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- (71) Applicant: **PHOGENIX IMAGING, LLC** [US/US];
16275 Technology Drive, San Diego, CA 92127-1815 (US).
- (72) Inventors: **ESCOBEDO, Sergio**; 11048 Red Cedar Drive, San Diego, CA 92131 (US). **DENNIS, Scott, Matthew**; 18190 Moon Song Court, San Diego, CA 92127 (US).
- (74) Agents: **SALAI, Stephen, B.** et al.; Harter, Secrest & Emery LLP, 1600 Bausch & Lomb Place, Rochester, NY 14604-2711 (US).
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(54) Title: METHOD AND APPARATUS FOR APPLYING A MATTE FINISH TO PHOTOGRAPHS AND ARTICLE

(57) Abstract: Disclosed is an embosser for producing matte finish photographs from a glossy finish photograph. The embosser receives a sheet of glossy prints as generated by an inkjet printer with a clear laminate over the print to protect the inkjet generated photographic image. Pressure and embossing rollers biased to spaced apart positions within the embosser are selectively operable to move one against the other to create a nip through which the laminated print passes. At the option of an operator the laminated print may be allowed to pass between the spaced apart rollers undisturbed thereby generating a glossy photograph. At the option of the operator the rollers are moved one against the other to create the nip so that passage of the print now results in an embossment of the lamination thereby producing a matte finish photograph. Also disclosed is a method for alternatively generating a glossy or matte finish print and a matte finished print wherein the matte finish is formed *in situ*.



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METHOD AND APPARATUS FOR APPLYING A MATTE FINISH TO PHOTOGRAPHS
AND ARTICLE

BACKGROUND OF THE INVENTION

TECHNICAL FIELD

5 The present invention relates generally to a photofinishing operation. More particularly the invention relates to a photofinishing operation that is capable of producing either glossy or matte finished photographs.

BACKGROUND ART

10 In photofinishing operations it is conventional to develop and print photographs on roll stock photographic paper having a width that generally accommodates one size of print. After printing out a roll of photos on a strip of the roll stock, the strip is cut to provide the individual prints. Advancements in photofinishing allow for the production of photographs by inkjet printers, laser printers and other photofinishing printers including silver-halide systems that receive a digital input and employ conventional wet chemistry output. The use of
15 computers in connection with these advancements allows for further improvement. For example, it is not necessary to use roll stock having the width of a desired finished photo. A photofinishing printer now can generate photos of various sizes on a single sheet of print media. Also the images can be manipulated to nest various image sizes on a single larger sheet. Accordingly, a sheet or roll stock of a single width can be used to generate prints of
20 various sizes for a single customer order.

 However, a draw back of using an inkjet printer or the like in a photofinishing operation is that the resulting photographic images are subject to durability and fading problems. For example, the printed image can be eroded by abrasion. In order to improve print durability, of any inkjet printed image, it is known to apply a laminate to the printed
25 surface. The resulting laminated photograph tends to take on the characteristics of the paper stock on which the image is printed. For example, the paper stock may have either a glossy or a matte finish and the laminated product will have a like finish.

For a photofinisher to provide a customer with a choice of finishes (either matte or glossy), it has been necessary for the photofinishing operation to stock photographic papers of each finish and to switch papers as needed for a given customer order. Larger photofinishing operations may have several photofinishing machines wherein one of the machines is dedicated to producing photographs of a matte finish. However, rather than carry an inventory of various sizes of paper in each of the two finishes and taking the time to change the paper supply in response to a customer request for one type of finish or another, photofinishing operations generally do not offer the customer a choice of finishes. If a choice of finishes is offered, it generally is in connection with a special promotion.

Accordingly, it is an object of the present invention to provide an apparatus and method for producing both glossy and matte finished photographs from the same photographic paper stock.

Another object is to provide an apparatus and method for converting a glossy photograph to one having a matte finish.

Yet another object is to provide an apparatus and method for providing an inkjet printed image having a protective laminate in either a glossy or matte finish.

Yet another object is to provide photograph inkjet printed on glossy paper yet having a matte finish.

