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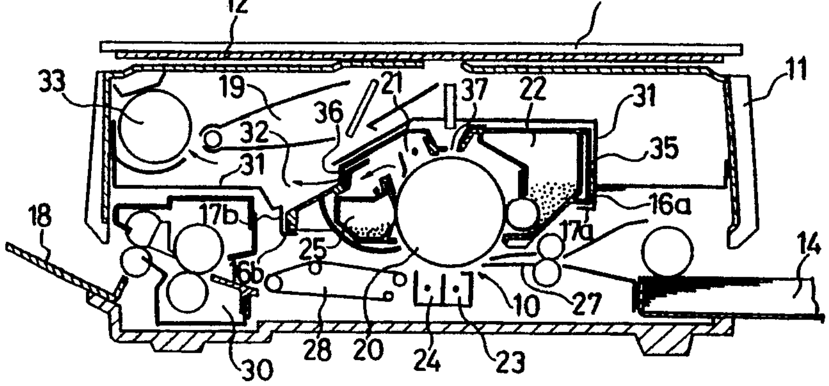
(54) **A coating material for obstructing optical flare and an image processing apparatus incorporating same.**

(57) An electronic image processing apparatus employing electrostatic charging comprises an image forming part (10) having an electrostatic charger (21) and a section (35,36,38) for obstructing optical flare emitted toward the image forming part (10). The optical flare obstructing section (35,36,38) includes a coating layer made of a coating material for obstructing optical flare, which includes a black ozone-eliminating substance and an organic binder to disperse the substance. Preferably, the image forming part (10) is located in a process cartridge (35) which has an air duct (36) for discharging air from around the image forming part (100 to the interior of the electronic image processing apparatus. The air duct (36) includes two staggered, parallel series of louvres (38) arranged so that each slat (38) overlaps the opposite opening (39) between a pair of adjacent slats (38). The louvres (38) are coated with the coating material. The electronic image processing apparatus may be, for example a copying machine or a laser printer.

FIG. 1



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A COATING MATERIAL FOR OBSTRUCTING OPTICAL FLARE AND AN IMAGE PROCESSING APPARATUS INCORPORATING SAME

The present invention relates to a coating material and an electronic image processing apparatus using the same. More specifically, it relates to a coating material for obstructing optical flare and an electronic image processing apparatus using the same.

In an electronic image processing apparatus which employs electrostatic charging, electrostatic charging devices such as the main charger generate ozone, increasing the ozone concentration inside the apparatus. The ozone creates an oxidized layer which lowers the sensitivity of the photoconductive material. Lowered sensitivity of photoconductive material leads to improper developing from, for example, fading and spreading of the image on the photoconductive member.

Furthermore, in a conventional apparatus, optical flare from the exposure system or ultraviolet light from outside the apparatus may irradiate the photoconductive material so that a latent image may be affected and the characteristics of the photoconductive material may become partially altered, resulting in uneven image formation.

To solve the above problems, elements which shut out optical flare and ultraviolet light have been provided, wherein black coating materials are used to coat the elements to diminish the light reflection in conventional apparatuses. For example, a process cartridge as disclosed in Japanese Patent Publication No. 57258/1984 has a duct flanked by two staggered, parallel series of louvres to allow ozone generated around the photoconductive drum to exit therethrough in order to decrease the concentration of interior ozone. in the process cartridge, the duct flanked by the staggered louvres inhibits the optical flare from entering but allows the ozone generated inside to exhaust and thereby the ozone concentration in the exhaust air is increased; consequently the ozone may have an adverse affect on the human body.

Accordingly, it is necessary to decrease the ozone in the air exhausted from the duct by provision of ozone filters in particular regions of the conventional image processing apparatus.

It is an object of the present invention to provide an electronic image processing apparatus which can reduce ozone in the exhaust air.

It is another object of the present invention to provide an electronic image processing apparatus which has an optical flare obstructing part or section for absorbing the optical flare from an exposure system and eliminating ozone generated in an image forming part.

It is yet another object of the present invention to provide a process cartridge having a duct for the exhaust air which is able to absorb optical flare and to eliminate ozone.

It is a further object of the present invention to provide coating material for forming a coating layer which is able to absorb optical flare and to eliminate ozone.

According to a first aspect of the present invention there is provided an image processing apparatus employing electrostatic charging comprising an image forming part having an electrostatic charging device and an optical flare obstructing section and characterised in that the walls defining the section have a coating layer made of coating material which includes a black ozone eliminating substance and an organic binder to disperse said ozone eliminating substance in order to obstruct the optical flare from irradiating the image forming part.

