(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 500 490 A2

(12) # EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.01.2005 Bulletin 2005/04

(51) Int Cl.[7]: B31B 43/00

(21) Application number: 04017102.7

(22) Date of filing: 20.07.2004

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

(30) Priority: 25.07.2003 JP 2003201503

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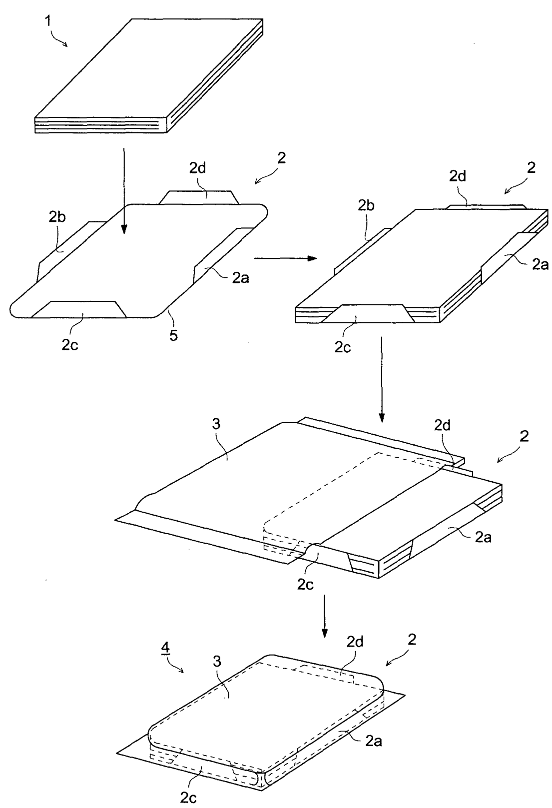
(54) **Tray container and method for manufacturing it**

(57) A manufacturing method of a tray container (2) for housing a plurality of photothermographic material sheets, comprising a step of:

pressing and heating a paperboard, using dies (11) to produce the tray container (2),

wherein temperature of the dies (11) is greater than 180°C, and pressing force is 180 - 230 kgf/cm^2 (18 - 23 Mpa).

FIG. 1



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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a manufacturing method of a tray for containing a plurality of photothermographic materials, and to the tray container itself.

[0002] In the medical and printing/plate making fields, waste solution generated by the wet process of image forming materials is a very cumbersome problem, and in recent years, reduction of the processing waste solution has become an increasingly greater goal. This has led to technology of photothermographic materials wherein effective exposure can be performed by a laser imager and a laser image setter, and wherein black images with high resolution and high sharpness can be produced.

[0003] Regarding this technology, well known are methods described in US Patents 3,152,904, 3,487,075, and "Dry Silver Photographic Materials" on page 48 of The Handbook of Imaging Materials, Marcel Dekker, Inc. 1991. Since these imaging materials are developed at high temperature, greater than 80°C, they are called photothermographic materials. Processing chemicals of the traditional liquid type are not used at all for these photothermographic materials, and therefore it is possible to provide a system which is very simple and does not deteriorate the natural environment.

[0004] End-products of these photothermographic materials are packaged and marketed in a light-proof bag. The bag, packaging the photothermographic materials, is called the packing bag, and condition under which the phbtothermographic materials is placed in the packing bag is called photothermographic materials package, in which the photothermographic materials is contained in a tray container within the packing bag.

[0005] Material of the resin sheet container for the photothermographic material is disclosed in Patent Documents 1 and 2, tray container containing the resin sheets is disclosed in Patent Documents 3 - 6, and a tray container containing a humidity controlling material is disclosed in Patent Document 7.

Patent Document 1: Japanese Tokkai 2000-89416
Patent Document 2: Japanese Patent 31460006
Patent Document 3: Japanese Tokkai 2002-31875
Patent Document 4: Japanese Jitukaihei 6-41246
Patent Document 5: Japanese Tokkaihei 6-87139
Patent Document 6: Japanese Tokkai 2002-62625
Patent Document 7: Japanese Tokkaihei 9-290937

[0006] In regard to the material for the resin sheet container carrying the photothermographic materials, as disclosed in Patents Documents 1 and 2, employed is a method in which a molded resin tray container is employed, in which the photothermographic materials are carried, which is covered with a plastic film employing an adhesive agent. This method assuredly protects the photothermographic materials, however, after use, the hard resin tray container, which is very voluminous, is not easily scrapped. Still further, since the resin sheet is adhered to the tray container which is based on a paper material, it is not practical to dispose of it for separated trash collection, because incompatible materials, namely paper and plastic, remain after use. Still further in a method wherein the above humidity controlling material is attached to the tray container, as disclosed in Patent Document 8, though the humidity controlling material is attached to the tray to control the humidity of the photographic material, the humidity controlling material is rather costly, which drives up the production cost.

SUMMARY OF THE INVENTION

[0007] The present invention was achieved with a view of overcoming these problems, and the objective of the present invention is to provide a manufacturing method of a tray container and the tray container itself, by which performance degradation (about photographic fog and sensitivity) of photothermographic materials is controlled, and which can be discarded without bothering about separation of the used tray container into burnable and unburnable trash, and which can be produced inexpensively compared to conventional methods.

[0008] In order to solve the above problems and thereby attain the objective, the invention is structured as below.

Structure 1

[0009] A manufacturing method of a tray container for housing a plurality of photothermographic material sheets, including a step of pressing and heating a paperboard, with dies to produce the tray container, wherein temperature of the dies is greater than 180°C, and pressing force is 180 - 230 kgf/cm^2 (18 - 23 Mpa).

[0010] Based on structure 1, the tray container is manufactured of the paperboard in the dies by pressing and heating, and if stipulated pressing condition of the tray container is met, pressing is achieved under high temperature and high pressure, whereby moisture and impurities included in the paperboard are evaporated during the pressing process, and thereby, any adverse influence to the photothermographic materials is minimized, without adhering a resin sheet onto contact areas between the tray container and the photothermographic materials. Further, since moisture content can be controlled to a certain amount without adhering a humidity control material onto the tray container, it is possible to minimize the performance degradation (about photographic fog and sensitivity) of the photothermographic materials. Still further, it is possible to discard the tray container, without bothering about separation of the components of the used tray container into burnable and unburnable trash. Still further, since the tray container is less bulky than the prior art, it is an effective way to reduce waste products. Still further the tray container can be produced inexpensively compared to the conventional methods.

Structure 2

[0011] The manufacturing method of the tray container of structure 1, wherein the moisture content of the tray container after pressing is less than 3.0 wt%.
[0012] Based on structure 2, by specifying the moisture content, it is possible to reduce impurities (being primarily formalin and hydrochloric acid-vinyl acetate copolymers) to a maximum of 100 ppm, whereby it is possible to improve the performance (fog level) of the photothermographic material.

Structure 3

[0013] The manufacturing method of the tray container of structure 1 or 2, wherein the material of the tray container is selected from among coated cardboard, corrugated fiberboard and synthetic paper.
[0014] Based on structure 3, material of the tray container is selected from among coated cardboard, corrugated fiberboard and synthetic paper, whereby the user can readily discard the used tray container, without bothering about separation of the used tray container into burnable and/or unburnable trash.

Structure 4

[0015] A tray container for storing plural photothermographic materials, wherein the tray container is manufactured of a paperboard with dies by pressing and heating, and wherein a pressing condition is that temperature of the dies is greater than 180°C, and the pressing force is 180 - 230 kgf/cm^2 (18 - 23 Mpa).
[0016] Based on structure 4, the tray container is manufactured of the paperboard with dies by pressing and heating, and moisture and impurities included in the paperboard are evaporated during the pressing, and thereby, the influence to the photothermographic materials can be controlled without attaching a resin sheet at contact areas between the tray container and the photothermographic materials. Further, since moisture content can be controlled under a specified amount without attaching the humidity control material to the tray container, it is possible to control performance degradation (about photographic fog and sensitivity) of the photothermographic materials. Still further, it is easier to discard the tray container, without bothering about separation of the used tray container into burnable and unburnable trash. Still further, since the tray container is reduced in volume and discarded, which is effective in the reduction of waste products. Still further the tray container can be produced inexpensively compared to conventional methods.