DISCLOSURE OF THE INVENTION

In the present invention a photofinishing system is provided wherein an inkjet printer generates the photographic images. The print medium preferably is a conventional glossy finish photographic paper. To protect the inkjet printed image, the printed sheet is fed to a laminator that applies a clear protective lamination over the printed image. In accordance with the present invention, the lamination then is selectively treated to provide it with a matte finish. This is accomplished by heating the lamination and embossing the heated laminate surface to apply texture. Light reflecting off of the embossed surface at different rates provides the appearance of a matte finish. In this fashion a photographic paper normally having a glossy finish is converted to a matte finish. If a glossy finish is desired, the laminated product is simply ejected from the laminator without embossing. Thus, at the

option of the operator, the operation can produce photographs from the same glossy photographic stock that selectively has either a glossy or matte finish.

Accordingly, the present invention may be characterized in one aspect thereof by an apparatus for producing a matte finish photographic print comprising:

- 5 a) a laminator for applying a clear protective laminate over a photographic image having a glossy finish surface to produce a laminated glossy finish photograph;
- b) an embosser arranged to receive the laminated photograph and including means for moving the laminated photograph along a path of travel from an inlet to an exit; and
- c) an embossing roller arranged at one side of the path of travel, the roller having a
10 textured outer surface and the clear protective laminate being selectively engaged against the embossing roller for embossing the laminate with a texture that produces a matte finish thereby selectively converting the glossy finish photograph to a matte finish.

In another aspect the present invention may be characterized by a method for producing a matte finish photographic print comprising:

- 15 a) providing a photographic image having a glossy finish surface;
- b) laminating a clear protecting laminate to the glossy finish surface to produce a laminated glossy finish photograph; and
- c) selectively embossing a textured pattern into the clear protective laminate to produce a laminated matte finish photograph.

20 In still another aspect, the present invention may be characterized by a matte finish photograph comprising:

- a) a first layer comprising a sheet of photographic paper having a glossy finish surface and a printed image on the glossy finish surface to provide a glossy finish photograph;
- 25 b) a second layer comprising a clear protective laminate applied to and extending over the printed image; and

c) the laminate having a textured outer surface and the textured surface being formed *in situ* to provide the glossy finish photograph with a matte finish appearance.

BRIEF DESCRIPTION OF THE DRAWINGS

5 Figure 1 shows a sequence of steps for producing a inkjet printed photograph according to the present invention;

 Figures 2 and 3 are schematic illustrations of the apparatus for embossing a laminated photographic image in different operative positions; and

 Figure 4 is a view showing, in cross section, a portion of a matte finish photograph in
10 accordance with the present invention.

BEST MODE(S) FOR CARRYING OUT THE INVENTION

 Referring to the drawings, Figure 1 shows generally the sequence of steps for producing an inkjet printed photograph. In this respect the apparatus generally indicated at 10 includes an inkjet printer 12. The printer is fed from a continuous roll of photographic paper
15 14 that preferably is a conventional paper used in inkjet printing to produce glossy photographs. A computer 16 that has been loaded with a digital representation of the image or images to be printed controls the printer. The printed output passes from the inkjet printer and into a coater/laminator 20. The printer and laminator generally have different operational speeds so a buffer 18 is disposed between the two. The buffer 18 serves to operatively
20 connect the printer to the laminator by first accommodating the output from the printer and then handing the printer output off to the laminator.

 In the laminator, a protective laminate is applied to the printed surface of the photographic paper. The laminate is any suitable clear plastic 0.5 to 1.0 mil film that is applied to the printed surface of the paper. The paper and laminate then pass through a nip
25 (not shown) that presses the two together, preferably with heat so the laminate is adhered to the image surface. Since the photograph is on glossy paper and both surfaces of the laminate are smooth, the result is a laminated, glossy finish photograph.

From the coater/laminator, the laminated structure passes into an embosser 22. While not shown, there may be a buffer between the laminator 20 and the embosser 22 in cases where the two have different operational speeds. The embosser is selectively operated either to produce a glossy finish photograph or a photograph having a matte finish. Information as to whether to produce either finish of photograph is inputted to the computer 16. The computer then controls the embosser as set out hereinbelow to produce the desired finish.

