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(71) Applicant: **FUJI PHOTO FILM CO., LTD.**
210 Nakanuma Minamiashigara-shi
Kanagawa-ken(JP)

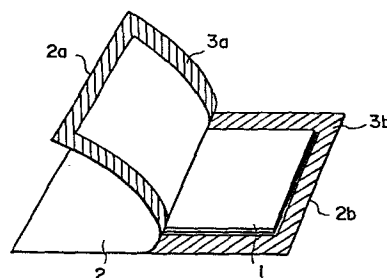
(72) Inventor: **Takano, Masao c/o Fuji Photo Film Co., Ltd.**
798 Miyanodai Kaisei-machi
Ashigarakami-gun Kanagawa-ken(JP)

(74) Representative: **Patentanwälte Grünecker, Dr.**
Kinkeldey, Dr. Stockmair, Dr. Schumann, Jakob, Dr.
Bezold, Meister, Hilgers, Dr. Meyer-Plath
Maximilianstrasse 58
D-8000 München 22(DE)

(54) **Composite material for storage of radiation image.**

(57) A composite material comprising a radiation image storage panel provided with a phosphor layer containing a stimuable phosphor, and a light-shielding bag for enclosing the radiation image storage panel. The light-shielding bag is made of a material interrupting stimulating rays which excite the stimuable phosphor, but permeable to a radiation passing through an object.

FIG. 1



BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a composite material for storage of a radiation image, which comprises a radiation
5 image storage panel.

Description of the Prior Art

As is well known, there is widely used a radiographic method wherein an X-ray photographic film is exposed to a radiation passing through an object to record an X-ray
10 transmission image of the object for viewing, particularly for diagnostic purposes. In conventional radiography, intensifying screens are used together with the X-ray photographic film in order to intensify the sensitivity to X-rays. In general, the radiography is conducted by inter-
15 leaving the X-ray photographic film between two intensifying screens, loading the obtained combination in a light-shielding cassette, and loading the cassette in an image recording stage.

However, in mammography, dental image recording or
20 the like, it is impossible to use the cassette as described above. In such a case, therefore, a radiation image is recorded by inserting the X-ray photographic film and the intensifying screens in a light-shielding, bag-like holder. However, in this method, since the X-ray photographic film
25 and the intensifying screens are simply inserted into the holder and not put into close contact with each other, the image quality of the obtained X-ray transmission image is deteriorated, and it is not possible to obtain an X-ray

transmission image suitable for viewing, particularly for diagnostic purposes. This presents a very real problem particularly when the X-ray photographic film and the intensifying screens are bent according to the shape of the object in dental panoramic image recording from the outside of the mouth, or the like. In order to eliminate the problem due to loose contact of the X-ray photographic film with the intensifying screens, there has heretofore been used a method wherein the bag-like holder is evacuated to improve contact of the X-ray photographic film with the intensifying screens. However, it is very troublesome to evacuate the bag-like holder, and forming of the bag-like holder so as to be capable of being evacuated results in higher cost of image recording.

One novel method for recording and reproducing a radiation image without using the X-ray photographic film is disclosed in U.S. Patent No. 4,239,968. In this radiation image recording and reproducing method, there is used a radiation image storage panel comprising a stimuable phosphor which emits light when stimulated by an electromagnetic wave selected from among visible light and infrared rays after exposure to a radiation. (The term "radiation" as used herein means electromagnetic wave or corpuscular radiation such as X-rays, α -rays, β -rays, γ -rays, high energy neutron rays, cathode rays, vacuum ultraviolet rays, ultraviolet rays, or the like.) The method comprises the steps of (i) causing the stimuable phosphor of the panel to absorb radiation energy corresponding to the amount of

radiation passing through an object, thereby to form a latent radiation image in the stimuable phosphor, (ii) scanning the panel with an electromagnetic wave such as visible light or infrared rays (hereinafter referred to as "stimulating rays") to sequentially release the radiation energy stored in the panel as light emission, and (iii) detecting the emitted light and converting it into an image.

The radiation image storage panel employed in the aforesaid method for recording and reproducing a radiation image has a phosphor layer comprising an appropriate binder and a stimuable phosphor dispersed therein. When the phosphor layer is self-supporting, the phosphor layer can by itself form the radiation image storage panel. In general, however, the phosphor layer is provided on an appropriate substrate to form the radiation image storage panel. Normally, a protective film for physically and chemically protecting the phosphor layer is provided on the phosphor layer on the side opposite to the substrate. Further, a prime-coating layer is sometimes formed between the phosphor layer and the substrate for the purpose of increasing adhesion therebetween, a light-reflecting layer is sometimes formed between the phosphor layer and the substrate to improve the sensitivity of the panel, or a light-absorbing layer is sometimes formed between the phosphor layer and the substrate to improve the sharpness of the image obtained by the panel. Further, to improve the sharpness of the image obtained by the panel, the phosphor layer is sometimes colored, or white particles are sometimes dispersed in the phosphor layer.