Structure 5

[0017] The tray container of structure 4, wherein the moisture content of the tray container after pressing is less than 3.0 wt%.
[0018] Based on structure 5, by specifying the moisture content, it is possible to reduce impurities (being mainly formalin and hydrochloric acid-vinyl acetate copolymers) to a maximum of 100 ppm, whereby it is possible to improve the performance (fog level) of the photothermographic material.

Structure 6

[0019] The tray container of structure 4 or 5, wherein material of the tray container is selected from among coated cardboard, corrugated fiberboard and synthetic paper.
[0020] Based on structure 6, wherein material of the tray container is selected from among coated cardboard, corrugated fiberboard and synthetic paper, therefore, the user can more readily discard the used tray container, without bothering about separation of the used tray container into burnable and unburnable trash.

Structure 7

[0021] The tray container of structures 4 - 6, including a base on which the photothermographic material sheets are stacked, and a short wall centered on each of the four sides of the base, integral and perpendicular to the base.
[0022] Based on structure 7, the tray container protects and supports the stacked photothermographic material sheets.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Fig. 1 shows an example for manufacturing the photothermographic material package.
Fig. 2 shows a manufacturing method of the tray container, in which Fig. 2(a) shows placing of a paperboard, Fig. 2(b) shows clamping of the paperboard, and Fig. 2(c) shows the shaped product.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0024] The embodiment of the manufacturing method of the tray container and the embodiment of the tray container itself of the present invention will now be explained. The invention is not limited to the present invention. Further the present embodiment shows the most preferable example, and the meaning of the vocabulary relating to the present invention is not limited thereto.
[0025] Fig. 1 shows an example for manufacturing the packaged photothermographic materials of the present invention, where numeral 1 shows plural stacked sheets of photothermographic materials, and numeral 2 shows a tray container to align and protect the plural stacked sheets of photothermographic materials. Plural stacked sheets of photothermographic materials 1 are placed on base 5 of tray container 2 and stored in package bag 3, which makes up packaged photothermographic materials 4.
[0026] Tray container 2 has four short walls 2a - 2d and base 5 to align and protect stacked photothermographic materials 1. Tray container 2 protects the four side surfaces as well as the bottom surface of stacked photothermographic materials 1, and contains stacked photothermographic materials 1, secured by the surrounding four short walls 2a - 2d.
[0027] Tray container 2 which houses a plurality of photothermographic materials 1 is produced in such a manner that paperboard 10 is subjected to pressing and heating by employing dies 11, shown in Fig. 2. Dies 11 are composed of female die 11a and male die 11b. Paperboard 10 is placed between heated female die 11a and male die 11b (see Fig. 2(a)), after which paperboard 10 is clamped between female die 11a and male die 11b (see Fig. 2(b)), and then paperboard 10 is released from female die 11a and male die 11b, resulting in pressed tray container 2.
[0028] The pressing condition for shaping this tray container 2 is that the temperature of dies 11 is greater than 180 °C, and the clamping pressure of die 11 is 180 - 230 kgf/cm^2 (18 - 23 Mpa). Basically, female die 11a and male die 11b are heated with the same temperature, however a temperature difference of ± 10°C is acceptable during pressing. Further pre-hardened steel is generally used for creating die 11. Still further, regarding the press machine for clamping dies 11, preferably used is one with power of 350- 1,000 kgf/cm^2.
[0029] The material of tray container 2 is selected from among coated cardboard, corrugated fiberboard and synthetic paper, therefore, the user can discard the used tray container, without bothering about separation of the used tray container 2 to a burnable and unburnable trash.
[0030] Regarding paperboard 10, preferably used are waste paper or recycled paper such as coated cardboard or manila paperboard in which both surfaces are coated with virgin pulp, and further is fiberboard in which corrugated paperboards is adhered by a flute or liner. Further, synthetic paper (paper in which PE resin is impregnated to less than 20%) is used, in order to improve shapability.
[0031] Since tray container 2 is manufactured of paperboard 10 with dies 11 by pressing and heating, and further the pressing condition for tray container 2 is such that the temperature of the dies 11 is greater than 180°C, and the pressing force is 180 - 230 kgf/cm^2 (18 - 23 Mpa), whereby paperboard 10 is shaped into a pressed piece, which is not deformed and keeps its fixed form. Further, since moisture and impurities included in paperboard 10 are evaporated during the pressing process, any adverse influence upon photothermographic materials 1 is controlled, without adhering the resin sheet on contact areas between tray container 2 and photothermographic materials 1.
[0032] Still further, since moisture content can be controlled to a certain amount without adhering a humidity control material in tray container 2, it is possible to minimize the performance degradation (about photographic fog and sensitivity) of photothermographic materials 1. Yet further, it is possible to discard the tray container, without bothering about separation of used tray container 2 into burnable and unburnable trash. In addition, since tray container 2 is reduced in volume and then discarded, it is effective in reducing waste. Also tray container 2 can be produced inex-

pensively compared to the conventional method.

[0033] Since the moisture content of the tray container after the pressing is less than 3.0 wt%, and by specifying the moisture amount, it is possible to reduce impurities (being mainly formalin and hydrochloric acid-vinyl acetate copolymers) to less than 100 ppm, whereby it is possible to improve the performance (fog level) of the photothermographic material.

[0034] For package bag 3, used is a bag with light shielding and damp-proofing characteristics. Package bag 3 can be formed of any materials which have such light shielding and damp-proofing characteristics, or any materials to which the light shielding and damp-proofing characteristics can be provided. Regarding materials having such damp-proofing characteristic, preferably employed is a laminated sheet wherein a polyethylene film is positioned on the interior surface. In order to provide the light shielding characteristic, carbon black is included in any layer of the above laminated sheet, or aluminum foil is placed on the surface thereof, or aluminum is vacuum-evaporated onto the surface of the laminated sheet.

[0035] Photothermographic materials to which this invention is applied will now be described.

[0036] It is preferable that photothermographic materials of this invention are formed in such a manner that a photographic constitution layer comprising organic silver salts, photosensitive silver halide, and silver ion reducing agents is formed on a support employing solvent coating, and comprises at least one protective layer on the aforesaid photographic composition layer. Further a so-called single-sided photosensitive material is preferred which comprises a backing layer on the side opposite the support.

[0037] In addition, a preferred embodiment is that the photographic constitution layer of photothermographic materials is comprised of a photosensitive layer and a non-photosensitive layer, in which the photosensitive layer incorporates organic silver salts as well as photosensitive silver halide grains, while the non-photosensitive layer incorporates reducing agents.

(Photosensitive Silver Halide) Silver halide grains function as a photo-sensor. In this invention, in order to reduce white turbidity after forming images and to achieve higher image quality, the average grain diameter is preferably quite small, being at most 0.20 μm, more preferably 0.02 - 0.15 μm, and still more preferably 0.03 - 0.1 μm.

[0038] Average grain diameter, as described herein, refers to the edge length of a silver halide grain when it is in the form of normal crystals such as a cube or octahedron. On the other hand, when they are not in such normal crystals, for example, in the case of spherical, rod-shaped, or tabular grains, the diameter refers to one of the sphere which has the same volume as each of those.

[0039] Further, it is preferable that silver halide grains are monodipsersed grains. Monodipsersed grains, as described herein, refer to those in which the degree of monodispersion, determined by the formula below, is preferably a maximum of 40 percent, more preferably a maximum of 30 percent, and most preferably a maximum of 20 percent.