As shown in Figure 2, the embosser 22 has an inlet 24 for receiving the laminated glossy finish print output 26 of the laminator. The print 26 includes a section of the photographic paper 14 including the inkjet-printed image and a section of laminate 15 disposed over the printed image and affixed to the paper. The inlet of the embosser connects to a guide track 28. The guide track and pairs of spaced drive rollers 30, 32 define a path of travel (indicated by a dotted line) through the embosser to an exit 34. Other drive rollers 36 may be located adjacent the track to facilitate the transport of a laminated photograph from the embosser inlet 24 to the exit 34. The spacing between pairs of drive rollers is small enough to accommodate the shortest photographic print delivered to the embosser.

Arranged along the path of travel and preferably between the roller pairs 30 and 32 is an embossing mechanism generally indicated at 38. The embossing mechanism includes an embossing roller 40 located at one side of the path of travel. The roller or at least the outer surface 42 of the roller is made of metal or other material that can be heated and retains heat. Preferably the embossing roller is hollow and has a heating element 44 disposed in the hollow for heating the roller and more particularly, for heating the outer surface 42. Any suitable heating device can be used including resistance or radiant heaters. Preferably the heater is a heating lamp incorporated into the embosser roller. A motor (not shown) drives the embossing roller.

The outer surface 42 of the embossing roller is textured by any suitable means such as by chemical etching or mechanical operation that will provide the roller with a degree of roughness. The roughness preferably is greater than 100 micro inches and sufficient, given various factors as set out hereinbelow, to provide the print output 26 of the laminator with a matte finish. The texture of the outer surface should be as random as possible with no sharp points.

Located across the path of travel opposite the embossing roller is a pressure roller 46 having a resilient outer surface formed of a rubber or the like. The pressure roller is journaled to a lever arm 48. The lever arm has a pivotally supported end 50 and a free end 52 wherein the pressure roller is journaled to the arm intermediate the supported and free ends 50, 52 respectively. The lever arm is biased by a spring 54 or the like that urges the free end of the arm about its supported end 50 to the left or to a first position as viewed in Figure 2. This creates a space 56 between the pressure roll 46 and the embossing roller 40 so as to maintain an open path of travel. It also maintains contact of the free end 52 of the lever arm with a mechanical cam 58. The cam is selectively operated to drive the lever arm free end 52 to the right and to a second position as viewed in Figure 2. This closes the space 56 and causes the pressure roll 46 to bear against and form a nip with the embossing roller 40. Operation of the cam is under the control of the computer 16 so that the selective actuation of the cam to allow movement of the pressure roller between its first and second positions determines whether a glossy or matte finish photograph is produced as further set out hereinbelow.

The operation of the embosser 22 begins by heating the embossing roller 40. A proper operating temperature may vary depending upon the material of the laminate, the roughness of the outer surface 42 of the embossing roller and the pressure exerted at by the pressure roller. In any event when temperature is reached, the embosser is in condition to receive an image from the coater/laminator 20. Accordingly, as shown in Figure 2, the laminated glossy finish print 26 oriented with its laminated side positioned on the same side of the path of travel as the textured embossing roller 40, enters the inlet 24. The photograph is moved forward through a series of driven rollers, such as shown at 36, 30 along the path of travel toward the embossing roller 40.

If a glossy finish photograph is desired, the path of travel is kept open by maintaining the pressure roller in the position as shown in Figure 2. This keeps the path of travel open so the laminated glossy finish photograph is transported through the space 56 without contacting the embossing roller. In this fashion the glossy finish is not disturbed as the laminated glossy finish photograph passes through the exit 34. Consequently, a glossy finish photograph moves through the embosser exit 34.

If a matte finish photograph is desired, the computer 16 causes the operation of cam 58. Operation of the cam causes the lever arm 48 to pivot to the right as shown in Figure 2,

which in turn causes the pressure roll 46 to create a nip between it and the heated embossing roller 40. Now, when a laminated print reaches the embossing roller, the print passes through the nip so the laminate 15 is contacted and pressed against the heated embossing roller. The heat of the embossing roller softens the laminate 15 and this allows the textured surface of the embossing roller to modify the surface of the laminate by embossing the texture of the outer surface 42 into the laminate. The result of this operation is that light now will reflect off the laminate surface at a different rate giving it the appearance of a matte finish. The photograph passes to the exit 34 and a matte finish photograph is produced from the glossy print.

