The present invention provides a discharge printing agent containing thiourea dioxide, wherein the discharge printing agent further contains at least one of the following components (i) and (ii): (i) at least one salt selected from the group consisting of a salt of monocarboxylic acid, a salt of ascorbic acid, and a salt of metasilicic acid; and (ii) β-diketone.
Printing control apparatus

- CPU
- HD
- ROM
- Operation section
- RAM
- Display section
- I/F
- To ink-jet printer

FIG. 5

Printing control apparatus

- Operation section (input and selection of data)
- Image data acquisition section
- Image data storage section
- To ink-jet printer

FIG. 6
The method for stabilizing a discharge printing agent is a method for stabilizing a discharge printing agent that comprises thiourea dioxide, the method comprising adding at least one of the following components (i) and (ii) to the discharge printing agent, (i) at least one salt selected from the group consisting of a salt of monocarboxylic acid, a salt of ascorbic acid, and a salt of metasilicic acid, (ii) \( \beta \)-diketone.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**0011** FIGS. 1A and 1B are figures each showing an example of applying a discharge printing agent in the method for discharge printing.

**0012** FIG. 2 is a schematic view showing an example of a configuration of an ink-jet recording apparatus.

**0013** FIG. 3 is a front view showing an example of a configuration of an ink-jet printer of the ink-jet recording apparatus.

**0014** FIG. 4A is a plan view showing the state where fabric is set to a platen of the ink-jet recording apparatus. FIG. 4B is a cross-sectional view taken along line A-A of FIG. 4A.

**0015** FIG. 5 is a block diagram showing a configuration of the ink-jet recording apparatus.

**0016** FIG. 6 is a function block diagram of the ink-jet recording apparatus.

**DETAILED DESCRIPTION**

**0017** The discharge printing agent is used for discharge printing of fabric. Examples of the fabric include clothes such as a T-shirt, a bathing suit, and a sweat shirt; a bag; shoes; slippers; socks; furniture such as a sofa; and a fabric good such as a flag. The fabric encompasses both of a woven fabric and a non-woven fabric. From the view point of an effect of discharge printing, a material of the fabric is, for example, a natural fiber. Examples of the natural fiber include cotton and silk. The material of the fabric may be a blended fabric obtained by mixing plural kinds of the fibers. The “discharge printing” is different in process and object to be subjected to discharge printing from bleaching usually performed in the home and the like, for example. Specifically, the bleaching performed in the home and the like is performed by immersing clothes in an agent and allowing the clothes to stand to chemically decompose stains themselves by an oxidation reaction or a reduction reaction. In contrast, “discharge printing” is performed by directly acting on dye molecules staining fabric, specifically cotton fibers to chemically decompose the molecules. The processes of “discharge printing” include, for example, in addition to processes of immersing fabric in an agent and allowing the fabric to stand, a process of heating the fabric at 100°C or more using a device such as a device called a heat press in the presence of high-temperature steam. In the presence of high-temperature steam such as mentioned above, for example, thiourea dioxide (aminoiminomethane-sulfonic acid) which is a main component is decomposed, resulting in generation of sulfonic acid having a reducing ability. Thus, the scheme of the chemical reaction of acting this sulfonic acid on the dye molecules is assumed. This mechanism, however, is merely an assumption, and the present invention is not limited by this assumption.

**0018** As mentioned above, the discharge printing agent is a discharge printing agent comprising thiourea dioxide, wherein the discharge printing agent further comprises at least one of the following (i) and (ii): (i) at least one salt...
selected from the group consisting of a salt of monocarboxylic acid, a salt of ascorbic acid, and a salt of metasilicic acid; and (ii) (3-diketone).

In the discharge printing agent, thiourea dioxide as a reductant and at least one of the components (i) and (ii) is used in combination, so that the discharge printing agent is capable of being stored for a long period of time, for example. Moreover, in the discharge printing agent, thiourea dioxide as a reductant and the component (i) are used in combination, so that the discharge printing ability is improved, for example. In the discharge printing using thiourea dioxide, a reaction intermediate is stabilized by a nucleophilic reaction of carbonyl carbon, and the intermediate is decomposed over time, so that a yield of effective sulfoxide acid is increased. Thus, it is assumed that a discharge printing effect is increased. This mechanism, however, is merely an assumption, and the present invention is not limited by this assumption. Moreover, the above-mentioned discharge printing agent containing ronalgite has a problem in that formaldehyde is generated by decomposition of the ronalgite. Formaldehyde has a very strong irritating odor, and the irritating odor worsens the working environment and causes an odor remaining in a product in some cases. It is therefore considered that there is a case where generation of formaldehyde is not favorable according to the working environment. In contrast, the discharge printing agent does not require ronalgite, so that formaldehyde is not generated. Furthermore, according to the discharge printing agent, for example, it is possible to suppress corrosion of an ink-jet head in an ink-jet recording apparatus when an ejection is performed from the ink-jet head.

The amount of the thiourea dioxide to be added in the discharge printing agent is not particularly limited and is, for example, 0.5 wt % to 5 wt %, 1 wt % to 5 wt %, 2 wt % to 5 wt %, relative to the total amount of the discharge printing agent.

The salt of monocarboxylic acid is not particularly limited and is, for example, at least one of a salt of formic acid, a salt of aliphatic carboxylic acid, and a salt of an aliphatic carboxylic acid derivative. Examples of the salt of formic acid include sodium formate and potassium formate. Examples of the salt of aliphatic carboxylic acid include sodium acetate, potassium acetate, sodium butyrate, and potassium butyrate. Examples of the salt of an aliphatic carboxylic acid derivative include sodium chloroacetate, potassium chloroacetate, sodium glycolate, potassium glycolate, sodium propionate (sodium trimethylcarboxylate), and potassium propionate (potassium trimethylate).

Examples of the salt of ascorbic acid include sodium ascorbate and potassium ascorbate. There are an L-form and a D-form in ascorbic acid. Any of the L-form salt and the D-form salt may be used, or a mixture of both of them may be used.

Examples of the salt of metasilicic acid include sodium metasilicate and potassium metasilicate.

As to the component (i), one kind may be used alone, or two or more kinds may be used in combination. The amount of the component (i) to be added in the discharge printing agent is not particularly limited and is, for example, 0.5 wt % to 10 wt %, 2 wt % to 10 wt %, 2 wt % to 5 wt %, relative to the total amount of the discharge printing agent.