[0040] Degree of monodispersion = (standard deviation of grain diameter)/(average value of grain diameter) x 100

[0041] The shape of silver halide grains is not particularly limited. However, it is preferable that the ratio of the plane occupied by a Miller index [100] plane is high. The aforesaid ratio is preferably a minimum of 50 percent, is more preferably a minimum of 70 percent, and is most preferably a minimum of 80 percent. It is possible to determine the ratio of the Miller index [100] plane, based on T. Tani, J. Imaging Sci., 29, 165 (1985), in which the ratio is determined utilizing adsorption dependency onto a [111] plane and a [100] plane during adsorption of sensitizing dyes.

[0042] The average grain diameter of the aforesaid monodipsersed grains is preferably a maximum of 0.1 μm, is more preferably 0.01 - 0.1 μm, and is most preferably 0.02 - 0.08 μm.

[0043] Another preferred silver halide grain is a tabular grain. Tabular grains, as described herein, refer to those at an aspect ratio (being r/h) of at least 3, wherein r (in μm) represents a grain diameter which is the square root of the projected area of the grain and h (also in μm) represents the thickness in the vertical direction. Of these, grains at an aspect ratio of 3 - 50 are preferred.

[0044] The diameter of tabular grains is preferably a maximum of 0.1 μm, but is more preferably 0.01 - 0.08 μm. These grains are described in U.S. Patent Nos. 5,264,337, 5,314,798, and 5,320,958, whereby it is possible to readily prepare targeted tabular grains.

[0045] In silver halides, halogens are not particularly limited, and any of silver chloride, silver chlorobromide, silver chloroiodobromide, silver bromide, silver iodobromide and silver iodide may be employed. Of these, silver bromide, silver iodide, or silver iodobromide is preferred, while silver bromide or silver iodobromide is more preferred, but silver iodobromide is most preferred. The content of silver iodide is preferably 0.1 - 40 mol percent, and is more preferably 0.1 - 10 mol percent. The distribution of halogen concentration in a grain may be uniform, or may vary stepwise. Alternatively, grains may be employed in which the halogen concentration continuously varies. A preferred embodiment is that silver halide grains are employed which have a core/shell structure having a high silver iodide content ratio in the interior of the grain.

[0046] Photographic emulsions employed in this invention can be prepared employing the methods described in P. Glafkides, Chimie et Physique Photographique (published by Paul Montel Co., 1967), G. F. Duffin, Photographic Emulsion Chemistry (published by The Focal Press, 1966), and V. L. Zelikman, et al., Making and Coating Photographic

Emulsion (published by The Focal Press, 1964). Namely, any of an acid method, a neutral method, or an ammonia method may be employed. Further, when silver halide is formed by allowing soluble silver salts to react with soluble halides, a single-jet mixing method, a double-jet mixing method and combinations of these may be employed.

[0047] The above-mentioned silver halide may be incorporated into an image forming layer employing any of those methods. At that time, silver halide is arranged to be in the vicinity of reducible silver sources.

[0048] Further, silver halide may be prepared by converting some or all silver of organic acid silver salts, via a reaction of the organic acid silver salts, with halogen ions. Alternatively, silver halide may be prepared in such a manner that silver halide is prepared in advance, and the resulting silver halide is added to a solution for preparing organic silver salts.

[0049] It is preferable that the content of silver halide are commonly 0.75 - 30 percent by weight with respect to the organic silver salts.

[0050] It is preferable that silver halide employed in this invention comprises ions or complex ions of metals which belong to Groups VIB, VIIB, VIII, and IB in the periodic table which include transition metals. Preferred as the above metals are Cr and W (both in Group VIB); Re (in Group VIIB); Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, and Pt (all in Group VIII); and Cu and Au (both in Group IB). Of these, when employed in printing and plate-making photosensitive materials, it is preferable that the metals are selected from Rh, Re, Ru, IR, or Os.

[0051] It is possible to introduce these metals into silver halide in the form of complexes. In this invention, it is preferable that transition metal complexes are the six-coordinate complexes, represented by the general formula below.

$$\text{General Formula} \qquad [ML_6]_m$$

wherein M represents a transition metal selected from Groups VIB, VIIB, VIII, or IB, L represents a crosslinking ligand, and m represents 0, -1, -2, or -3.

[0052] Listed as specific examples of the ligand represented by L are halides (fluorides, chlorides, bromides, and iodides) and cyanates; each ligand of cyanato, thiocyanato, selenocyanato, tellurocyanato, azide, and aquo; nitrosyl and thionitrosyl. Of these preferred are aquo, as well as nitrosyl, and thionitrosyl. In the case of the presence of an aquo ligand, it is preferable that one or two ligands are occupied. L may be the same or different.

[0053] Particularly preferred specific examples of M include rhodium (Rh), ruthenium (Ru), rhenium (Re), and osmium (Os).

[0054] Specific examples of transition metal coordinated complexes are listed below.

[0055] 1: $[RhCl_6]^{3-}$ 2: $[RuCl_6]^{3-}$ 3: $[ReCl_6]^{3-}$ 4: $[RuBr_6]^{3-}$ 5: $[OsCl_6]^{3-}$ 6: $[CrCl_6]^{4-}$ 7: $Ru(NO)Cl_5)^{2-}$ 8: $[RuBr_4(H_2O)]^{2-}$ 9: $[Ru (NO) (H_2O)Cl_4]^{-}$ 10: $[RhCl_5(H_2O)]^{2-}$ 11: $[Re(NO)Cl_5]^{2-}$ 12: $[Re(NO_9CN_5)]^{2-}$ 13: $[Re(NO)ClCN_4]^{2-}$ 14: $[Rh(NO)_2Cl_4]^{-}$ 15: $[Rh(NO) (H_2O)Cl_4]^{-}$ 16: $[Ru(NO)CN5]^{2-}$ 17: $[Fe(CN)6]^{3-}$ 18: $[Rh(NSD)Cl_5]^{2-}$ 19: $[Os(NO)Cl_5]^{2-}$ 20: $[CrNO]Cl_5]^{2-}$ 21: $[RE(NO)Cl_5]^{-2}$ 22: $[OS(NS)Cl_4(SeCN)^{2-}$ 23: $[Ru(NS)Cl_5]^{2-}$ 24: $[Re(NS)Cl_4(SeCN)^{2-}$ 25: $[Os(NS)Cl(SCN)_4]^{2-}$ and 26: $[Ir (NO)Cl_5]^{2-}$. These metal ions or complex ions may be employed individually or in combinations of at least two of the same kind or different kinds of metals.

[0056] The content of these ions or complex ions is commonly 1×10^{-9} - 1×10^{-2} mol per mol of sliver halide, and is preferably 1×10^{18} - 10^{-4} mol.

[0057] It is preferable that compounds, which provide these metal ions or complex ions, are added during formation of silver halide grains and thereby are incorporated into the silver halide grain. These may be added during any preparation stage of silver halide grains such as nuclei formation, growth, physical ripening, and prior to or after chemical ripening. However, addition is preferably carried out especially during the stage of nuclei formation, growth, and physical ripening, is more preferably carried out during the stage of nuclei formation and growth, and is most preferably carried out during the stage of nuclei formation.

[0058] When added, a composition may be divided into several portions and added intermittently. It is thereby possible to achieve uniform incorporation in a sliver halide grain. As described in JP-A Nos. 63-29603, 2-306236, 3-167545, 4-76534, 6-110146, and 5-273683, it is possible to carry out incorporation resulting distribution in a grain. Preferably, it is possible to result in distribution in the interior of the grain.