In the electronic image processing apparatus, the optical flare which irradiates the optical flare obstructing part is absorbed by the coating layer made of the coating material which includes the black ozone-eliminating substance. Moreover, ozone generated in the image forming part is eliminated by the ozone eliminating substance in the coating layer of the optical flare obstructing part. Thus, the ozone concentration is decreased in the electronic image processing apparatus so that the sensitivity of the photoconductive material is maintained. Additionally, the ozone concentration in the exhaust air from the electronic image processing apparatus is decreased.

According to a second aspect of the present invention there is provided a process cartridge for use in an electronic image processing apparatus employing electrostatic charging comprising an image forming part having an electrostatic charging device, and a case for containing said image forming part, and characterised in that the case has an air duct for discharging air from said image forming part, which duct is coated by a coating material for obstructing optical flare and includes a black ozone-eliminating substance.

In this process cartridge, optical flare scarcely enters the process cartridge, because the optical flare is absorbed bu the coating layer formed on the duct. Therefore, the characteristics of the image forming part are maintained so multiple prints are formed identically. Furthermore, ozone generated in the image forming part is eliminated when it goes through the duct because the coating layer located in the path includes the ozone eliminating substance. Therefore, the ozone concentration is decreased in the air exhausted from the process cartridge.

According to a third aspect of the present invention there is provided a coating material for obstructing optical flare characterlsed in that it comprises a black ozone-eliminating substance and an organic binder to disperse said ozone eliminating substance.

The coating material for obstructing optical flare may be used to form a mat-black coating layer covering a predetermined portion of the electronic image processing apparatus. The coating layer not only absorbs light but decomposes or absorbs ozone in the air. Therefore, the coating layer located on predetermined positions in the electronic image processing apparatus prevents optical flare from entering the image forming part and it eliminates ozone from the image forming part.

The present invention will now be described by way of example with reference to the accompanying drawing, in which:

Fig. 1 is a sectional schematic view of an electronic image processing apparatus incorporating an embodiment of the present invention; and

Fig. 2 is a sectional view showing part of an air duct of the apparatus of Fig. 1.

Fig. 1 is a sectional schematic view showing a copying machine in which an embodiment of the present invention is incorporated. In the figure, a copying machine body 11 has a contact glass 12 horizontally slidable at its the upper surface and an original holder 13 thereon which is hinged. On the right side of the machine body 11, a detachable paper cassette case 14 is attached. On the left side of the machine body 11, a copy tray 18 is attached, wherein copied paper is received.

The inner space of the machine body 11 is divided into an upper portion and a lower portion by a dividing plate 31. The dividing plate 31 has an opening 32 in correspondence with an air duct 36 of a process cartridge 35, described hereinafter. Above the dividing plate 31, an exposure system 19 is provided for reading the image from the original. The exposure system 19 consists of a light source, mirrors, etc. At the left side of the exposure system 19, a ventilating fan 33 is provided for exhausting the air from the copying machine body 11.

An image forming part or section 10 is located in the central part of the machine body 11 below the dividing plate 31. The image forming section 10 has a photoconductive drum 20 for forming an electrostatic latent image in the central portion. surrounding the photoconductive drum 20, there are a main charger 21 for charging the photoconductive drum 20 with a predetermined level of electric charge, a developing unit 22 for developing the electrostatic latent image , a transferring device 23 for transferring a toner image to a sheet of material paper, a detaching device 24 for detaching the sheet from the photoconductive drum 20, and a cleaning unit 25 for removing toner from the conductive drum in that order.

A paper transportation path 27 is provided between the paper cassette case 14 and the image forming part 10, and a paper discharging path 28 is provided on the left of the image forming part 10. Between the paper discharging path 28 and the copy tray 18 is a fixing unit 30 for fixing the transferred image onto the transported sheet.

In the image forming part 10, the photoconductive drum 20, the main charger the developing unit 22 and the cleaning unit 25 are contained within a process cartridge 35. The process cartridge 35 has shoulders 16a and 16b at the lower portion of opposite side walls. The shoulders 16a and 16b are slidably placed on guides 17a and 17b, which are formed in the dividing plate 31. Hence, the process cartridge 35 is supported by the dividing plate 31 so that it may be withdrawn from the region surrounded by the dividing plate 31.