In the "(3-diketone", "ketone" encompasses all of carbonyl compounds (aldehyde, carboxylic acid, ester, and the like) and salts, ions, and hydrates thereof. The \( \beta \)-diketone is not particularly limited, and examples thereof include acetylacetone, sodium malonate (monosodium malonate, disodium malonate), potassium malonate (monopotassium malonate, dipotassium malonate), 3-acetyl-1-3-butyrolactone, dehydroacetic acid, and methyl acetooacetate, and the \( \beta \)-diketone is acetylacetone, disodium malonate, 3-acetyl-1-3-butyrolactone, dehydroacetic acid, methyl acetooacetate, or N-methyl glutaric acid amide.

One kind of the \( \beta \)-diketone may be used alone, or two or more kinds of the \( \beta \)-diketone may be used in combination. The amount of the \( \beta \)-diketone to be added in the discharge printing agent is not particularly limited and is, for example, 1 wt % to 15 wt %, 2 wt % to 15 wt %, relative to the total amount of the discharge printing agent.

The discharge printing agent may further comprise acetone or an acetone derivative. The acetone derivative is, for example, a compound represented by the following chemical formula where each of \( R_1 \) and \( R_2 \) represents an alkyl group or hydrogen. The alkyl group is not particularly limited and is, for example, an alkyl group with a carbon number of 1 to 20. The alkyl group may be, for example, a straight-chain alkyl group or a branched alkyl group. Specific examples of the alkyl group include a methyl group, an ethyl group, a n-propyl group, an isopropyl group, a n-butyl group, an isobutyl group, a sec-butyl group, a tert-butyl group, a pentyl group, a hexyl group, a heptyl group, an octyl group, a nonyl group, a decyl group, an undecyl group, a dodecyl group, a tetradecyl group, a pentadecyl group, a hexadecyl group, a heptadecyl group, an octadecyl group, a nonadecyl group, and anicosyl group.

The compound represented by the following chemical formula is, for example, 2-hydroxy-2-methyl-4-pentanone. The amount of the acetone or the acetone derivative to be added is not particularly limited and is, for example, 1 wt % to 10 wt %, for example, 2 wt % to 10 wt %, relative to the total amount of the discharge printing agent.

\[
\begin{align*}
\text{HO} & \quad \text{R}_1 \\
\text{C}_3 & \quad \text{R}_2 \\
\text{CH}_3 & \quad \text{O}
\end{align*}
\]

The discharge printing agent may further comprise an amine base. The amine base is, for example, primary amine and may have one amino group or a plurality of amino groups. Examples of the primary amine include aminoalcohol, a guanidine salt, a guanidine derivative, and N,N'-bis(2-aminoethyl)-1,2-ethanediame. Specific examples of the aminoalcohol include 2-amino-2-hydroxymethyl-1,3-propanediol (AHP), 2-amino-2-methyl-1-propanol (AMP), 2-amino-2-ethyl-1,3-propanediol (AP), and 2-(2-aminoethoxy) ethanol (AEE). The guanidine salt is, for example, guanidine carbonate, and the guanidine derivative is, for example, guanidino hemisulfate. The amount of the amine base (iii) to be added is not particularly limited and is, for example, 1 wt % to 10 wt %, for example, 2 wt % to 10 wt %, relative to the total amount of the discharge printing agent. When the discharge printing agent comprises the amine, the discharge printing agent may be stabilized for a long period of time even after one month (28 days) from preparation.

The discharge printing agent may further comprise water. The water is, for example, ion-exchange water or pure water. The amount of the water to be added relative to the total...
amount of the discharge printing agent is, for example, the balance of the discharge printing agent, excluding other components.

[0030] The discharge printing agent may further comprise a water-soluble organic solvent. As the water-soluble organic solvent, any of conventionally known organic solvents may be used. Examples of the water-soluble organic solvent include polyalcohol, a polyalcohol derivative, alcohol, amide, ketone alcohol, ether, a nitrogen-containing solvent, a sulfur-containing solvent, propylene carbonate, ethylene carbonate, and 1,3-dimethyl-2-imidazolidinone. Examples of the polyalcohol include glycerin (Gly), ethylene glycol, diethylene glycol (DEG), propylene glycol, butylene glycol, hexylene glycol, triethylene glycol, polyethylene glycol, dipropylene glycol, tripropylene glycol, polypropylene glycol, trimethylolpropane, 1,5-pentanediol, and 1,2,6-hexanetriol. Examples of the polyalcohol derivative include ethylene glycol methyl ether, ethylene glycol ethyl ether, ethylene glycol n-propyl ether, ethylene glycol n-butyl ether, diethylene glycol methyl ether, diethylene glycol ethyl ether, diethylene glycol n-propyl ether, diethylene glycol n-butyl ether, triethylene glycol methyl ether, triethylene glycol ethyl ether, triethylene glycol n-propyl ether, triethylene glycol n-butyl ether, propylene glycol methyl ether, propylene glycol ethyl ether, propylene glycol n-propyl ether, propylene glycol n-butyl ether, dipropylene glycol methyl ether, dipropylene glycol ethyl ether, dipropylene glycol n-propyl ether, dipropylene glycol n-butyl ether, tripropylene glycol methyl ether, tripropylene glycol ethyl ether, tripropylene glycol n-propyl ether, and tripropylene glycol n-butyl ether. Examples of the alcohol include methyl alcohol, ethyl alcohol, n-propyl alcohol, isopropyl alcohol, n-butyl alcohol, sec-butyl alcohol, isobutyl alcohol, ten-butyl alcohol, and benzyl alcohol. Examples of the amide include dimethylformamide and dimethylacetamide. The ketooalcohol is, for example, diacetone alcohol. Examples of the ether include tetrahydrofuran and dioxane. Examples of the nitrogen-containing solvent include pyrididine, 2-pyrididine, N-methyl-2-pyrididine, cyclohexylpyrididine, and triethanolamine. Examples of the nitrogen-containing solvent include thiourea thiophenolate, thioglycololic acid, sulfonic acid, and dimethyl sulfoxide. The amount of the water-soluble organic solvent to be added relative to the total amount of the discharge printing agent is, for example, 0.5 wt% to 30 wt%, for example, 5 wt% to 30 wt%, for example, 10 wt% to 20 wt%. The water-soluble organic solvents may be used alone or in a combination of two or more of them.