[0059] These metal compounds may be added after being dissolved in water or suitable organic solvents (for example, alcohols, ethers, glycols, ketones, esters, and amides). Addition is carried out employing a method in which a water-based metal compound composition or an aqueous solution, in which metal compounds are dissolved together with NaCl and KCl, is added to a water-soluble silver salt solution or a water-soluble halide solution, a method in which when a silver salt solution and a halide solution are mixed employing a double- jet method, addition is carried out as a third aqueous solution, whereby silver halide grains are formed employing a triple-jet method, a method in which during formation of grains, an aqueous solution of metal compounds in a necessary amount is charged into a reaction vessel, or a method in which during preparation of silver halides, other silver halide grains which have been doped with metal ions or complex ions is added and dissolved. Of these, the method is particularly preferred in which a water-based metal compound composition or an aqueous solution, in which metal compounds are dissolved together with NaCl and KCl, is added to a water-soluble halide solution. Addition onto the surface of grains may be carried out immediately after grain formation, during or at termination of physical ripening, or during chemical ripening, an aqueous solution of metal compounds of the necessary amount is charged into a reaction vessel.

[0060] It is preferable that the photosensitive silver halide grains of this invention are washed to remove water-soluble salts.

[0061] Photosensitive silver halide grains employed in this invention may undergo chemical sensitization employing various methods and particularly undergo chemical sensitization employing chalcogen compounds. Chemical sensitization employing chalcogen compounds may be carried out employing a sulfur sensitization method, a selenium sensitization method, or a tellurium sensitization method.

[0062] The addition of sensitizers employed in this invention may be carried out at any time such as during formation of silver halide grains, prior to desalting after formation of grains, or after desalting, but is preferably carried out during formation of grains or after desalting.

[0063] Photosensitive silver halide grains employed in this invention may be spectrally sensitized to the desired wavelength employing spectral sensitizers. Usable spectral sensitizers include cyanine dyes, merocyanine dyes, composite cyanine dyes, composite merocyanine dyes, homopolar cyanine dyes, hemicyanine dyes, styryl dyes, and hemioxonol dyes.

[0064] Any of the nuclei commonly employed in dyes may be available in these dyes. Namely, employed may be a pyyroline nucleus, an oxazoline nucleus, a thiazoline nucleus, a pyrrole nucleus, an oxazole nucleus, a thiazole nucleus, a selenazole nucleus, an imidazole nucleus, a tetrazole nucleus, and a pyridine nucleus, and in addition, nuclei, which are prepared by combining the above nuclei with an aliphatic hydrocarbon ring, such as an indolenine nucleus, a benzindolenine nucleus, an indole nucleus, a benzoxazole nucleus, a naphthoxazole nucleus, a benzothiazole nucleus, a naphthothiazole nucleus, a benzoselenazole nucleus, a benzimidazole nucleus, and a quinoline nucleus. These nuclei may be substituted on a carbon atom.

[0065] Applied to the cyanine dyes or merocyanine dyes may be 5- or 6-membered heterocyclic nuclei such as a pyrazolone-5-one nucleus, a thiohydantoin nucleus, a 2-thioxazoline-2 nucleus, a 4-dione nucleus, a thiazoline-2,4-dione nucleus, a rhodanine nucleus, or a thiobarbituric acid nucleus as a nucleus having a ketomethine structure. Specifically, it is possible to use those described on pages 2 and 3 of Research Disclosure, Volume 176, RD 17643 (issued December 1978), and U.S. Patent Nos. 4,425,424 and 4,425,426. Further, sensitizing dyes may be dissolved employing ultrasonic vibration described in U.S. Patent No. 3,485,634. In addition, employed as methods in which sensitizing dyes are incorporated into an emulsion upon being dissolved or dispersed may be those described in U.S. Patents Nos. 3,482,981, 3,585,195, 3,469,087, 3,425,835, 3,342,605, 3,660,101, and 3,658,546; as well as British Patent Nos. 1,271,329 and 1,121,174. These sensitizing dyes may be employed individually or in combinations. Combinations of sensitizing dyes are particularly employed to achieve supersensitization. Combinations which exhibit usable supersensitization as well as substances which exhibit supersensitization are described on page 23 of RD 17643 Item J (issued December 1978).

(Organic Silver Salts) Organic silver salts usable in this invention are silver salts which are relatively stable for light but are silver salts which form silver images upon being heating at 80 °C or higher in the presence of exposed photocatalysts (such as photographic silver salts) or reducing agents.

[0066] Organic silver salts may be any of the organic substances which comprise sources capable of reducing silver ions. Silver salts of organic acids, particularly long chain aliphatic carboxylic acids (having preferably 10 - 30 carbon atoms and more preferably 15 - 28 carbons atoms), are preferred.

[0067] Organic or inorganic silver salts in which the ligand exhibits a stability constant in the range of 4.0 - 10.0 are also preferred. It is essential that silver source substances are incorporated into a photosensitive layer in an amount of about 5 - about 30 percent by weight. Preferred organic silver salts include silver salts of organic compounds containing a carboxyl group. These examples include, but are not limited to, silver salts of aliphatic carboxylic acids as well as silver salts of aromatic carboxylic acids. Preferred examples of silver salts of aliphatic carboxylic acids include silver behenate, silver stearate, silver arachidate, silver oleate, silver laurate, silver caproate, silver myristate, silver palmitate, silver maleate, silver fumarate, silver tartarate, silver linoleate, silver butyrate, and silver camphorate, as well as mixtures thereof. It is also possible to employ silver salts of compounds having a mercapto group or a thione group, and derivatives thereof. Preferred examples of these include a 3-mercapto-4-phenyl-1,2,4-triazole silver salt, a 2-mercaptobenzimidazole silver salt, a 2-mercapto-5-aminothiadiazole silver salt, a 2-(ethylglycolamido)benzothiazole silver salt, thioglycolic acid silver salts such as S-alkylthioglycolic acid (wherein the alkyl group has 12 - 22 carbon atoms) silver salts, dithiocarboxylic acid silver salts such as a dithioacetic acid silver salt, a thioamide silver salt, a 5-carboxyl-1-methyl-2-phenyl-4-thiopyridine silver salt, a mercaptotriazine silver salt, a 2-mercaptobenzoxazole silver salt, silver salts described in U.S. Patent No. 4,123,274, for example, silver salts of 1,2,4-mercaptothiazole derivatives such as a 3-amino-5-benzylthio-1,2,4-thiazole silver salt, and silver salts of thione compounds described in U.S. Patent No. 3,301,678, such as a 3-(3-carboxyethyl)-4-methyl-4-thazoline-2-thione silver salt. In addition, it is possible to use silver salts of compounds containing an imino group. Preferred examples of these compounds include benzotriazole silver salts and derivatives thereof, for example, a benzotriazole silver salt such as a methylbenzotriazole silver, halogen substituted benzotriazole silver salts such as 5-chlorobenzotriasole silver, and a 1,2,4-triazole or 1-H-tetrazole silver salt as well as silver salts of imidazole derivatives described in U.S. Patent No. 4,220,709. Further, it is possible to use various silver acetylide compounds described in U.S. Patent Nos. 4,761,361 and 4,775,613.

[0068] In this invention, of the above, a preferred silver source is silver behenate and more preferred is a mixture with silver stearate or silver arachidate. The proportion of silver stearate is commonly 0 - 70 mol percent with respect to silver behenate, and is preferably 10 - 30 mol percent, while the proportion of silver arachidate is commonly 0 - 70 mol percent with respect to silver behenate, and is preferably 30 - 60 mol percent.

[0069] Organic silver salt compounds are prepared by mixing water-soluble silver compounds with compounds which form complexes with silver. Mixing is preferably carried out by the use of a normal mixing method, a reverse mixing method, a double-jet mixing method, and a controlled double-jet mixing method described in JP-A No. 9-127643.