The resulting matte finish photograph is shown in Figure 4. As shown in Figure 4, the photographic paper 14 is overlaid with the laminate 15 and the laminate has its outer surface embossed. This provides the photograph with a matte finish wherein the matte finish is applied *in situ* to the photograph as opposed to an initial printing of the photograph on a matte finish paper.

It is generally understood that a glossy image is one that generates values of between 60 and 70 on a 20° reflectivity scale. In contrast, an image having a matte finish is one considered to have reflectivity values generally below about 40 and preferably below about 10- 26.

As noted above the various factors of temperature, pressure, the finish of the embossing surface and the particular material and thickness of the laminate are factors contributing to the production of a matte finish. For conventional plastic films used as photographic laminates as described herein, a temperature of the textured surface above 75° C is too extreme as at this temperature, the laminate tends to delaminate from the print rather than be embossed. Conversely, a surface temperature of below about 50° C appears to be too cold to accept texturing from the roller. Accordingly a temperature range of between 50° C and 75° C is considered an operable range.

The pressure at the nip and surface roughness of the embosser roller also are related in that the amount of force pressing on the laminated surface is directly proportional to the surface roughness of the embosser roll. Given the operational factors of the particular material used as the laminate, an acceptable range of parameters for the degree of surface

roughness, the temperature of the embossing roll and the pressure applied are matters of design within the skill of the art.

Accordingly, it should be appreciated that the present invention accomplishes its intended objects in providing a method and apparatus for producing either a glossy finish or a
5 matte finish photograph from the same glossy print stock. The apparatus allows the photofinishing operator to selectively make either glossy or matte prints without the need to inventory both glossy and matte finish print paper.

Having described the invention in detail, what is claimed as new is:

Claims

1. Apparatus for producing a matte finish photographic print comprising:

a) a laminator for applying a clear protective laminate over a photographic image having a glossy finish surface to produce a laminated glossy finish photograph;

5 b) an embosser arranged to receive the laminated photograph and including means for moving the laminated photograph along a path of travel from an inlet to an exit; and

c) an embossing roller arranged at one side of the path of travel, the roller having a textured outer surface and the clear protective laminate being selectively engaged against the embossing roller for embossing the laminate with a texture that produces a matte finish

10 thereby selectively converting the glossy finish photograph to the matte finish.

2. Apparatus as in Claim 1 wherein the embossing roller includes a heater.

3. Apparatus as in Claim 1 wherein the embossing roller provides the matte finish generating values below 40 on a 20° reflectivity scale.

4. Apparatus as in Claim 1 including a pressure roller across the path of travel from
15 the embossing roller, the pressure roller being selectively movable from and between a first position spaced from the embossing roller and a second position bearing against the textured surface of the embossing roller and the movement of the pressure roller to the second position causing a selective engagement of the embossing roller against the clear protective laminate for embossing the laminate.

20 5. Apparatus as in Claim 4 wherein movement of the pressure roller to the first position maintains the path of travel open for the free passage of the laminated photograph thereby producing the glossy finish photograph.

6. Apparatus as in Claim 4 including an actuator for selectively moving the pressure roller between the first and second position.

25 7. Apparatus as in Claim 4 comprising:

a) a lever arm supported for movement towards and away from the embossing roller;

- b) the pressure roller carried by the lever arm; and
- c) a cam selectively operated to engage and move the lever arm towards the embossing roller.

8. Apparatus as in Claim 1 wherein the embossing roller has a hollow and a heater is
5 disposed in the hollow.

9. Apparatus as in claim 1 wherein the embossing roller has a chemically etched surface comprising the textured surface.

10. Apparatus as in Claim 1 wherein the textured surface comprises surface features having a height of at least 0.1 inches.

10 11. A method for producing a matte finish photographic print comprising:

- a) providing a photographic image having a glossy finish surface;
- b) laminating a clear protecting laminate having smooth surfaces to the glossy finish surface to produce a laminated glossy finish photograph; and
- c) selectively embossing a textured pattern into the clear protective laminate to
15 produce a laminated matte finish photograph.