The process cartridge 35 has a slit 37 above the photoconductive drum 20 through which light from the exposure system 19 irradiates the photoconductive drum 20. To the left of the cleaning unit 25 in Fig. 1, the air duct 36 is in correspondence with the opening 32 of the dividing plate 31. The air duct 36, as shown in Fig. 2, consists of a portion of the wall of the process cartridge 35 and a plate member 38 located in parallel with and apart from the portion of the wall by a small gap. The wall portion and the plate member 38 include two staggered, parallel series of louvres wherein each slat overlaps the opposite opening 39 between a pair of adjacent slats. Hence, many zigzag channels in the air duct 36, as shown by arrows in Fig. 2, are formed.

All surfaces of the plate member 38 and the wall portion of the process cartridge 35 which constitute the air duct 36 are coated by coating layers consisting of coating material for obstructing optical flare. The coating material for obstructing optical flare is made by dispersing an ozone eliminating substance in an organic binder. The ozone eliminating substance for the coating material may be a black ozone-decomposing substance or a black ozone absorbing substance. The ozone decomposing substance may be a palladium-carbon catalyst, a palladium-active-carbon catalyst, a platinum-carbon catalyst or a platinum-active-carbon catalyst, which are made by mixing carbon powder or active carbon powder with palladium or platinum of more than 0.1 weight percent; manganese dioxide; lead peroxide; or a mixture of manganese dioxide and powder of a binary composite oxide of titanium and silicon. in these substances, the mixture of manganese dioxide and the powder of a binary composite oxide of titanium and silicon is the most preferable due to its high efficiency of decomposing ozone. Alternatively, the ozone absorbing substance may be active carbon or carbon powder. These black ozone eliminating substances form a mat-black coating layer. The organic binder for the coating material may be an emulsion including a polymer of polyacrylicester type (for example, polycyanoacrylate), polymetaacrylicester type, polyvinyl acetate type, or polyethylene type; a copolymer of vinylacetate/acrylicester type or styrene/butadiene type; acetal resin; butylal resin; polyimide resin; or polyamide resin. These organic binders may be employed so that the solid part of the binder ranges from 2 to 100 percent by weight and is preferably from 5 to 50 percent by weight. An ozone eliminating substance of 3 to 100 parts by weight, preferably 5 to 50 parts by weight, may be mixed with the organic binder of 100 parts by weight. if the amount of the ozone eliminating substance is less then 3 parts by weight, a sufficient ozone eliminating effect cannot be obtained. However, if the amount of the ozone eliminating substance is more than 100 parts by weight, the cost of the substance is higher though the effect is not better despite the increased amount of the substance. Furthermore, in this case the coating layers obtained may easily become detached.

The coating material for obstructing optical flare may be foamable. Foamable coating material is made by adding a foaming agent to a material consisting of the aforementioned ozone eliminating substance, the aforementioned organic binder, and a solvent. The foaming agent may be, for example, sodium bicarbonate, ammonium carbonate, dinitrosopentamethylenetetramine, azobisformamide, azobisisobutyronitryl, barium azodicarboxylate, or trihydrazinotriazine. More specifically, the following are examples of foamable coating materials which may be used.

(1) A material made by dissolving in ethanol of 100 parts by weight manganese dioxide of 80 parts by weight, butylal resin of 10 parts my weight and ammonium carbonate of 0.05 parts by weight.

(2) A material made by dissolving in ethanol of 100 parts by weight palladium-carbon powder of 95 parts by weight, butylalresin of 10 parts by weight and dinitrosopentamethylenetetramine of 0.03 parts by weight.

(3) A material made by dissolving in toluene of 80 parts by weight a mixed powder of manganese dioxide and a binary composite oxide of titanium and silicon of 100 parts by weight, acrylic resin of 10 parts by weight and azobisformamide of 0.08 parts by weight.

The coating material for obstructing optical flare is applied usually with a spray, a brush, a coater or a gravure roll. The thickness of the coating layer should preferably be about 20 µm. The layer is usually treated by heating at 100° C for 1 minute in order to remove the solvent from the coating material so that the ozone eliminating substance is baked on to form a mat-black layer coating.

When a foamable coating material is used, the coating layer is made porous by means of the foaming agent.

The operation of the copying machine will now be described.

Light from the exposure system in correspondence with image information from a sheet of original on the contact glass 12 radiates into the processing cartridge 35. The light forms an electrostatic latent image, in correspondence with the original image, on the photoconductive drum 20, which has been charged by the main charger 21. During this process, optical flare from the exposure system 19 cannot radiate into the process cartridge 35 through the air duct 36, because optical flare in the air duct 36 is absorbed by the mat-black coating layer.