[0031] The water-soluble organic solvent is, for example, at least one of Gly and DEG which are high boiling point solvents and is, for example, Gly. The amount of the high boiling point solvent to be added relative to the total amount of the discharge printing agent is, for example, 0.5 wt% to 30 wt%, for example, 5 wt% to 30 wt%, for example, 10 wt% to 20 wt%.

[0032] The discharge printing agent may further comprise conventionally known additives if necessary. Examples of the additives include a surfactant, a viscosity modifier, a surface tension regulator, an antioxidant, and an anti-mold agent. Examples of the viscosity modifiers include polyvinyl alcohol, cellulose, and a water-soluble resin.

[0033] The discharge printing agent may be prepared by mixing components other than the thiourea dioxide and at least one of the components (i) and (ii) in advance and then adding the thiourea dioxide and at least one of the components (i) and (ii) to the resultant mixture, for example.

[0034] The container is described below. The container is characterized in comprising the discharge printing agent. As a main body of the container, for example, a conventionally known substance such as an ink tank 20 in an ink-jet printer 1 shown in FIG. 3 described below may be used. For example, as a main body of the container, an ink cartridge having a case made of a resin or an ink pack formed of a flexible film may be used. If there is a concern that a function of discharge printing is reduced by a movement of a charging jet caused by impact given to the discharge printing agent at the time when the discharge printing agent is placed in a flexible ink pack, a container having a case may be used. In this instance, the discharge printing agent may be placed directly in the case. The discharge printing agent may be placed in a flexible ink pack arranged inside the case. Further, the discharge printing agent may be placed in a space between an ink pack formed of a flexible material and a wall of the case. Moreover, only a solid of the discharge printing agent is placed in the container to mix with a liquid later.

[0035] The ink-jet recording apparatus is described below. The ink-jet recording apparatus is an ink-jet recording apparatus comprising a liquid ejecting unit of ejecting a liquid, wherein the apparatus further comprises a unit of applying a discharge printing agent. Examples of the liquid include an ink for ink-jet recording and a treatment liquid for use in ink-jet recording. The ink-jet recording apparatus may further include a storage section of storing the container and may be configured so that a liquid placed inside the container in the storage section is ejected by the liquid ejecting unit. An apparatus having such configuration, is, for example, an apparatus having a configuration in which a unit of applying a discharge printing agent is added to the ink-jet recording apparatus shown in FIG. 2 described below. Examples of the unit of applying a discharge printing agent include an ink-jet head, a spray, a stamp of applying a discharge printing agent to the fabric, a brush, and a roller. The present embodiment includes ink-jet heads 5 shown in FIG. 3 as the unit of applying (ejecting) a discharge printing agent. The ink-jet recording apparatus may further comprise a discharge printing agent storage section of storing a discharge printing agent.

[0036] The method for discharge printing is described below. The method for discharge printing is a method for discharge printing of fabric, the method comprising: a discharge printing agent-applying step of applying a discharge printing agent to fabric; and a heating step of heating a discharge printing agent-applied part.

[0037] In the discharge printing agent-applying step, a discharge printing agent is applied by a method such as an ink-jet method of applying (ejecting) with an ink-jet head, a spray method, a stamp application, a brush application, or a roller application, for example. In the method for discharge printing, the discharge printing agent using the thiourea dioxide and at least one of the components (i) and (ii) in combination is used. Thus, corrosion of the ink-jet heads may be suppressed in the case where the discharge printing agent is used (ejected) by the ink-jet method.

[0038] In the discharge printing agent-applying step, the discharge printing agent may be applied to the entire surface of fabric in which an image is formed or a part of the surface. When the discharge printing agent is applied to a part of the surface, a region mostly the same as at least a part to be subjected to printing with an ink(s) in the surface of fabric in
which an image is formed is a discharge printing agent-applied part. When the discharge printing agent is applied to a part of the surface, the size of the discharge printing agent-applied part is bigger than the part which is subjected to printing. For example, as shown in FIG. 1A, when a character (X) is printed on fabric (T-shirt in the present example) 100, the discharge printing agent is applied so that the discharge printing agent-applied part 110 has a line width higher than the line width of the character is formed. Moreover, for example, as shown in FIG. 1B, when a pattern is printed on fabric (T-shirt) 100, the discharge printing agent is applied so that a discharge printing agent-applied part 120 bigger than the pattern is formed.

The heating step is a step of heating a discharge printing agent-applied part. The heating may be performed using a commercially available iron, hot press apparatus, an oven, or a conveyor belt oven, for example. When the iron or the hot press apparatus is used, for example, the discharge printing agent-applied part is heated in the state where a Teflon (registered trademark) sheet having a flat surface is placed on the part. Thus, generation of a nap of the fabric may be suppressed, and for example, when the method for discharge printing is used in the method for forming an image described below, an image may be printed smoothly. The heating temperature is not particularly limited and is, for example, in a range of 160° C. to 185° C. In the method for discharge printing, the discharge printing agent using the thiourea dioxime and at least one of the components (i) and (ii) in combination is used. Thus, when the discharge printing agent is used after being stored for a long period of time, for example, after the lapse of one month, discharge printing of fabric may be performed, and there is no generation of formaldehyde.

The method for forming an image is described below. The method for forming an image is a method for forming an image on fabric, the method comprising: a discharge printing step of subjecting fabric to discharge printing; and an image printing step of printing an image on a discharge printing-subjected part with an ink, wherein the discharge printing step is performed by the method for discharge printing.

The method for forming an image may further comprise a step such as a heat-fixing step described below in addition to the above-mentioned two steps, for example.

The discharge printing step is the same as described for the method for discharge printing.

The image printing step is a step of printing an image on a discharge printing-subjected part or a discharge printing agent-applied part with an ink(s). When an image is printed on a discharge printing agent-applied part with an ink(s), the heating step in the method for discharge printing may be performed after printing an image with an ink(s). The ink(s) for use in the image printing step is not particularly limited, and for example, a pigment ink, a dye ink, or the like may be used, and a pigment ink is used.

The image printing step may be performed using an ink-jet recording apparatus shown in FIG. 2. In the ink-jet recording apparatus of the present example, the image printing step is performed by an ink-jet method. As shown in FIG. 2, this ink-jet recording apparatus is configured so that an ink-jet printer 1 of printing a desired image by ejecting an ink(s) on fabric and a printing control apparatus 70 of acquiring an image data of the desired image and controlling the ink-jet printer 1 are connected via an interface.