In the aforesaid method for recording and reproducing a radiation image, a radiation image is stored in the phosphor layer itself of the radiation image storage panel. Namely, the panel is not combined with an X-ray
5 photographic film as in the case of the intensifying screens. Therefore, this method does not present the aforesaid problem due to loose contact of the X-ray photographic film with the intensifying screens. Accordingly, this method can provide a radiation image having high image quality even
10 when image recording is conducted without using the cassette. However, since it is a property of the radiation image storage panel that the radiation energy stored in the phosphor layer is lost as light emission when exposed to stimulating rays, the phosphor layer of the panel should be
15 shielded from light, as in the case of the conventional X-ray photographic film, between the image recording step and the image read-out step so that the phosphor layer will not be exposed to stimulating rays contained in natural light.

Accordingly, when the radiation image storage
20 panel is used for image recording without using the cassette, the panel must be carefully handled, for example in a dark room, so that the phosphor layer of the panel will not be exposed to stimulating rays between the image recording and the image read-out.

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SUMMARY OF THE INVENTION

The primary object of the present invention is to provide a composite material for storage of a radiation image, which can be easily handled even in a light room

when image recording is conducted without using a cassette.

Another object of the present invention is to provide a composite material for storage of a radiation image, which is suitable for obtaining a radiation image
5 having a high image quality.

The composite material for storage of a radiation image in accordance with the present invention comprises a radiation image storage panel provided with a phosphor layer containing a stimuable phosphor, and a light-shielding
10 bag for enclosing said radiation image storage panel, thereby shielding the phosphor layer of said panel from light.

Since a radiation image is recorded in the phosphor layer itself of the radiation image storage panel, the panel
15 does not present the problem due to loose contact of the X-ray photographic film with the intensifying screens when they are used in combination with each other as in the conventional method. Therefore, in the present invention, it is sufficient that the radiation image storage panel be
20 simply enclosed in the light-shielding bag so that the phosphor layer is shielded from light. The light-shielding bag need not be evacuated as in the case of the conventional combination of the X-ray photographic film with the intensifying screens. Accordingly, the construction of the
25 light-shielding bag employed in the present invention is markedly simpler than the construction of the light-shielding bag (holder) used for the conventional combination of the X-ray photographic film with the intensifying screens.

In the present invention, the radiation image storage panel can be handled even in a light room and, therefore, it is very easy to handle. Further, the light-shielding bag constituting the composite material for storage of a radiation image in accordance with the present invention is advantageous also for protecting the radiation image storage panel from dust, and can prevent the image quality from being deteriorated due to dust which might otherwise stick to the radiation image storage panel and interrupt or scatter the stimulating rays irradiated onto the panel or the light emitted from the panel when the panel is exposed to stimulating rays.

The light-shielding bag constituting the composite material for storage of a radiation image in accordance with the present invention may be made of any material that interrupts the stimulating rays but is permeable to a radiation image of an object formed by a radiation passing through the object.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic view showing an embodiment of the composite material for storage of a radiation image in accordance with the present invention, and

Figure 2 is a schematic view showing another embodiment of the composite material in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will hereinbelow be described in further detail with reference to the accompanying drawings.

Referring to Figure 1, a radiation image storage panel 1 is contained in a light-shielding bag 2 to shield the phosphor layer of the radiation image storage panel 1 from light. The light-shielding bag 2 consists of an upper sheet 2a and a lower sheet 2b. Inner edge portions 3a and 3b of the upper sheet 2a and the lower sheet 2b, respectively, are provided with flat fasteners. (The flat fasteners are flat tapes of the press-on, split-off type, generally called "magic tapes" and provided with fine fibrous joining members which join with each other. The flat fasteners are hereinafter referred to as "magic tapes".) At the image recording step, the radiation image storage panel 1 is positioned in the light-shielding bag 2. Then, the edge portions of the upper sheet 2a and the lower sheet 2b of the light-shielding bag 2 are pressed against each other to adhere the magic tapes 3a and 3b to each other. In this manner, the radiation image storage panel 1 is contained in the light-shielding bag 2 in a condition shielded from light. After the image recording is finished, the upper sheet 2a and the lower sheet 2b are separated from each other, and the radiation image storage panel 1 is taken out of the light-shielding bag 2 to conduct read-out of the radiation image stored in the radiation image storage panel 1.