Meanwhile , during the image forming process in the image forming part 10, the main charger 21, the transferring device 23 and the detaching device 24 generate ozone. Since the ventilating fan 33 draws the air in the copying machine body 11 towards it, the ozone generated flows from the process cartridge 35 through the air duct 36 in the direction shown by arrows in Fig. 1. Passing through the air duct 36, the ozone in the flow comes into contact with the coating layer and is decomposed or absorbed. Thus, the ozone contained in the exhaust air is effectively eliminated from the air duct 36 so that the ozone concentration in the exhaust air from the copying machine is decreased.

When a foamable coating material is used, the coating layer is porous. Hence, the coating layer has a maximal surface for contact with ozone, so that it more effectively eliminates ozone.

The coating material for obstructing optical flare may additionally be used to coat other parts in the copying machine, which are typically coated by conventional black coating materials, for example the cleaning unit 25 and the developing unit 22.

The coating material for obstructing optical flare may also be used to coat all the surfaces inside the copying machine body 11. The coating material in this case can absorb the optical flare more effectively and eliminate ozone more effectively.

The present invention can also be implemented by means of an adhesive double-coated tape applied to the process cartridge 35, etc. Such a tape would incorporate powder of an ozone eliminating substance on one side.

It will also be appreciated that the present invention can be applied to electronic image processing apparatus other than copying machines, for example laser printers.

EXPERIMENTS

Example

A coating material was prepared by adding powder of manganese dioxide of 50 parts by weight to a binder of 100 arts by weight with respect to its solid component. the binder was an emulsion of polyvinyl acetate, including a solid component of 5 weight percent. Optical flare obstructing parts on the back surface of a main charger and the air duct of the process cartridge in a copying machine were coated with the coating material obtained. The thickness of the applied coating material was 20 µm. The coating material was dried to form a coating layer. The copying machine had a photoconductive drum incorporating organic photoconductive material which takes on positive charge.

This copying machine was used to make 100 copies. As soon as the 100th copy was obtained, the ozone concentration of the exhaust air was measured by an ozone monitor (EG-2001; Ebara-Jitsugyosya). The ozone concentration was 0.8 ppm.

Comparative example

By the same procedure as in the above example, but with the coating material for obstructing optical flare excluded in a control machine, the ozone concentration was measured. The ozone concentration was 2.0 ppm.

Various details of the invention may be changed without departing from its spirit nor its scope. Furthermore, the foregoing description of the embodiments according to the present invention is provided for the purpose of illustration only, and not for the purpose of limiting the invention as defined by the appended claims and their equivalents.

Claims

1. An image processing apparatus employing electrostatic charging comprising an image forming part (10) having an electrostatic charging device (21) and an optical flare obstructing section (35,36,38) and characterised in that the walls (35,38) defining the section (35,36,38) have a coating layer made of coating material which includes a black ozone eliminating substance and an organic binder to disperse said ozone eliminating substance in order to obstruct the optical flare from irradiating the image forming part (10).

2. An apparatus as claimed in Claim 1, characterised in that said ozone eliminating substance comprises a black ozone-decomposing substance.

3. An apparatus as claimed in Claim 1, characterised in that said ozone eliminating substance comprises a black ozone absorbing substance.

4. An apparatus as claimed in any one of Claims 1 to 3, characterised in that said coating material comprises a foaming agent.

5. An apparatus as claimed in any one of Claims 1 to 4, characterised in that said image forming part (10) comprises a photoconductive drum (20) for forming an electrostatic latent image, a developing unit (22) for developing said electrostatic latent image, and a cleaning unit (25) for removing toner from said photoconductive drum (20).

6. An apparatus as claimed in Claim 5, characterised in that said electrostatic charging device (21) includes a main charger (21) for charging said photoconductive drum (20) with a predetermined level of electric charge, a transferring device (23) for transferring a toner image to a sheet of paper, and a detaching device (24) for detaching said sheet from said photoconductive drum (20).

7. An apparatus as claimed in Claim 6, comprising a detachable process cartridge (35) having an air duct (36) for discharging air from the image forming part (10) and characterised in that said process cartridge (35) contains said photoconductive drum (20), said main charger (21) and said cleaning unit (25), and in that said coating layer is located on the walls defining said air duct (36) of said process cartridge (35).