The ink-jet printer 1 includes a frame-like frame 2 as shown in FIG. 3. The frame 2 includes a horizontal part 2h located on the bottom part of the printer 1 and two vertical parts 2v which are perpendicular to the both ends of the horizontal part 2h. In FIG. 3, identical parts to those in FIG. 2 are denoted by identical reference numerals. The same applies to figures subsequent to FIG. 4.

A slide rail 3 horizontally supports and bridges the two vertical parts so that upper parts of the two vertical parts 2v are linked with each other. The slide rail 3 is provided with a carriage 4 so as to be slideable along the longitudinal direction (main scanning direction) of the slide rail 3. The lower surface of this carriage 4 is provided with five piezoelectric ink-jet heads (liquid ejecting units) 5 arranged at predetermined positions according to the respective colors in order to eject five color inks. The ink-jet printer 1 may be configured so that it is provided with eight ink-jet heads, for example. Specifically, two head units in each of which four ink-jet heads are disposed along a direction of moving the cartridge (hereinafter also referred to as "cartridge moving direction") may be arranged so as to face the direction orthogonal to the cartridge moving direction. In this instance, one head unit is provided with four ink-jet heads of ejecting the respective four color inks (cyan, magenta, yellow, black), and the other head unit is provided with two ink-jet heads of ejecting a white ink and two ink-jet heads of ejecting a discharge printing agent.

The respective upper parts of the two vertical parts 2v are supported by pulleys 6 and 7, and the pulley 6 is linked with a motor axis of a motor 8 supported by the vertical part 2v. An endless belt 9 bridges the pulleys 6 and 7, and the carriage 4 is fixed at an appropriate part of this endless belt 9.

With such configuration, when the pulley 6 is rotated in the forward direction and the reverse direction by driving the motor 8, the carriage 4 is driven to linearly reciprocate along the longitudinal direction (main scanning direction) of the slide rail 3. Thus, the ink-jet heads 5 are reciprocated.

A mounting part 10 which detachably mounts ink tanks 20 is formed in each of the two vertical parts 2v. In one of the two mounting parts 10, two color ink tanks 20 may be inserted, and in the other mounting part 10, three color ink tanks 20 may be inserted. Ink bags (not shown) formed in the inside of the respective ink tanks 20 are connected to the respective five sub tanks 30 located at the upper parts of the ink-jet heads 5 via flexible tubes 28. The five sub tanks 30 are communicated with the respective ink-jet heads 5 as described below, so that each ink is supplied from each ink tank 20 to each ink-jet head 5.

Slide mechanisms 11 are positioned on the horizontal part 2h of the frame 2, and a platen (support) 12 is supported on the slide mechanisms 11. This platen 12 is provided with a fixing frame (fixing unit) 15 so that the position of the fabric is determined so as to face up a part to be subjected to printing, and the fabric is set tightly and flatly without creases. The ink-jet printer 1 of the present example performs ink-jet recording on a sewn T-shirt and however may be applied to general fabric. In the ink-jet printer 1 of the present example, the number of platens 12 is one, and however, the number of the platens is not limited to one and may be increased as required. For example, when an ink-jet printer having two platens is used, while an image is printing on a T-shirt fixed on one of the platens, a T-shirt may be fixed on the other platen. Thus, operating efficiency may be enhanced.
A platen convey mechanism (not shown) is arranged at a predetermined position of the ink-jet printer 1 in order to reciprocate the platen 12 in a direction perpendicular to a sheet of FIG. 3, which is a direction in which the slide mechanism 11 slides and a vertical scanning direction of the ink-jet printer 1). As the platen convey mechanism, a mechanism using a rack, a pinion mechanism, and an endless belt may be applied, for example.

FIGS. 4A and 4B show the state where fabric is set to a platen. FIG. 4A is a plan view, and FIG. 4B is a cross-sectional view taken along line A-A of FIG. 4A. As shown in FIGS. 4A and 4B, the platen 12 has a rectangular shape whose longitudinal direction is a direction orthogonal to the direction of reciprocating the carriage 4 in plan view and has a supporting surface 16 of supporting the T-shirt 100. The lower surface of the platen 12 on the back side in a direction perpendicular to the sheet of FIG. 1B is connected to the slide mechanism 11 and a supporting member 17 which is located so as to face the lower surface. Each of the upper parts of the both ends of the platen 12, parallel to the longitudinal direction of the platen 12, has an arc shape.

The fixing frame 15 is configured so that a frame having L-shaped sections covers four sides of the supporting surface 16 of the platen 12. An opening 15a having an opening area slightly smaller than the area of the supporting surface 16 is formed in a surface facing the supporting surface 16 of the platen 12 in the fixing frame 15. The inner surface of the fixing frame 15, facing a side surface of the platen 12, is provided with an anti-slip winding member 19 made of rubber. By providing the inner surface with this anti-slip winding member 19, the T-shirt 100 may be set in the state where the T-shirt 100 is pulled in both of the longitudinal direction (of the T-shirt) and the short direction (of the T-shirt) of the supporting surface 16 of the platen 12 at the time of setting the T-shirt 100 to the platen 12, and the T-shirt 100 may be held without creases. When the T-shirt 100 is set to the platen 12, the T-shirt 100 is overlaid on the platen 12 from the hem side of the T-shirt 100 so as to cover the supporting surface 16 of the platen 12 and is fixed with the fixing frame 15. The fixing frame 15 is provided so as to be rotatable by a rotating part (not shown) provided at the end part of the platen 12 on the back side in a direction perpendicular to the sheet of FIG. 4B. The T-shirt 100 is overlaid on the platen 12, and thereafter, the fixing frame 15 is rotated so as to fit in the platen 12. Thus, the T-shirt 100 is fixed so as to be sandwiched between the platen 12 and the fixing frame 15.

The ink-jet printer 1 includes a cover 13, and the cover 13 may protect the ink-jet heads 5 and the slide mechanisms 11 by covering them. In FIG. 3, in order to specifically show the inside of the cover 13, the cover 13 is shown in perspective by drawing the cover 13 with a chain double-dashed line. An operation panel 14 including a liquid crystal panel and an operation button is arranged at a predetermined position of the upper right part of the front surface of the cover 13.