[0070] In this invention, it is preferable that the average grain diameter of organic silver salts is at most 1 μm, and the aforesaid silver salts are monodispersed. The average grain diameter of organic silver salts, as described herein, refers to the diameter of a sphere having the same volume as the grain in the case in which organic silver salt grains are, for example, spherical, rod-shaped, or tabular. The average grain diameter is preferably 0.01 - 0.8 μm, and is particularly preferably 0.05 - 0.5 μm. Further, monodispersion, as described herein, is as defined for silver halide grains, and the degree of monodispersion is preferably 1 - 30 percent.

[0071] In this invention, mixing methods of photosensitive silver halide with an organic sliver salt, as well as mixing conditions thereof, are not particularly limited as long as the effects of this invention are sufficiently exhibited. Preferred mixing methods include a method in which photosensitive silver halide and the organic silver salt, which have been separately prepared, are mixed, a method in which photosensitive silver halide which has been prepared is added at any timing to an organic silver salt during its preparation, and a method in which silver halide is prepared by mixing an organic silver salt which has been prepared with halogenating agents. A more preferred mixing method is one in which photosensitive silver halide which has been prepared is mixed with an organic acid and thereafter, the organic acid is subjected to formation of a silver salt.

[0072] In this invention, in order to realize the specified optical density, it is preferable that the total amount of silver halide and organic salts is 0.3 - 1.5 g per m^2, in terms of silver. Further, the amount of silver halide with respect to the total silver amount is at most 50 percent in terms of weight ratio, is preferably at most 25 percent, and is more preferably in the range of 0.1 - 15 percent. (Silver Ion Reducing Agents) Silver ion reducing agents are reducing agents for organic silver salts. Reducing agents usable in the present invention may be any of the substances capable of reducing silver ions to metallic silver, and are preferably organic substances. Conventional photographic developing agents such as Phenidone, hydroquinone, and catechol are useful, but hindered phenol reducing agents are preferred.

[0073] It is preferable that reducing agents are present in the range of 1 - 10 percent by weight with respect to the photographic constitution layer (being the image forming layer). In the case in which photosensitive materials are comprised of a multilayer, when reducing agents are added to layers other than the emulsion layer, an addition amount of about 2 - about 15 percent by weight, which is slightly more than the aforesaid amount, tends to be preferred.

[0074] In photothermographic materials, it is possible to use a wide variety of reducing agents. Examples include phenylamidoxime, amidoxime such as 2-thienylamidoxime and p-phenoxyphenylamidoxime; azines such as 4-hyroxy-3,5-dimethoxybenzaldehydeazine; combinations of aliphatic carboxylic acid arylhydrazide and ascorbic acid such as a combination of 2,2'-bis(hydroxymethyl)propionyl-β-phenylhydrazide and ascorbic acid; a combination of polyhydroxybenzene and hydroxylamine, reducton and/or hydrazine (for example, a combination of hydroquinone, bis(ethoxyethyl) hydroxylamine, piperidinohexose reducton or formyl-4-methylphenylhydrazine); hydroxamic acids such as phenylhydroxamic acid, p-hydroxyphenylhydroxamic acid and β-aniline hydroxamic acid; combinations of azine and sulfoneamidophenol (for example, phenothiazine and 6-dichloro-4-benzenesulfoneamidophenol); α-cyanophenyl acetate derivatives such as ethyl-α-cyano-2-methylphenyl acetate or ethyl-α-cyanophenyl acetate; bis-β-naphthols exemplified by 2,2'-dihydroxy-1,1'-binaphthyl, 6,6'-dibromo-2,2'-dihydroxy-1,1'-binaphthyl, and bis(2-hydroxy-1-naphthyl)methane: combinations of bis-β-naphthol and 1,3-dihydroxybenzene derivatives (for example, 2,4-dihydroxybenzophenone or 2',4'-dihydtoxyacetophenone); 5-pyrazolones such as 3-methyl-1-phenyl-5-pyrazolone; reductons exemplified by dimethylaminohexose reduction, anhydrodihydroaminohexose reduction, and anhydrodihydropiperidonehexose reduction; sulfoneamidophenol reducing agents such as 2,6-dichloro-4-benzenesulfonamidophenol and p-benzenesulfonamidophenol; 2-phenylindan-1,3-dione; chromans such as 2,2-dimethyl-7-t-butyl-6-hydroxychroman; 1,4-dihyropyridine such as 2,6-dimethoxy-3,5-dicarboethoxy-1,4-dihydropyridine; bisphenols (for example, bis(2-hydroxy-3-t-butyl-5-methylphenyl)methane, 2,2-bis(4-hydroxy-3-methylphenyl)propane, 4,4-ethylidene-bis(2-t-butyl-6-methylphenol), and 2,2-bis(3,5-dimethyl-4-hydroxyphenyl)propane); ascorbic acid derivatives (for example, 1-ascorbyl palmitate and ascorbyl stearate); aldehydes and ketones such as benzyl and acetyl; 3-pyrazolidones and certain kinds of indan-1,3-diones. (Binders) Binders suitable for photothermographic materials of this invention are transparent or translucent and commonly colorless natural polymers, synthetic polymers as well as copolymers, and others such as any media which form films. Examples include gelatin, gum Arabic, poly(vinyl alcohol), hydroxyethylcellulose, cellulose acetate, cellulose acetate butyrate, poly(vinylpyrrolidone), casein, starch, poly(acrylic acid), poly(methylmethacrylic acid), poly (vinyl chloride), poly(methacrylic acid), copoly(styrene-maleic anhydride), copoly(styrene-acrylonitrile), copoly(styrene-butadiene), poly(vinyl acetals) (for example, poly(vinyl formal) and poly(vinyl butyral)), poly(esters), poly(urethanes), phenoxy resins, poly(vinylidene chloride), poly(epoxides), poly(carbonates), poly(vinyl acetate), cellulose esters, and poly(amides). They may be hydrophilic or hydrophobic.

(Other Additives) In this invention, it is preferable that matting agents are incorporated into the photosensitive layer side, and in order to minimize abrasion on images, matting agents are disposed on the surface of photosensitive materials. Further, it is preferable that the aforesaid matting agents are incorporated in an amount of 0.5 - 10 percent by weight with respect to the total binders.

[0075] Materials of the matting agents employed in this invention may be either organic or inorganic. Employed as inorganic materials may be, for example, silica described in Swiss Patent No. 330,158, glass powder described in French Patent No. 1,296,995, and carbonates of alkaline earth metals or cadmium and zinc described in British Patent No. 1,173,181.

[0076] Employed as organic materials may be organic matting agents such as starch described in U.S. Patent No. 2,322,037, starch derivatives described in Belgian Patent No. 625,451 as well as British Patent No. 981,198, polyvinyl alcohol described in Japanese Patent Publication No. 44-3643, styrene or polymethacrylate described in Swiss Patent No. 330,158, polyacrylonitrile described in U.S. Patent No. 3,079,257, and polycarbonate described in U.S. Patent No. 3,022,169.

[0077] The shape of matting agent particles may be either regular or irregular. However, those which are regular and spherical are preferably employed.

[0078] The size of matting agent particles is represented by the diameter of a sphere which has the same volume as each matting agent particle. The particle diameter of matting agent, as described in the present invention, refers to the aforesaid sphere equivalent diameter. The average particle diameter of matting agents employed in the present invention is preferably 0.5 - 10 μm, and is more preferably 1.0 - 8.0 μm. Further, the variation coefficient of a particle size distribution is preferably a maximum of 50 percent, is more preferably a maximum of 40 percent, and is most preferably a maximum of 30 percent.

[0079] Herein, the variation coefficient of the particle size distribution refers to the value represented by the formula below.

(standard deviation of particle diameter)/(average

value of particle diameter) x 100

[0080] Matting agents according to this invention may be incorporated into any of the constitution layers. However, in order to achieve the objective of the present invention, the matting agents are preferwbly incorporated into the constitution layers other than the photosensitive layer, and are more preferably incorporated into the outermost layer, viewed from the support.