8. An apparatus as claimed in Claim 7, characterised in that said air duct (36) includes a plurality of air channels (39) defined by a plurality of slats (38) which are staggered so that each slat (38) overlaps the opposite opening (39) between a pair of adjacent slats (38).

9. An apparatus as claimed in any one of Claims 1 to 8, characterised in that said coating layer is 20 µm in thickness.

10. A process cartridge for use in an electronic image processing apparatus employing electrostatic charging comprising an image forming part (10) having an electrostatic charging device (21), and a case (35) for containing said image forming part (10), and characterised in that the case (35) has an

air duct (36) for discharging air from said image forming part (10), which duct (36) is coated by a coating material for obstructing optical flare and includes a black ozone-eliminating substance.

11. An process cartridge as claimed in Claim 10, characterised in that said air duct (36) incorporates two staggered series of slats (38) such that each slat (38) overlaps the opposite opening (39) defined between a pair of adjacent slats (38).

12. A process cartridge as claimed in Claim 10 or Claim 11, characterised in that said ozone eliminating substance is an ozone decomposing substance.

13. A process cartridge as claimed in Claim 10 or Claim 11, characterised in that said ozone eliminating substance is an ozone absorbing substance.

14. A process cartridge as claimed in any one of Claims 10 to 13, characterised in that said coating material comprises a foaming agent.

15. A process cartridge as claimed in any one of Claims 10 to 14, characterised in that said image forming part (10) includes a photoconductive drum (20) for forming an electrostatic latent image, a developing unit (22) for developing the electrostatic latent image, and a cleaning unit (25) for removing toner from said photoconductive drum (20).

16. A process cartridge as claimed in any one of Claims 10 to 15, characterised in that said electrostatic charging device (21) includes a charger (21) for charging said photoconductive drum (20) with a predetermined level of electric charge.

17. A coating material for obstructing optical flare characterised in that it comprises a black ozone-eliminating substance and an organic binder to disperse said ozone eliminating substance.

18. A coating material as claimed in Claim 17, characterised in that the quantity of said ozone eliminating substance therein ranges from between 3 and 100 parts by weight and the quantity of said organic binder therein comprises 100 parts by weight.

19. A coating material as claimed in Claim 18, characterised in that the quantity of said ozone eliminating substance therein ranges from between 5 and 50 parts by weight.

20. A coating material as claimed in any one of Claims 17 to 19, characterised in that said ozone eliminating substance is an ozone decomposing substance.

21. A coating material as claimed in any one of Claims 17 to 19, characterlsed in that it comprises a foaming agent.

22. A coating material as claimed in Claim 21, characterised in that said ozone eliminating substance is manganese dioxide, said organic binder is butylal resin, and said foaming agent is ammonium carbonate.

23. A coating material as claimed in Claim 22, characterised in that it further comprises ethanol as a solvent with said manganese dioxide at 80 parts by weight, said butylal resin at 10 parts by weight and said ammonium carbonate at 0.05 parts by weight all dissolved in said ethanol at 100 parts by weight.

24. A coating material as claimed in Claim 21, characterised in that said ozone eliminating substance is a powder of palladium-carbon, said organic binder is butylal resin, and said foamimg agent is dinitrosopentamethylenetetramine.

25. A coating material as claimed in Claim 24, characterised in that it further comprises ethanol as a solvent with said palladium-carbon powder at 95 parts by weight, said butylal resin at 10 parts by weight and said dinitrosopentamethylenetetramine at 0.03 parts by weight all dissolved in said ethanol at 100 parts by weight.

26. A coating material as claimed in Claim 21, characterised in that said ozone eliminating substance is a binary composite oxide of titanium and silicon, said organic binder is acrylic resin, and said foaming agent is azobisformamide.

27. A coating material as claimed in Claim 26, characterised in that said ozone eliminating substance further comprises manganese dioxide.

28. A coating material as claimed in Claim 27, characterised in that it further comprises toluene as a solvent with a mixed powder of said manganese dioxide and said binary composite oxide of titanium and silicon at 100 parts by weight, said acrylic resin of 10 parts at weight, and said azobisformamide at 0.08 parts by weight all dissolved in said toluene at 80 parts by weight.

29. A coating material as claimed in any one Claims 17 to 19, characterised in that said ozone eliminating substance is an ozone absorbing substance.