The five ink-jet heads 5 shown in FIG. 3 correspond to the respective five color inks (white, yellow, magenta, cyan, and black), are arranged in parallel along the direction of reciprocating the carriage 4, and are communicated with the respective ink tanks 20 via the respective flexible tubes 28 and the respective sub tanks 30. As a configuration of supplying the inks to the respective ink-jet heads, a conventionally known configuration may be used, for example (for example, see JP 2004-291461 A).

By linking the ink tanks 20 with the respective sub tanks 30 via the respective flexible tubes 28, the inks in the respective ink tanks 20 may be supplied to the respective sub tanks 30, and the ink tanks 20 may be provided at the positions which are easily replaced. Thus, when the inks in the respective ink tanks 20 are run out, the ink tanks 20 may be easily replaced.

The ink-jet heads 5 are arranged so as to form a small space between the lower surface of each ink-jet head 5 and the supporting surface 16 of the platen 12, and when an image is printed on the T-shirt 100, a part to be subjected to printing of the T-shirt 100 set to the platen 12 is conveyed to the space. With this configuration, by ejecting a color ink(s) from many ejection nozzles each having a small diameter, arranged in the bottom surfaces of the ink-jet heads 5 in sequence, while reciprocating the ink-jet heads 5 by the carriage 4, a desired color image may be printed on the T-shirt 100.

The printing control apparatus 70 shown in FIG. 2 is, for example, configured using a general purpose personal computer (PC) and includes a main body 71, a display as a display section 72, a keyboard 73 and a mouse (pointing device) 74 as an operation section 75.

FIG. 5 is a block diagram showing a configuration of the printing control apparatus 70 shown in FIG. 7. The printing control apparatus 70 includes a CPU (Central Processing Unit) 81, a ROM (Read Only Memory) 82, a RAM (Random Access Memory) 83, a HD (Hard Disk) 84, an operation section 75, a display section 72, and an interface (IF) 85, and they are connected via a bus. The CPU 81, the ROM 82, the RAM 83, and the HD 84 are incorporated into the main body 71 of the printing control apparatus 70, and the operation section 75 is configured by the keyboard 73 and the mouse 74.

The HD 84 stores various programs for use in control of operation of the printing control apparatus 70. The HD 84 further stores various image data produced by software and various data according to the kind of fabric such as a T-shirt. The CPU 81 performs various operations and processes on the basis of signals input with the operation section 75 and various programs and data stored in the ROM 82, the RAM 83, and the HD 84. Then, data and the like are sent to the ink-jet printer 1 via the interface 85. The RAM 83 is a volatile storage device which is readable and writeable and stores results of the various operations and the like obtained in the CPU 81. The interface 85 is connected to an interface of the ink-jet printer 1 and allows the printing control apparatus 70 and the ink-jet printer 1 to communicate with each other.

FIG. 6 is a functional block diagram of the printing control apparatus 70. As shown in FIG. 6, the printing control apparatus 70 includes an image data acquisition section 90 and an image data storage section 91. In the present example, the image data acquisition section 90 is realized by the CPU 81, and the image data storage section 91 is composed of the RAM 83 and the HD 84.

The image data acquisition section 90 has a known function for use in production of image data and produces various image data on the basis of signals input from the keyboard 73 or the mouse 74 by an operator. The image data storage section 91 stores image data collected from removable storage media such as a CD-ROM, an FD, and an MO and the Internet and image data acquired by the image data acquisition section 90.
A desired image is printed on a T-shirt 100 using the ink-jet recording apparatus of the present example as follows, for example. First, an image data which is desired to be printed on a T-shirt 100 is acquired using a keyboard 73 and a mouse 74 of a PC. In the acquisition of the image data, image data is produced using software installed in the PC, or image data previously stored in a HD 84 is selected.

Then, the T-shirt 100 is fixed on the platen 12. That is, the T-shirt 100 is overlaid on the platen 12 from the hem of the T-shirt 100 and is fixed with a fixing frame 15 along a supporting surface 16 of the platen 12 without creases.

Subsequently, when the operator instructs that printing is performed, the image data is sent to the ink-jet printer 1 via the interface 85, an ink(s) are ejected from ink-jet heads 5 on the basis of the image data, and the T-shirt 100 fixed on the platen 12 is subjected to printing.

The ink-jet recording apparatus may further comprise a heating unit. The heating unit may be any unit as long as a heat-fixing step described below is performed in the ink-jet recording apparatus. The heating unit is, for example, a unit of heating and pressurizing a printing-subjected part of the fabric, such as a hot press unit or the like. The ink-jet recording apparatus may further comprise a pressurizing unit in addition to the heating unit. Any of the heating and the pressurizing may be performed in advance, or both of them may be performed simultaneously. As described below, the heat-fixing step may be performed by an apparatus having a heating unit and a pressuring unit, different from the ink-jet recording apparatus.

The ink-jet recording apparatus may not include an ink tank for a white ink and an ink-jet head for a white ink. In the method for forming an image, an image is printed on fabric after subjecting the fabric to discharge printing. Thus, a color image may be formed on deep-color fabric without forming a base layer of a white ink.

In the present example, the image printing step is performed by the ink-jet method. However, the image printing step may be performed by screen printing, gravure printing, stencil, or the like using a conventionally known device or unit.

The method for forming an image may comprise a heat-fixing step of heat-fixing the ink(s) on the fabric by subjecting the printing-subjected part of the fabric to a heat treatment after the image printing step. The heat-fixing step may be performed with the same device under the same conditions as in the heating step of the method for discharge printing. The heat-fixing step may be performed using a device described in JP 2009-209495 A. According to this device, the fabric may be heated at 180°C and pressurized.

The method for stabilizing a discharge printing agent is described below. The method for stabilizing a discharge printing agent is a method for stabilizing a discharge printing agent that comprises thiourea dioxide, the method comprising adding at least one of the following components (i) and (ii) to the discharge printing agent, (i) at least one salt selected from the group consisting of a salt of monocarboxylic acid, a salt of ascorbic acid, and a salt of metallic acid, (ii) β-diketone. In the method for stabilizing a discharge printing agent, conditions such as the kind of at least one of the components (i) and (ii) and the amount of at least one of the component (i) and (ii) to be added may be the same as those in the above-mentioned discharge printing agent.