The light-shielding bag 2 is made of a material which interrupts the stimulating rays but is permeable to a radiation passing through the object, for example, paper or plastics such as vinylchloride, polypropylene, polyethylene, polyester, NYLON colored in black, or the like.

In the embodiment described above, since the light-shielding bag 2 can be opened and closed by use of the magic tapes, the light-shielding bag 2 can be used repeatedly. Since the radiation image storage panel 1 is
5 used repeatedly, it is advantageous that the light-shielding bag 2 also be reusable.

In Figure 2 showing another embodiment of the composite material for storage of a radiation image in accordance with the present invention, four edge portions
10 of a light-shielding bag 2' are completely bonded when the radiation image storage panel 1 is loaded therein. When the image recording is finished, the light-shielding bag 2' is broken, and the radiation image storage panel 1 is taken out of the light-shielding bag 2', which is then
15 discarded.

The radiation image storage panel 1 constituting the composite material for storage of a radiation image in accordance with the present invention may comprise a substrate and a stimuable phosphor layer provided on the
20 substrate, or may simply consist of a self-supporting stimuable phosphor layer alone. As the material of the substrate and the stimuable phosphor dispersed in a binder to form the phosphor layer, any material and any phosphor that are known to be usable for the radiation image storage
25 panel may be used. Particularly, the substrate should preferably be made of a flexible material since a panel comprising the flexible substrate can be bent according to the shape of the object. Further, a protective film for

physically and chemically protecting the phosphor layer is provided on the phosphor layer on the side opposite to the substrate. Further, a prime-coating layer may be formed between the phosphor layer and the substrate for the purpose of increasing adhesion therebetween, or a light-reflecting layer may be formed between the phosphor layer and the substrate to improve the sensitivity of the panel. Or, a light-absorbing layer may be formed between the phosphor layer and the substrate to improve the sharpness of the image obtained by the panel. Further, to improve the sharpness of the image obtained by the panel, the phosphor layer may be colored, or white particles may be dispersed in the phosphor layer.

C L A I M S

1. A composite material for storage of a radiation image, which comprises a radiation image storage panel provided with a phosphor layer containing a stimuable phosphor, and a light-shielding bag for enclosing said radiation image storage panel.

2. A composite material as defined in Claim 1 wherein said light-shielding bag consists of an upper sheet and a lower sheet, and inner edge portions of said upper sheet and said lower sheet are provided with flat fasteners for separably joining said upper and lower sheets with each other to form said light-shielding bag.

3. A composite material as defined in Claim 1 wherein said light-shielding bag consists of an upper sheet and a lower sheet, and inner edge portions of said upper sheet and said lower sheets are completely bonded when said radiation image storage panel is loaded in said light-shielding bag.

4. A composite material as defined in any of Claims 1 to 3 wherein said radiation image storage panel comprises a flexible substrate on which said phosphor layer is formed.

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FIG. 1

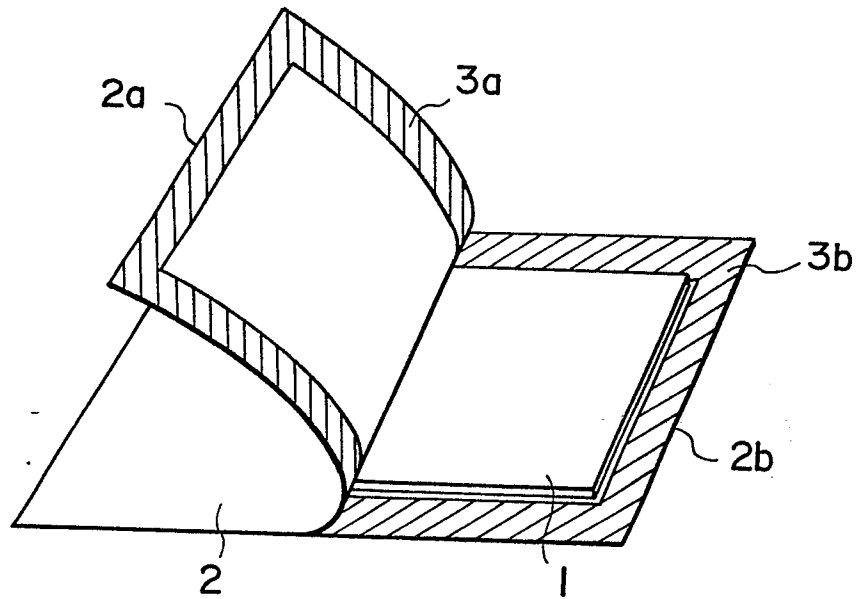


FIG. 2