12. A method as in Claim 11 comprising:

- a) passing the laminated glossy finish photograph along a path of travel extending between a pressure roller and an embossing roller having a textured surface;
- b) maintaining a space between the pressure roller and the embossing roller to
20 prevent engagement of the embossing roller with the laminate so as not to disturb the glossy finish of the laminated glossy finish photograph;
- c) selectively closing the pressure roller and the embossing roller one against the other so as to create a nip; and
- d) passing the laminated glossy finish photograph through the nip to emboss a texture
25 in the laminate and create the laminated matte finish photograph.

13. A method as in Claim 12 comprising:

a) maintaining the space between the pressure roller and the embossing roller with a bias means urging the pressure roller in a direction away from the embossing roller; and

5 b) selectively moving the pressure roller against the bias and towards the embossing roller to create the nip between the pressure roller and the embossing roller.

14. A method as in Claim 11 comprising providing the embossing roller with a textured surface having surface features at least 0.1 inches high.

15. A method as in Claim 11 comprising heating the embossing roller.

10 16. A method as in Claim 11 comprising maintaining the space between the pressure roller and the embossing roller to provide a photograph having a glossy finish that generates between 60 and 70 on a 20° reflectivity scale and selectively closing the pressure roller and the embossing roller one against the other to provide a photograph having a matte finish that generates values below about 40 on a 20° reflectivity scale.

17. A matte finish photograph comprising:

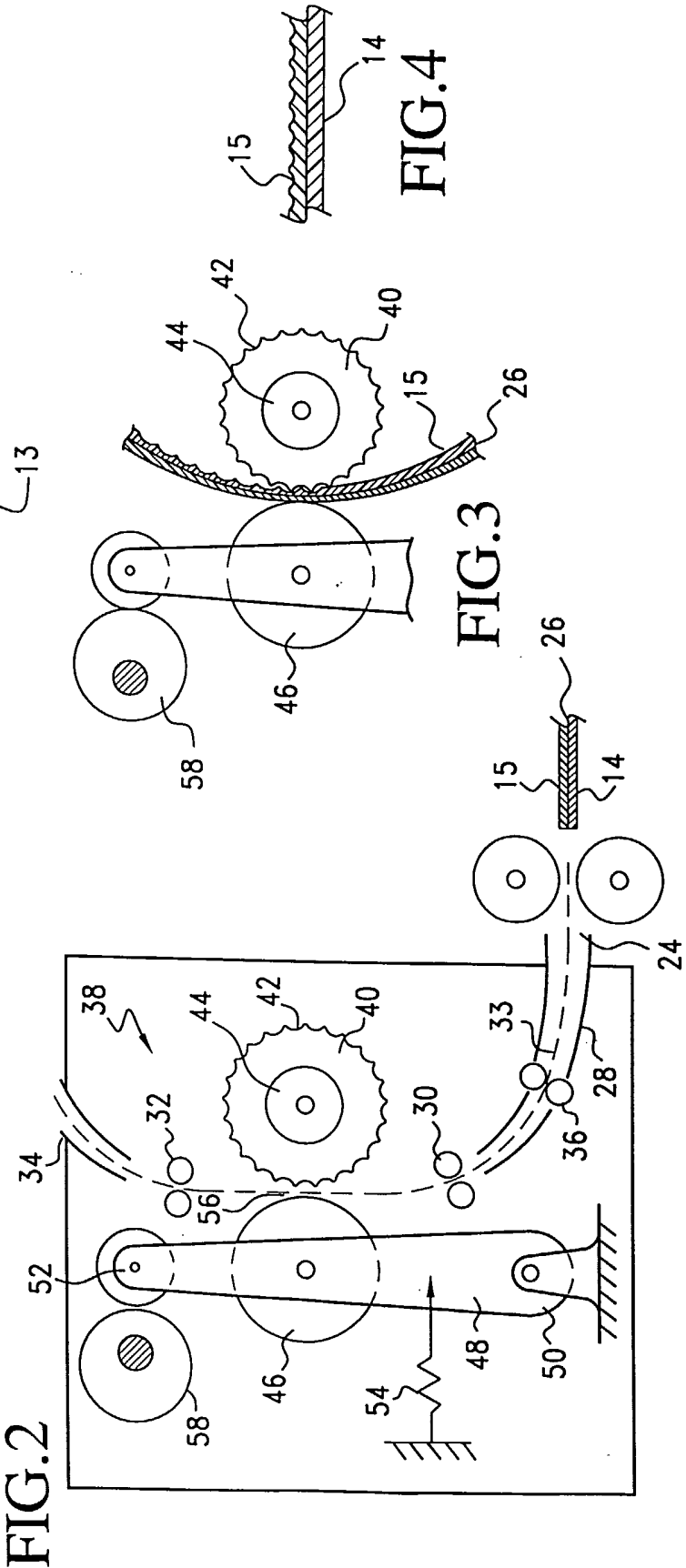
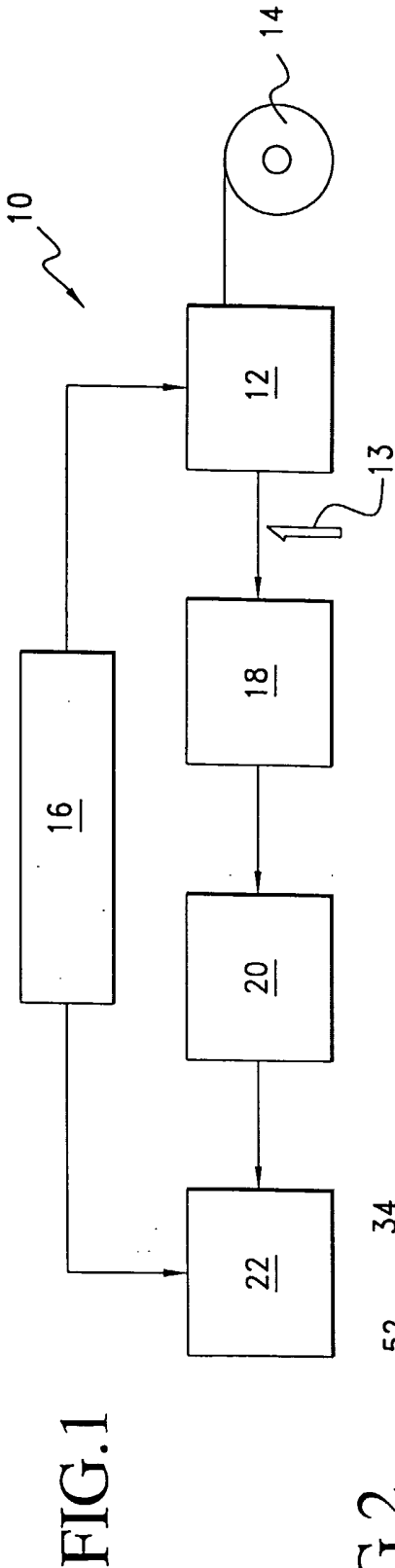
15 a) a first layer comprising a sheet of photographic paper having a glossy finish surface and a printed image on the glossy finish surface to provide a glossy finish photograph;