EXAMPLES

The examples are described below together with comparative examples. The present invention, however, is not limited by the following examples and comparative examples.

Examples 1-1 to 1-17 and Comparative Examples 1-1 to 1-10

Examples 1-1 to 1-17 and Comparative Examples 1-1 to 1-10 are examples of a discharge printing agent containing the thiourea dioxide and the component (i). Components in each discharge printing agent composition (Table 1 or 2) except the thiourea dioxide and each salt were mixed, and the thiourea dioxide and each salt were then added to the resultant mixture. Thus, discharge printing agents of Examples 1-1 to 1-17 and Comparative Examples 1-1 to 1-10 were obtained.

Storing stability of each of the discharge printing agents of Examples 1-1 to 1-17 and Comparative Examples 1-1 to 1-10 was evaluated by the following method. That is, first, each of the discharge printing agents of Examples 1-1 to 1-17 and Comparative Examples 1-1 to 1-10 as of immediately after preparation. 24 hours from preparation, 72 hours from preparation was sprayed, by a spray method, seven times on each T-shirt (manufactured by Hanes, trade name: BEEFY (black)) on which a sheet obtained by cutting out a 5 cm x 5 cm portion of a US passport had been placed within 1 hour before the spraying. Then, a discharge printing agent-applied part was heated while moving an iron in the state of placing a Teflon (registered trademark) having a flat surface on the applied part. Subsequently, the T-shirt was washed with a washing machine as per normal (using a detergent) and was thereafter natural-dried in the shade. The degree of discharge printing of the T-shirt was evaluated according to the following evaluation criteria using a discharge printing agent containing no salt as of immediately after preparation as a reference.

Storage Stability Evaluation of Discharge Printing Agent

Evaluation Criteria:

AA: Color was discharged further significantly than the reference.

A: Color was further discharged than the reference.

B: Color was further discharged than the reference, and however, discoloration was observed.

C: The degree of color discharge was equal to or less than the reference.

The composition and the evaluation result of each of the discharge printing agents of Examples 1-1 to 1-17 are summarized in Table 1. The composition and the evaluation result of each of the discharge printing agents of Comparative Examples 1-1 to 1-10 are summarized in Table 2.
### TABLE 1

<table>
<thead>
<tr>
<th>Examples</th>
<th>1-1</th>
<th>1-2</th>
<th>1-3</th>
<th>1-4</th>
<th>1-5</th>
<th>1-6</th>
<th>1-7</th>
<th>1-8</th>
<th>1-9</th>
</tr>
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<tbody>
<tr>
<td>Discharge</td>
<td>Thiourea dioxide</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
</tr>
<tr>
<td>print</td>
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<td>0.054</td>
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<td>0.034</td>
<td>0.067</td>
<td>0.033</td>
<td>0.066</td>
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<tr>
<td>agent</td>
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<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
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<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
</tr>
<tr>
<td>(g)</td>
<td>Potassium acetate</td>
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<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
</tr>
<tr>
<td></td>
<td>Sodium butyrate</td>
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<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
</tr>
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<td>Sodium chloroacetate</td>
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<td>AA</td>
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<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
</tr>
<tr>
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<td>AA</td>
<td>AA</td>
<td>AA</td>
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<tr>
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<td>AA</td>
<td>AA</td>
<td>AA</td>
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</tr>
<tr>
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<td>Sodium pivalate</td>
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<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
</tr>
<tr>
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<td>AA</td>
</tr>
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<td>24 hours from preparation</td>
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<td>AA</td>
<td>AA</td>
<td>AA</td>
<td>A</td>
<td>AA</td>
</tr>
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<td>B</td>
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</table>

### TABLE 2

**Comparative Examples**

<table>
<thead>
<tr>
<th>Examples</th>
<th>1-1</th>
<th>1-2</th>
<th>1-3</th>
<th>1-4</th>
<th>1-5</th>
<th>1-6</th>
<th>1-7</th>
<th>1-8</th>
<th>1-9</th>
<th>1-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge</td>
<td>Thiourea dioxide</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
</tr>
<tr>
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<td>L-arginine</td>
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<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
</tr>
<tr>
<td>agent</td>
<td>Cupferon</td>
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<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
</tr>
<tr>
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<td>0.032</td>
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<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
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<tr>
<td></td>
<td>Imidazole</td>
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<td>0.032</td>
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<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
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<td>0.032</td>
</tr>
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<td></td>
<td>Potassium hydroxide</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
</tr>
<tr>
<td></td>
<td>Sodium chloride</td>
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<td>0.032</td>
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<td>Sodium sulfate</td>
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<td>0.032</td>
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<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
</tr>
<tr>
<td></td>
<td>Sodium oxalate</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
<td>0.032</td>
</tr>
<tr>
<td></td>
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<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>24 hours from preparation</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>A</td>
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<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
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<td>72 hours from preparation</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>

*1: Reference*
printing using thiourea dioxide, a reaction intermediate is stabilized by a nucleophilic action of carbonyl carbon, resulting in an increasing yield of effective sulfonic acid. Thus, it was assumed that an effect of discharge printing was consequently increased.

Examples 1-18 to 1-27

Examples 1-18 to 1-27 also are examples of a discharge printing agent containing the thiourea dioxide and the component (i). Components in each discharge printing agent composition (Table 3) except the thiourea dioxide and each salt were mixed, and the thiourea dioxide and each salt were then added to the resultant mixture. Thus, discharge printing agents of Examples 1-18 to 1-27 were obtained.

[0080] Storing stability of each of the discharge printing agents of Example 1-18 to 1-27 was evaluated by the following method. That is, first, each of the discharge printing agents of Example 1-18 to 1-27 as of immediately after preparation, 2 days from preparation, 7 days from preparation, 14 days from preparation was sprayed, by a spray method, seven times on each T-shirt (manufactured by Hanes, trade name: BEEFY (black)) on which a sheet obtained by cutting out 5 cm×5 cm had been placed within 1 hour before the spraying. Then, a discharge printing agent-applied part was heated while moving an iron in the state of placing a Teflon (registered trademark) having a flat surface on the applied part. Subsequently, the T-shirt was washed with a washing machine as per normal (using a detergent) and was thereafter natural-dried in the shade. The degree of discharge printing of the T-shirt was evaluated based on the optical density (OD value) measured using a spectrophotometry: SpectroEye (light source: D65/10) manufactured by X-Rite. A reduction in OD value represents color discharge. The OD value of a T-shirt before discharge printing was 1.7.