[0081] The matting agents according to this invention may be added by the use of a method in which matting agents are previously dispersed into a liquid coating composition and subsequently coated, or a method in which after coating a liquid coating composition, matting agents are sprayed prior to completion of drying. Further, in the case in which a plurality of matting agents is added, both methods may be simultaneously employed.

[0082] The photothermographic materials of this invention are stable at normal temperature. However, when after exposure, heating at a high temperature (for example, 80 - 220 °C), development is carried out. Upon being heated, silver is formed through a oxidation-reduction reaction between organic silver salts (functioning as an oxidizing agent) and reducing agents. This oxidation-reduction reaction is accelerated by the catalytic action of the latent image formed in silver halide through exposure. Silver formed by the reaction of the organic silver salts in the exposed area provides a black image. Thus an image is formed in contrast to the unexposed area. This reaction process proceeds without supply of a processing solution, such as water, from the exterior.

[0083] In order to control the amount or wavelength distribution of light which is transmitted through a photosensitive layer, a filter layer may be formed on the same side as the photosensitive layer or on the opposite side. Dyes or pigments may be incorporated into the photosensitive layer. Preferred as dyes are the compounds described in JP-A No. 7-11184.

[0084] In addition to the aforesaid components, incorporation of additives known as "color toner" which enhances images, occasionally results in advantage. As described in U.S. Patent Nos. 3,080,254, 3,847,612, and 4,123,282, color toners are prior art materials in photographic techniques.

[0085] Examples of color toners include phthalimide and N-hydroxyphthalimide; succinimide, and pyrazoline-5-one, and cyclic imides such as quinazoline, 3-phenyl-2-pyrazoline-5-one, 1-phenylurazole, quinazoline, and 2,4-thiazolizinedione; naphthalimides (for example, N-hydroxy-1,8-naphthalimide); cobalt complexes (for example, cobalthexamine trifluoroacetate); mercaptans exemplified by 3-mercapto-1,2,4-triazole, 2,4-dimercaptopyrimidine, 3-mercapto-4,5-diphenyl-1,2,4-triazole, and 2,5-dimercapto-1,3,4-thiadiazole; N-(aminomethyl)aryldicarboxyimides (for example, (N,N-dimethylaminomethyl)phthalimide and N,N-(dimethylaminomethyl)-naphthalene-2,3-dicarboxyimide); and blocked pyrazole, isothiuronium derivatives and certain kinds of photofading agents (for example, N,N'-hexamethylenebis(1-carbamoyl-3,5-dimethylpyrazole), 1,8-(3,6-diazaoctane)bis(isothiuronium trifluoroacetate) and 2-trobromomethylsulfonyl)-(benzothiazole); and 3-ethyl-5[(3-ethyl-2-benzothiazolinilidene)-1-methylethylidene]-2-thio-2,4-oxazolidinedione; phthalazine; phthalazinone, phthalazinone derivatives or metal salts, or derivatives of 4-(1-naphthyl) phthalazinone, 6-chlorophthalazinone, 5,7-methoxyphthalazinone, and 2,3-dihydro-1,4-phthalazinedione; combinations of phthalazine and phthalic acid derivatives (for example, phthalic acid, 4-methylphthalic acid, 4-nitrophthalic acid, and tetrachlorophthalic anhydride); quinazolinedione, benzoxazine or naphthoxazine derivatives; rhodium complexes, which not only function as a color toner, but also function as an in situ halide ion source for producing silver halide, such as ammonium hexachlororhodate (III), rhodium bromide, rhodium nitrate, and potassium hexachlororhodate (III); inorganic peroxides and persulfates such as ammonium sulfide peroxide and hydrogen peroxide; benzoxazine-2,4-diones such as 1,3-benzoxazine-2,4-dione, 8-methyl-1,3-benzoxazine-2,4-dione, and 6-nitro-1,3-benzoxazine-2,4-dione; pyrimidines and asymmetric triazines (for example, 2,4-dihydroxypyrimidine, 2-hydroxy-4-aminopyrimidine; azauracil and tetraazapentalene derivatives (for example, 3.6-dimercapto-1,4-diphenyl-1H,4H,-2,3a,5,6a-tetraazapentalene, and 1,4-di(o-chlorophenyl)-3,6-dimercapto-1H, 4H-2, 3a, 5, 6a-tetraazapentalene.

[0086] In this invention, preferred as color toners are phthalazinone or phthalazine, and combinations with phthalic acid derivatives are further preferred. Of these, preferred are combinations of phthalazine with 4-methylphthalic acid, tetrachlorophthalic acid, or tetrachlorophthalic anhydride.

[0087] In the photothermographic materials of this invention, incorporated may be antifogging agents. Known as the most effective antifogging agents are mercury ions. The use of mercury compounds in photosensitive materials as an antifogging agent is disclosed in U.S. Patent No. 3,589,903.

[0088] However, mercury compounds are not environmentally preferable. Mercury-free antifogging agents are preferred which are disclosed, for example, in U.S. Patent Nos. 4,546,075 and 4,452,885, and JP-A No. 59-57234.

[0089] Particularly preferred mercury-free antifogging agents are heterocyclic compounds provided with at least one substituent represented by $-C(X_1)(X_2)(X_3)$ (wherein X_1 and X_2 each represent a halogen atom, and X_3 represents a hydrogen atom or a halogen atom), which are disclosed in U.S. Patent Nos. 3,874,946 and 4,756,999. Examples of preferably employed antifogging agents include the compounds described in Paragraph Nos. [0062] and [0063] of JP-A No. 9-90550.

[0090] In addition, more preferable antifogging agents are disclosed in U.S. Patent No. 5,028,523, and British Patent Application Nos. 92221383.4, 9300147.7, and 9311790.1.

[0091] The photosensitive layer may be comprised of a plurality of layers. For controlling gradation, layer order may be either a high speed layer/low speed layer or a high speed layer/low speed layer.

[0092] In order to achieve the specified optical density after photographic processing and to minimize deformation of images after photographic processing, supports employed in this invention are preferably plastic films (comprised, for example, of polyethylene terephthalate, polycarbonate, polyimide, nylon, cellulose triacetate, and polyethylene terephthalate).

[0093] Of these, listed as preferable supports are plastic supports comprised of polyethylene terephthalate (hereinafter referred to as PET) and styrene based polymers having a syndiotactic structure.

[0094] The thickness of supports is preferably about 50 - about 300 μm, and is more preferably 70 - 180 μm.

[0095] Further, it is possible to use plastic supports which have been thermally treated. Thermal treatment of supports, as described herein, refers to operations in which after casting a support, the resulting support is heated at a temperature higher than the glass transition point of the support, preferably at a temperature at least 35 °C higher, and more preferably at a temperature at least 40 °C higher prior to coating of a photosensitive layer. However, when heated at a temperature exceeding the melting point of the support, no desired effects of the present invention are exhibited.

[0096] Employed as casting methods and subbing methods with regard to the supports according to the present invention may be those known in the art. However, it is preferable to use the methods described in Paragraphs [0030] - [0070] of JP-A No. 9-50094.

[0097] In this invention, in order to improve physical properties as well as photographic performance, it is preferable to provide a backing layer in the photosensitive materials. Binders suitable for the backing layer of this invention are transparent or translucent and commonly colorless natural polymers, synthetic polymers as well as copolymers, and others such as media which form films. Examples include gelatin, gum Arabic, poly(vinyl alcohol), hydroxyethylcellulose, cellulose acetate, cellulose acetate butyrate, poly(vinylpyrrolidone), casein, starch, poly(acrylic acid), poly(methylmethacrylic acid), poly(vinyl chloride), poly(methacrylic acid), copoly(styrene-maleic anhydride), copoly(styrene-acrylonitrile), copoly(styrene-butadiene), poly(vinyl acetals) (for example, poly(vinyl formal) and poly(vinyl butyral)), poly (esters), poly(urethanes), phenoxy resins, poly(vinylidene chloride), poly(epoxides), poly(carbonates), poly(vinyl acetate), cellulose esters, and poly(amides). Binders may be coated employing water, organic solvents or emulsions.

