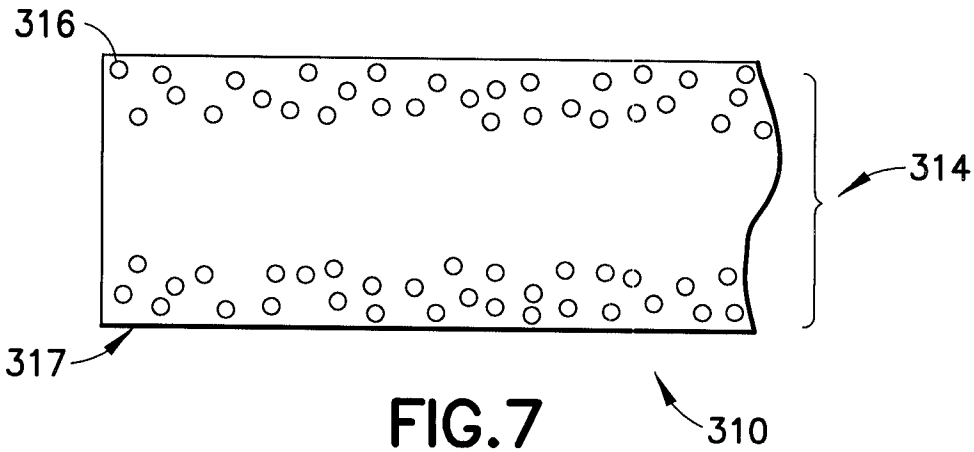

FIG.7

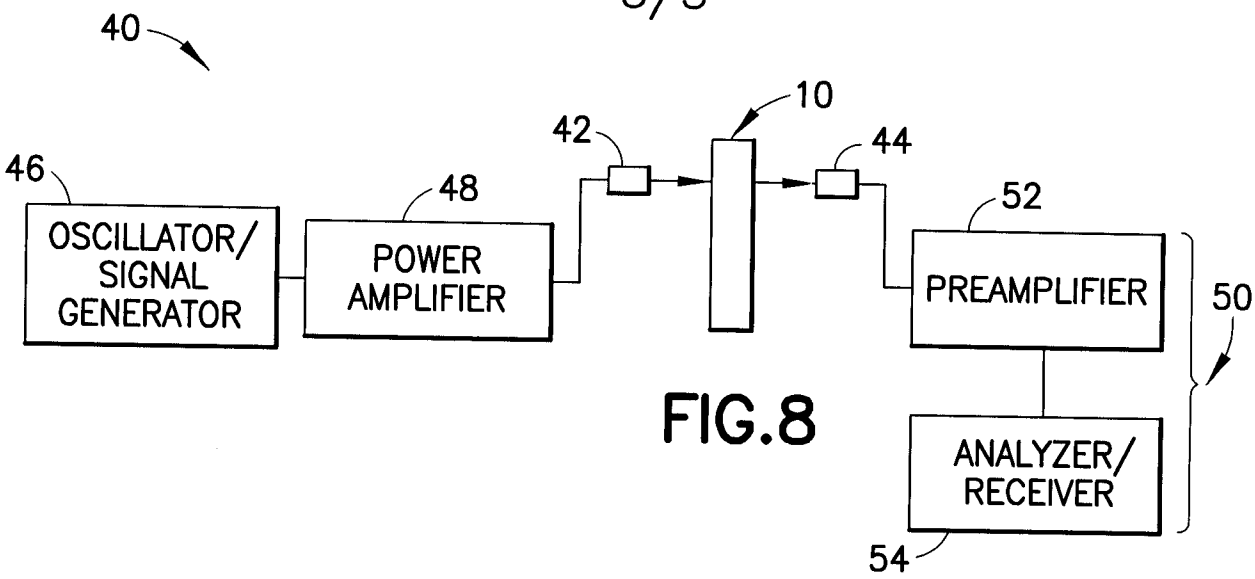

FIG.8

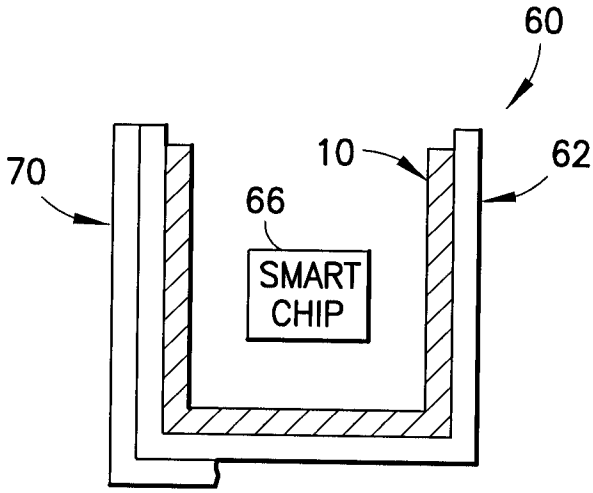

FIG.9

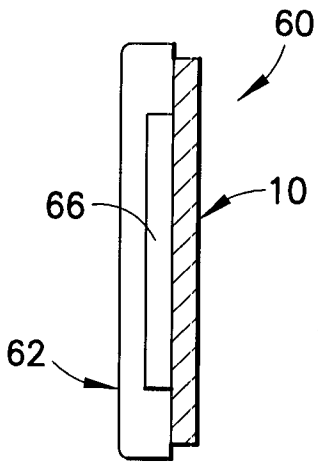

FIG.10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 08/63595

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A01K 1/015 (2008.04)
USPC - 428/221
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)
USPC: 428/221

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 428/221, 292.7, 931

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWest(PGPG,USPT,USOC), DialogClassic (US Patent full-text, Derwent, Claims), GoogleScholar;
search terms: shield?, layer?, laminat?, paper, pp, pet, pla, metal? film, carbon, nanotube, al, ag, ni, cu, polymer?, sheet?, rfid, radio frequency identif?, electromagnet?

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 2007/0080233 A1 (FORSTER et al.) 12 April 2007 (12.04.2007), para [0008], [0017]-[0020], [0024], [0034], [0039], [0060], [0077], [0078], [0081], [0089], [0090], [0094], [0112].	1-3, 6-10, 16, 17, 20, 21, 23-27, 31, 32 ---------- 4, 5, 11-15, 18, 19, 22, 28-30, 33, 34
Y	US 4,647,714 A (GOTO) 03 March 1987 (03.03.1987), Figs. 2 and 3, col 4, ln 39-51, col 5, ln 6-18, col 6, ln 25-31, col 7, ln 60 to col 8, ln 23, col 11, ln 42-54, col 12, ln 41-58.	4, 5, 11-15, 18, 19, 22, 28-30, 33, 34

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"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 August 2008 (20.08.2008)	02 SEP 2008
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2007)