[0082] The composition and the evaluation result of each of the discharge printing agents of Examples 1-18 to 1-27 are summarized in Table 3.

TABLE 3

<table>
<thead>
<tr>
<th>Examples</th>
<th>1-18</th>
<th>1-19</th>
<th>1-20</th>
<th>1-21</th>
<th>1-22</th>
<th>1-23</th>
<th>1-24</th>
<th>1-25</th>
<th>1-26</th>
<th>1-27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge</td>
<td>Thiourea dioxide</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>agent</td>
<td>Sodium formate</td>
<td>0.5</td>
<td>1</td>
<td>2</td>
<td>0.5</td>
<td>1</td>
<td>2</td>
<td>0.5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sodium glycinate</td>
<td>Glycerin</td>
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<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Composition</td>
<td>Lauril betaine (**)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>PVA500 (*)</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
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<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
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<td>Water</td>
<td>Balance</td>
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<td>0.979</td>
<td>0.879</td>
<td>0.784</td>
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<tr>
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<td>Balance</td>
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<td>1.287</td>
<td>1.651</td>
<td>0.992</td>
<td>0.810</td>
<td>0.822</td>
<td>0.638</td>
<td>0.558</td>
</tr>
<tr>
<td></td>
<td>2 days from preparation</td>
<td>Balance</td>
<td>1.417</td>
<td>1.333</td>
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<td>1.277</td>
<td>1.140</td>
<td>0.950</td>
<td>1.106</td>
<td>0.984</td>
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<tr>
<td></td>
<td>7 days from preparation</td>
<td>Balance</td>
<td>1.454</td>
<td>1.312</td>
<td>1.243</td>
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<td>0.951</td>
<td>1.180</td>
<td>1.049</td>
</tr>
<tr>
<td></td>
<td>14 days from preparation</td>
<td>Balance</td>
<td>1.266</td>
<td>1.287</td>
<td>1.651</td>
<td>0.992</td>
<td>0.810</td>
<td>0.822</td>
<td>0.638</td>
<td>0.558</td>
</tr>
</tbody>
</table>

(**) Surfactant
(*) Viscosity modifier, polyvinyl alcohol with a molecular weight of 500
The unit of discharge printing agent composition: wt %

As summarized in Table 3, in each of discharge printing agents of Examples 1-18 to 1-27 using Gly as a high boiling point solvent, a reduction in OD value as of 14 days from preparation 1.7 before discharge printing was 0.1 or more, and color was discharged to the extent that the different in color is observed by visual check.

Examples 2-1 to 2-7

Examples 2-1 to 2-7 are examples of a discharge printing agent containing the thiourea dioxide and the component (ii). Components in each discharge printing agent composition (Table 1) except the thiourea dioxide and the β-diketone were mixed, and the thiourea dioxide and the β-diketone were then added to the resultant mixture. Thus, discharge printing agents of Examples 2-1 to 2-7 were obtained.

[0085] Storing stability of each of the discharge printing agents of Examples 2-1 to 2-7 was evaluated in the same manner as in Examples 1-18 to 1-27.

[0086] The composition and the evaluation result of each of the discharge printing agents of Example 2-1 to 2-7 are summarized in Table 4.
As summarized in Table 4, in each of discharge printing agents of Examples 2-1 to 2-7, the OD value as of 14 days from preparation was substantially reduced from 1.7 before discharge printing, and color was discharged significantly. As mentioned above, in discharge printing using thiourea dioxide, a reaction intermediate is stabilized by a nucleophilic action of carbonyl carbon, and the intermediate is decomposed over time. Therefore, the residence time of effective sulfoxide acid becomes long. Thus, it was assumed that an effect of discharge printing was consequently increased.

Examples 2-8 to 2-10 and Comparative Examples 2-1 to 2-2

Examples 2-8 to 2-10 and Comparative Examples 2-1 to 2-2 also are examples of a discharge printing agent containing the thiourea dioxide and the component (ii). Components in each discharge printing agent composition (Table 5) except the thiourea dioxide and the β-diketone (2-hydroxy-2-methyl-4-pentanone in Comparative Example 2-2) were mixed, and thiourea dioxide and β-diketone were then added to the resultant mixture. Thus, discharge printing agents of Examples 2-8 to 2-10 and Comparative Examples 2-1 to 2-2 were obtained.

Storing stability of each of the discharge printing agents of Examples 2-8 to 2-10 and Comparative Examples 2-1 to 2-2 was evaluated in the same manner as in Examples 1-18 to 1-27 except that the OD value as of 28 days from preparation was measured as substitute for the OD value as of 2 days from preparation.

The composition and the evaluation result of each of the discharge printing agents of Examples 2-8 to 2-10 and Comparative Examples 2-1 to 2-2 are summarized in Table 5.
As summarized in Table 5, in each of the discharge printing agents of Examples 2-8 to 2-10, the OD value as of 28 days from preparation was significantly reduced from 1.7 before discharge printing, and color was discharged significantly. In contrast, in each of the discharge printing agent of Comparative Example 2-1 using no β-diketone and the discharge printing agent of Comparative Example 2-2 using 2-hydroxy-2-methyl-4-pentanone as substitute for β-diketone, the OD value as of 28 days from preparation was close to 1.7 before discharge printing.

Examples 3-1 to 3-3

Examples 3-1 to 3-3 are examples of a discharge printing agent containing the thiourea dioxide and the components (i) and (ii). Components in each discharge printing agent composition (Table 6) except the thiourea dioxide, sodium formate, and acetylacetone were mixed, and the thiourea dioxide, the sodium formate, and the acetylacetone were added to the resultant mixture. Thus, discharge printing agents of Examples 3-1 to 3-3 were obtained.

Storing stability of each of the discharge printing agents of Examples 3-1 to 3-3 was evaluated in the same manner as in Examples 1-18 to 1-27.

The composition and the evaluation result of each of the discharge printing agents of Examples 3-1 to 3-3 were summarized in Table 6.