30. A coating material as claimed in Claim 29, characterised in that it comprises a foaming agent.

FIG. 1

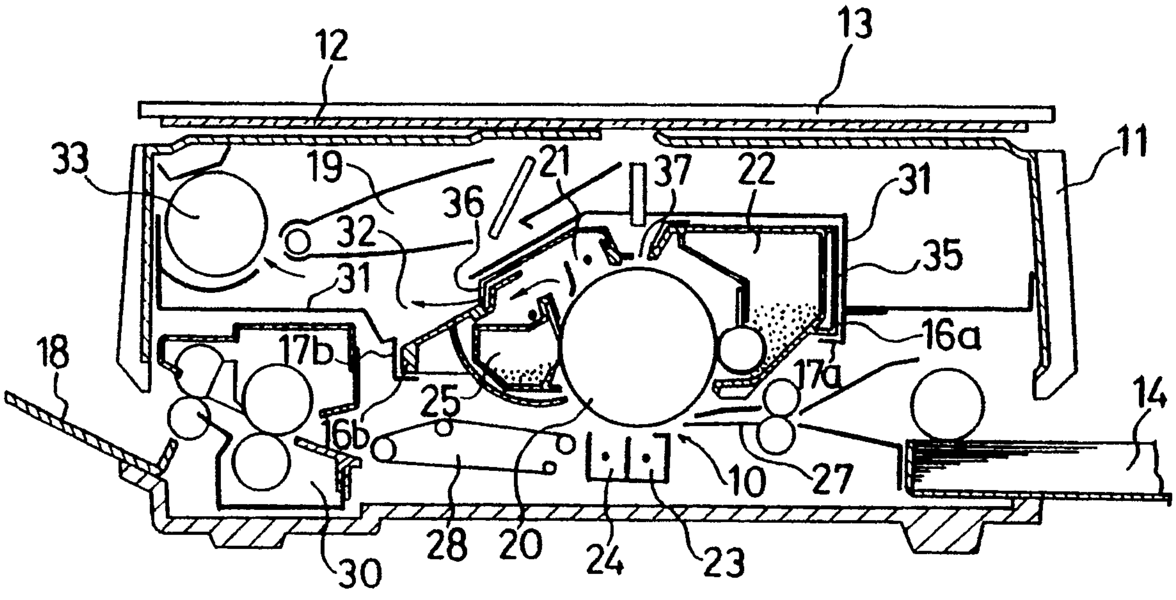
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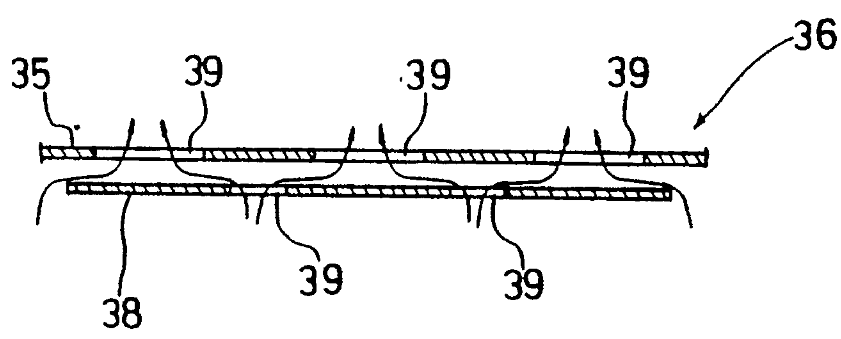
FIG. 2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EUROPEAN SEARCH REPORT

Application Number

EP 90 11 6671

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	PATENT ABSTRACTS OF JAPAN vol. 10, no. 185 (C-357)(2241), 27 June 1986; & JP-A-6131477 (CANON) 13.02.1986	1,2,10, 12,17, 20,22, 27	G 03 G 21/00
X	PATENT ABSTRACTS OF JAPAN vol. 9, no. 253 (P-395)(1976), 11 October 1985; & JP-A-60102659 (CANON K.K.) 06.06.1985	1,5,6	
X	PATENT ABSTRACTS OF JAPAN vol. 13, no. 172 (P-862)(3520), 24 April 1989; & JP-A-17066 (TOSHIBA) 11.01.1989	3,13,29	
D,A	PATENT ABSTRACTS OF JAPAN vol. 8, no. 159 (P-289)(1596), 24 July 1984; & JP-A-5957258 (CANON) 02.04.1984	1,5-8, 10,11, 15,16	
A	US-A-4 540 268 (T. TOYONO et al.) * column 2, lines 62-68; figures 1-6 *	1,5-8, 10,11, 15,16	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

G 03 G 15/00
G 03 G 21/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	28-11-1990	HOPPE H

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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