[0098] It is possible to incorporate various auxiliaries into the photothermographic materials of this invention, and useful are, for example, accelerators, acutance dyes, stabilizers, surface active agents, lubricants, covering aids, halogen supplying agents, polyhalogen compounds as well as mercapto compounds, leuco dyes, chelating agents, plasticizers, UV absorbers, and various other additives.

[0099] Further, it is possible to preferably apply various techniques, processing, formulations, as well as additives and addition methods thereof, which are known in the art, to the aforesaid processing methods and production methods. Various additives may be incorporated into any of photosensitive layers, non-photosensitive layers or other composition layers.

EXAMPLES

[0100] Tray containers which house a plurality of photothermographic materials were produced in such a manner that paperboard was subjected to heat pressing employing a die. Pressing conditions during prewsing of the tray containers were as follows.

[0101] Employed as paper was coated cardboard (NEW-DV, 450 g/m^2, coated on both sides, manufactured by Hokuetsu Paper Mills, Ltd.), and tray containers were shaped under the following conditions. Employed as a pressing machine was Mini Test Press at a maximum pressing pressure of 350 kgf/cm^2, manufactured by Toyo Seiki Seisaku-Sho, Ltd.).

[0102] Further, prior to pressing, the coated cardboard was allowed to hold moisture. In order that paper fibers exhibited flexibility and were subjected to deformation of corners of the container, board paper was allowed to absorb moisture by the use of a humidifier. The moisture content was determined by the use of the drying method specified in JIS P 8129. Table 1 shows the results.

Table 1

Pressing Temperature (°C)	Pressing Pressure (Wpa)	Residual Moisture Content (weight percent)	Film Speed	Film Fog	Number of Film Scars	Evaluation Level
100	150	6.2	-0.22	-0.22	50	bad
120	150	4.4	-0.16	-0.17	33	bad
140	150	4.0	-0.14	-0.09	25	bad
160	150	3.8	-0.10	-0.05	17	bad
180	150	3.0	-0.03	-0.02	14	bad
200	150	2.4	-0.01	-0.01	12	bad
220	150	2.0	0	0	4	bad
240	150	1.5	0	0	2	bad
100	180	5.8	-0.22	-0.22	4	bad
120	180	4.2	-0.16	-0.17	2	bad
140	180	3.9	-0.14	-0.09	0	bad
160	180	3.4	-0.10	-0.05	0	bad
180	180	2.7	-0.02	-0.01	0	good
200	180	2.0	0	0	0	good
220	180	1.5	0	0	0	good
240	180	1.0	0	0	0	good
100	200	5.3	-0.20	-0.20	1	bad
120	200	3.8	-0.12	-0.14	1	bad
140	200	3.3	-0.07	-0.08	0	bad

Table 1 (continued)

Pressing Temperature (°C)	Pressing Pressure (Wpa)	Residual Moisture Content (weight percent)	Film Speed	Film Fog	Number of Film Scars	Evaluation Level
160	200	2.8	-0.04	-0.03	0	bad
180	200	2.1	0	0	0	good
200	200	1.5	0	0	0	good
220	200	1.1	0	0	0	good
240	200	0.7	0	0	0	good
100	230	4.5	-0.18	-0.19	0	bad
120	230	3.0	-0.10	-0.13	0	bad
140	230	2.5	-0.06	-0.05	0	bad
160	230	2.1	-0.04	-0.03	0	bad
180	230	1.6	0	0	0	good
200	230	1.1	0	0	0	good
220	230	0.7	0	0	0	good
240	230	0.2	0	0	0	good
100	250	4.5	-0.17	-0.18	0	bad
120	250	3.0	-0.09	-0.11	0	bad
140	250	2.5	-0.06	-0.05	0	bad
160	250	2.1	-0.04	-0.03	0	bad
180	250	0.2	0	+0.05	0	bad
200	250	0.1	+0.06	+0.06	0	bad
220	250	0.0	+0.14	+0.09	0	bad
240	250	0.0	+0.22	+0.12	0	bad

[0103] The above results showed the following. When the pressing temperature was at least 180 °C and the shaping pressure was at least 180 kgf/cm^2 (18 MPa), the moisture content of paper resulted in a maximum of 3.0 weight percent, whereby a decrease in speed and fogging due to paper moisture was eliminated. Further, it was noted that the amount of volatile components which were assumed to be generated together with moisture was very small, resulting in a decrease of desired effects of the film. However, under a shaoing pressure of at most 180 kgf/cm^2 (18 MPa), the walls of the tray container were not completely formed and film sheets rub each other in the package, resulting in scarring of the photosensitive surface, whereby product quality was degraded. Still further, it was noted that when the shaping pressure exceeded 230 kgf/cm^2 (23 MPa), paper moisture was completely removed, but the paper was subjected to burning which decreased film speed and fogging. Consequently, it was noted that at a pressure of 180 - 230 kgf/cm^2 (18 - 23 MPa) and at least 180 °C, it was possible to shape more acceptable tray containers for films.

(Evaluation Methods)

(1) Vibration and Development Method

[0104] Measurement method of the number of scars on film: A tray container containing 100 sheets of a photothermographic material (Konica Medical Film SD-P14*17 Size) were packaged in a moisture resistant bag. The resulting package was subjected to test by the use of a vibration testing machine (at 23 °C and 55 percent, an amplitude of 3 mm at an acceleration of 0.8 G, and for 2 hours). Thereafter, the resulting sheets were subjected to half solid image exposure at an exposure amount of 40 percent and developed at 125 °C, using a Konica Laser Imager (Drypro 752).

(2) Evaluation method of film quality

[0105]

- Measurement of the number of scars: The number of scars of a length of at least 1mm per film sheet (a size of 354 x 430 mm) was recorded and all 100 film sheets were evaluated. Subsequently, an average value was calculated.
- Film speed: Speed obtained by developing a blank film was designated as S2. When the speed of a sample film differed from S2 by more than ±0.03, it was judged that speed variation had occurred, in which "+" represented an increase in speed, while "-" represented a decrease in speed.
- Film fog: Fog resulting from developing a blank film was designated as Dmin. When the fog of a sample film differed from Dmin by more than ±0.03, it was judged that fog variation had occurred, in which "+" represented an increase in fog, while "-" represented a decrease in fog.

[0106] As noted above, in the invention described in Structures 1 and 4, a tray container is produced in such a manner that board paper is subjected to heat pressing by the use of a die, during pressing of the aforesaid tray container, pressing conditions are specified, and pressing is carried out at high temperature and high pressure to volatilize moisture as well as impurities contained in the paper, whereby it is possible to retard undesirable effects to a photothermographic material without adhering a resinous sheet to portions of the tray container which come into contact with the aforesaid photothermographic material. Further, it is possible to maintain the moisture amount at less than the definite value without adhering a humidity control material onto the tray container, whereby it is possible to retard degradation of performance (fog and speed) of the aforesaid photothermographic material due to the moisture. Still further, it is possible for customers to dispose, after use, tray containers without worrying whether they are combustible or not. In addition, since it is possible to dispose tray containers resulting in a decrease in volume, reduction of waste is effectively carried out due to the lower bulk volume, and it is also possible to reduce cost of tray containers compared to conventional methods.