As summarized in Table 6, in each of the discharge printing agents of Examples 3-1 to 3-3, the OD value as of 14 days from preparation was significantly reduced from 1.7 before discharge printing, and color was discharged significantly. As mentioned above, in discharge printing using thiourea dioxide, a reaction intermediate is stabilized by a nucleophilic action of carbonyl carbon, and the intermediate is decomposed over time. Therefore, a yield of effective sulfonic acid is increased, and the residence time of effective sulfonic acid becomes long. Thus, it was assumed that an effect of discharge printing was consequently increased.

Examples 4-1 to 4-3

Examples 4-1 to 4-3 are examples of a discharge printing agent containing thiourea dioxide, β-diketone (the component (ii)), and an amine base (the component (iii)). In Example 4-2, the discharge printing agent further contains β-diketone. In Example 4-3, the discharge printing agent further contains ketone. Thiourea dioxide, disodium malonate (the component (i)), and 2-amino-2-hydroxymethyl-1,3-propanediol (AHP, an amine base (the component (iii)) shown in each discharge printing agent composition (Table 7) were completely dissolved in water. Thereafter, as summarized in Table 7, N-methyl acetoacetic acid amide was added in Example 4-2, and 2-hydroxy-2-methyl-4-pentanone was added in Example 4-3. Thus, discharge printing agents of Examples 4-1 to 4-3 were obtained.

Storing stability of each of the discharge printing agents of Examples 4-1 to 4-3 was evaluated by the following method. That is, first, each of the discharge printing agents of Examples 4-1 to 4-3 as of immediately after the preparation, 0.5 months from preparation, 1 month from preparation, 2 months from preparation, 3 months from preparation was sprayed, by a spray method, seven times on each T-shirt (manufactured by Hanes, trade name: BEEFY (black)) on which a sheet obtained by cutting out 5 ems5 cm had been placed within 1 hour before the spraying. Then, a discharge printing agent-applied part was heated while moving an iron in the state of placing a Telfon (registered trademark) having a flat surface on the applied part. Subsequently, the T-shirt was washed with a washing machine as per normal (using a detergent) and was thereafter natural-dried in the shade. The degree of discharge printing of the T-shirt was evaluated based on the optical density (OD value) measured using a spectrophotometry: SpectroEye (light source: D65/10) manufactured by X-Rite. A reduction in OD value represents color discharge. The OD value of a T-shirt before discharge printing was 1.7.

The composition and the evaluation result of each of the discharge printing agents of Examples 4-1 to 4-3 are summarized in Table 7.

As summarized in Table 7, in each of the discharge printing agents of Examples 4-1 to 4-3, the OD value as of 2 months from preparation was significantly reduced from 1.7 before discharge printing, and color was discharged significantly. Specifically, Example 4-2 using N-methyl acetoacetic acid amide as β-diketone showed the largest decrease in OD value, and the really low OD value was maintained after 3 months from preparation.

It will be obvious to those having skill in the art that many changes may be made in the above-described details of
the particular aspects described herein without departing from the spirit or scope of the invention as defined in the appended claims.

What is claimed is:
1. A discharge printing agent comprising thiourea dioxide, wherein the discharge printing agent further comprises at least one of the following components (i) and (ii):
   (i) at least one salt selected from the group consisting of a salt of monocarboxylic acid, a salt of ascorbic acid, and a salt of metasilicic acid; and
   (ii) β-diketone.
2. The discharge printing agent according to claim 1, wherein the salt of monocarboxylic acid is at least one of a salt of formic acid, a salt of aliphatic carboxylic acid, and a salt of an aliphatic carboxylic acid derivative.
3. The discharge printing agent according to claim 2, wherein the salt of aliphatic carboxylic acid is at least one of a salt of acetic acid and a salt of butyric acid.
4. The discharge printing agent according to claim 1, wherein the β-diketone is at least one selected from the group consisting of acetylacetone, disodium malonate, 3-acetyl-γ-butyrolactone, dehydroacetic acid, methyl acetoacetate, and N-methyl acetoacetic acid amide.
5. The discharge printing agent according to claim 1, wherein the discharge printing agent comprises both of the components (i) and (ii).
6. The discharge printing agent according to claim 1, wherein the discharge printing agent comprises at least one of the components (i) and (ii) and further comprises the following component (iii):
   (iii) an amine base.
7. The discharge printing agent according to claim 6, wherein the component (iii) is a primary amine base.
8. The discharge printing agent according to claim 7, wherein the component (iii) is 2-amino-2-hydroxymethyl-1,3-propanediol (AHP).
9. The discharge printing agent according to claim 1, wherein the amount of the thiourea dioxide to be added is 0.5 wt% to 5 wt% relative to the total amount of the discharge printing agent, and the amount of at least one of the components (i) and (ii) to be added is 1 wt% to 15 wt% relative to the total amount of the discharge printing agent.
10. A container comprising a discharge printing agent, wherein the discharge printing agent is the discharge printing agent according to claim 1.
11. The container according to claim 10, wherein a main body of the container comprises a case.
12. An ink-jet recording apparatus comprising a liquid ejecting unit of ejecting a liquid, wherein the apparatus further comprises a unit of applying a discharge printing agent, and the discharge printing agent is the discharge printing agent according to claim 1.
13. A method for discharge printing of fabric, the method comprising:
   a discharge printing agent-applying step of applying a discharge printing agent to fabric; and
   a heating step of heating a discharge printing agent-applied part, wherein as the discharge printing agent, the discharge printing agent according to claim 1 is used.
14. A method for forming an image on fabric, the method comprising:
   a discharge printing step of subjecting fabric to discharge printing; and
   an image printing step of printing an image on a discharge printing-subjected part with an ink, wherein the discharge printing step is performed by the method according to claim 13.
15. The method according to claim 14, wherein the image printing step is performed by an ink-jet method.
16. A method for stabilizing a discharge printing agent that comprises thiourea dioxide, the method comprising adding at least one of the following components (i) and (ii) to the discharge printing agent,
   (i) at least one salt selected from the group consisting of a salt of monocarboxylic acid, a salt of ascorbic acid, and a salt of metasilicic acid,
   (ii) β-diketone.
17. The method according to claim 16, comprising adding both of the components (i) and (ii) to the discharge printing agent.
18. The method according to claim 16, comprising adding at least one of the components (i) and (ii) to the discharge printing agent and further comprising adding the following component (iii) to the discharge printing agent,
   (iii) an amine base.
19. The method according to claim 18, wherein the component (iii) is 2-amino-2-hydroxymethyl-1,3-propanediol (AHP).

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