b) a second layer comprising a clear protective laminate applied to and extending over the printed image; and

20 c) the laminate having a textured outer surface and the textured surface being formed *in situ* to provide the glossy finish photograph with a matte finish appearance.

18. A matte finish photograph as in Claim 17 wherein the matte finish generates values below about 40 on a 20° reflectivity scale.

25 19. A matte finish photograph as in Claim 17 wherein the glossy finish photograph generates values of between 60 and 70 on a 20° reflectivity scale and the matte finish formed *in situ* generates values of below about 40 on a 20° reflectivity scale.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/02433

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : B65G 29/00

US CL : 428/141

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)

U.S. : 428/141

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3,758,970 A (ANNENBERG) 18 September 1973 (18.09.1973), see whole document.	1-19
Y	US 3,871,947 A (BREKKEN) 18 March 1975 (18.03.1975), see whole document.	1-19
Y	US 4,305,768 A (LONTZ) 15 December 1981 (15.12.1981), see whole document.	1-19
Y	US 6,460,687 B1 (ESCOBEDO et al.) 08 October 2002 (08.10.2002), see whole document.	1-19

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Further documents are listed in the continuation of Box C.

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See patent family annex.

* Special categories of cited documents:

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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

"&"

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Date of the actual completion of the international search

21 March 2003 (21.03.2003)

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Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703)305-3230

Authorized officer

Alicia Chevalier

Telephone No. (703) 308-0661