[0107] In the invention described in Structures 2 and 5, by specifying the moisture amount after pressing of the tray containers, it is possible to reduce impurities (being formalin and hydrochloric acid-vinyl acetate copolymers) to a maximum of 100 ppm, whereby it is possible to improve the performance (fog level) of the photothermographic material.

[0108] In the invention described in Structures 3 and 6, materials of the tray container are selected from coated cardboard, corrugated cardboard, and synthetic paper, and it is also possible for customers to dispose, after use, tray containers without worrying whether they are combustible or not.

Claims

1. A manufacturing method of a tray container for housing a plurality of photothermographic material sheets, comprising a step of:

    pressing and heating a paperboard, with dies to produce the tray container,

    wherein temperature of the dies is greater than 180°C, and pressing force is 180 - 230 kgf/cm^2 (18 - 23 Mpa).

2. The manufacturing method of the tray container in claim 1, wherein moisture content of the tray container after pressing is less than 3.0 wt%.

3. The manufacturing method of the tray container in claim 1, wherein a material for the tray container is selected from among coated cardboard, corrugated fiberboard and synthetic paper.

4. A tray container for housing a plurality of photothermographic material sheets, wherein the tray container is manufactured of paperboard with the dies by pressing and heating, and wherein temperature of the dies is greater than 180°C, and pressing force is 180 - 230 kgf/cm^2 (18 - 23 Mpa).

5. The tray container for housing a plurality of photothermographic material sheets in claim 4, wherein moisture content of the tray container after pressing is less than 3.0 wt%.

6. The tray container for housing a plurality of photothermographic material sheets in claim 4, wherein a material of the tray container is selected from among coated cardboard, corrugated fiberboard and synthetic paper.

7. The tray container for housing a plurality of photothermographic material sheets in claim 4, comprising:

   a base on which the photothermographic material sheets are stacked; and
   a short wall centered on each of the four sides of the base, integral and perpendicular to the base.

FIG. 1

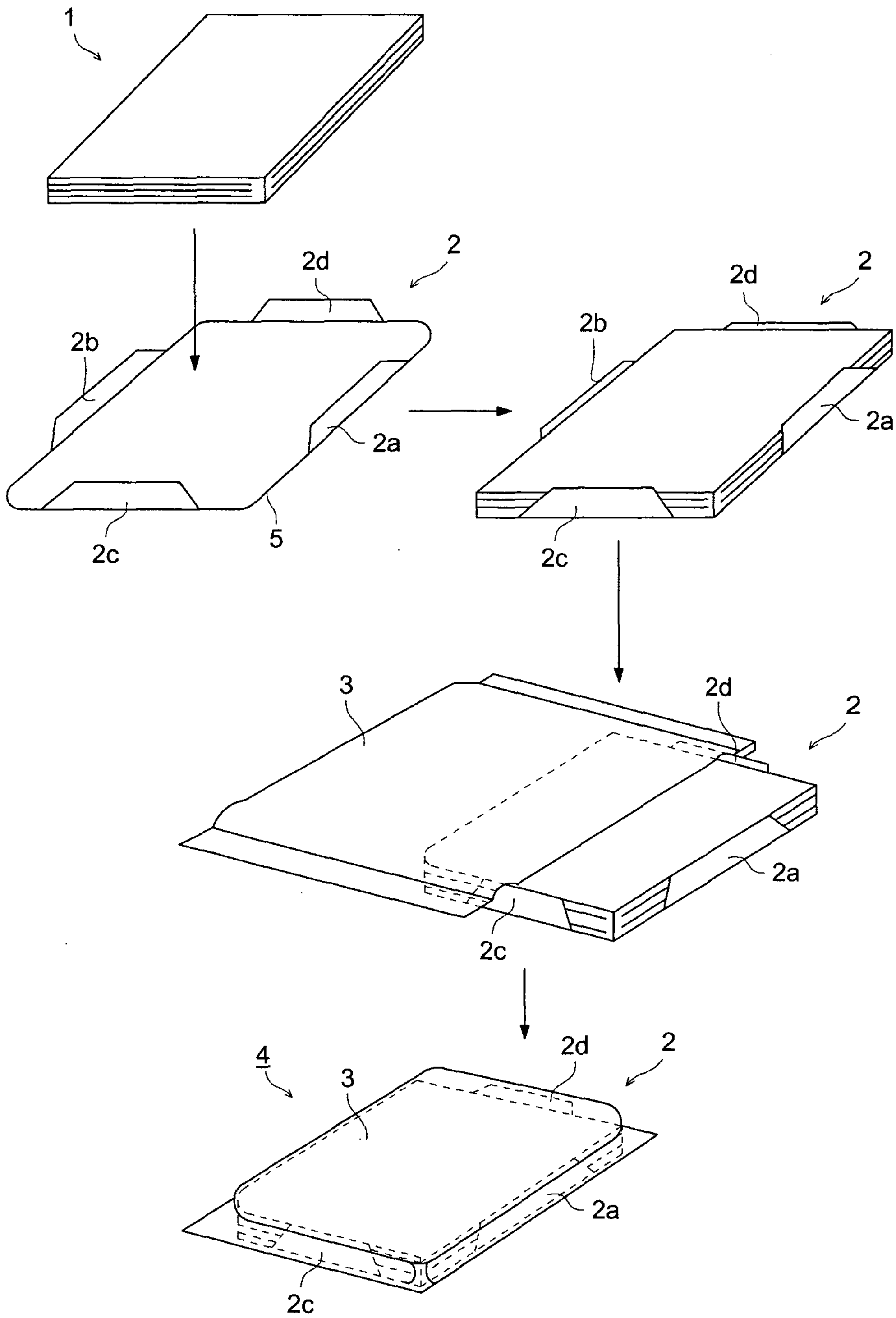

FIG. 2 (a)

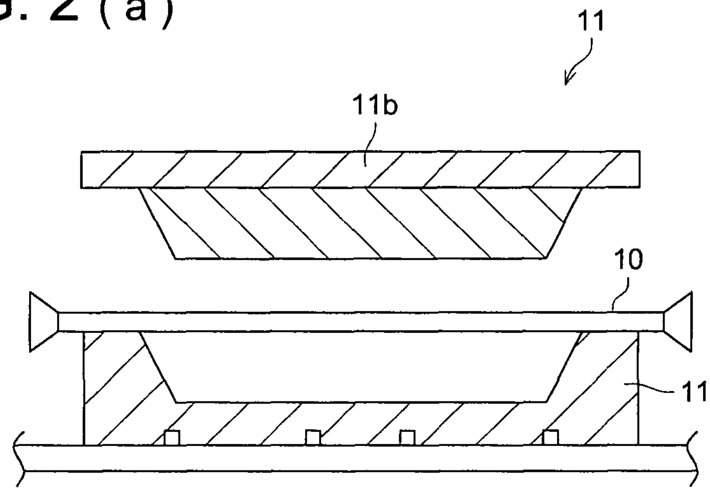

FIG. 2 (b)

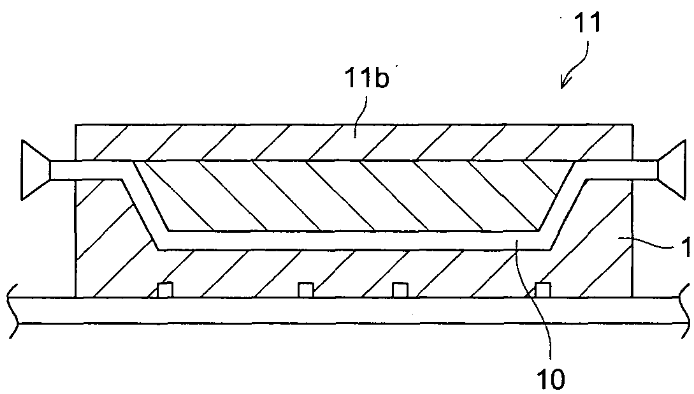

FIG. 2 (c)