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(54) Packaging body and collective packaging body for photosensitive materials.

(57) A packaging body comprises a packaging member, a light-shielding moisture-proof bag and a plurality of photosensitive materials, the photosensitive materials being in sheet form and stacked in one body, the light-shielding moisture-proof bag packaging the stacked photosensitive materials and the packaging body packaging the light-shielding moisture-proof bag, wherein the following inequalities are satisfied;

$P > 0.62$

$1/1.50 \leqq \ell/L < 1/1.00$

$1/1.67 \leqq y/Y < 1/1.00$

$0.02 \leqq X \leqq 2.0$

wherein P is the flat compressive strength (Kg/cm^2) of a material of which the packaging member is made, ℓ is the volume of the stacked photosensitive materials, L is the content of the light-shielding moisture-proof bag, y is the volume of the light-shielding moisture-proof bag, Y is the content of the packaging member and X is the percentage of voids of the stacked photosensitive materials.

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FIELD OF THE INVENTION

The present invention relates to a packaging body by which sheet-shaped photosensitive materials such as X-ray films are packaged. More particularly, the present invention relates to a packaging body for photosensitive materials appropriate for handling in a bright room, and also relates to a collective packaging body for photosensitive materials in which a plurality of packaging bodies are packaged.

BACKGROUND OF THE INVENTION

Conventionally, photosensitive materials such as X-ray films are sent by a maker to a customer such as a hospital under the condition that a plurality of sheets of X-ray films are accommodated in a light-shielding moisture-proof bag and further this light-shielding moisture-proof bag is put in a packaging member to form a packaging body. When X-ray photographs are taken in the hospital, the packaging member is opened in a dark room and the light-shielding moisture-proof bag is taken out of the packaging member, and then the photosensitive materials are taken out of the light-shielding moisture-proof bag and set in an X-ray photographing apparatus. When the packaging body is conveyed, or when the photosensitive materials are set in the X-ray photographing apparatus, the photosensitive materials are moved in the light-shielding moisture-proof bag or the packaging member, so that they are rubbed to each other, which causes scratches on the surfaces of the photosensitive materials.

In order to prevent the occurrence of scratches, the light-shielding moisture-proof bag is subjected to vacuum packaging so that the photosensitive materials can not be moved in the bag. When the vacuum packaging is conducted in the manner described above, the photosensitive materials are stuck to each other, and further the photosensitive materials are stuck to the light-shielding moisture-proof bag. Accordingly, it becomes difficult to take out the photosensitive materials from the light-shielding moisture-proof bag. In this case, after the photosensitive materials have been taken out from the light-shielding moisture-proof bag, they are subjected to fanning so that they are not stuck to each other, and then they are set in a film magazine. Since this operation is conducted in a dark room, the work efficiency is extremely low.

In some cases, in the process of packaging photosensitive materials, dust blows into the light-shielding moisture-proof bag and sticks onto the surfaces of the photosensitive materials. When the bag is subjected to vacuum packaging, defects and fog are caused on the photosensitive materials. Further, the photosensitive materials are stuck to each other by the action of vacuum, so that they are not smoothly conveyed to the X-ray photographing apparatus. Further, when the photosensitive materials are set in the X-ray photographing apparatus and the light-shielding moisture-proof bag is taken away from the photosensitive materials, scratches are caused on the photosensitive materials by the dust stuck on the surface.

When the packaging body is conveyed or stored, a pressing force is applied to the packaging member, so that defects such as fog are caused on the photosensitive material, and further the packaging member is curved, so that the accommodated photosensitive materials are also curved, which causes scratches on the surfaces of the photosensitive materials.

SUMMARY OF THE INVENTION

The present invention has been achieved to solve the above problems. It is an object of the present invention to provide a packaging body for photosensitive materials characterized in that: the occurrence of fog and scratches on the photosensitive material is prevented even in the case of transportation and storage of the packaging body; the photosensitive material accommodated in the packaging body can be set in a film magazine even in a bright room; and the photosensitive material can be smoothly conveyed in the apparatus. It is another object of the present invention to provide a collective packaging body in which a plurality of packaging bodies are accommodated, characterized in that: no problems are caused in the photosensitive material when the plurality of packaging bodies formed into a unit are transported and stored. It is still another object of the present invention to provide a packaging body characterized in that: the occurrence of fog, deformation and scratches of photosensitive material can be prevented even when a pushing force is applied to the packaging body accommodating the photosensitive materials packaged by a light-shielding moisture-proof bag.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing a condition in which a protective sheet is attached to the integrated body of photosensitive material.

Fig. 2 is a perspective view of the light-shielding moisture-proof bag in which the integrated body of photosensitive material is accommodated.

Fig. 3 is a perspective view of the packaging body for photosensitive material.

Fig. 4 is a perspective view showing a condition in which the packaging body for photosensitive material is opened.

Fig. 5 is a development view of the packaging body for photosensitive material.

Fig. 6 is a development view of the packaging body for photosensitive material.

Fig. 7 is a perspective view showing a condition in which the packaging body for photosensitive material is opened.

Fig. 8 is a perspective view showing a condition in which the packaging body for photosensitive material is opened.

Fig. 9 is a development view of the packaging body for photosensitive material.

Fig. 10 is a perspective view showing an example of the collective packaging body for photosensitive material.

DETAILED DESCRIPTION OF THE INVENTION

The above problem scan be solved by a packaging body comprising a packaging member, a light-shielding moisture-proof bag and a plurality of photosensitive materials, the photosensitive materials being in sheet form and stacked in one body, the light-shielding moisture-proof bag packaging the stacked photosensitive materials and the packaging body packaging the light-shielding moisture-proof bag, wherein the following inequalities are satisfied;

$P > 0.62$

$1/1\ 5 \leqq \ell/L < 1/1.0$

$1/1.67 \leqq y/Y < 1/1.00$

$0.02 \leqq X \leqq 2.0$

wherein P is the flat compressive strength (Kg/cm^2) of a material of which the packaging member is made, ℓ is the volume of the stacked photosensitive materials, L is the content of the light-shielding moisture-proof bag, y is the volume of the light-shielding moisture-proof bag, Y is the content of the packaging member and X is the percentage of voids of the stacked photosensitive materials represented by the following expression,

$$X = (T - nt) \times 100 / nt$$

wherein T is a thickness of the stacked photosensitive materials, t is a theoretical thickness of one sheet of the stacked photosensitive materials, and n is the number of the sheets of the stacked photosensitive materials.

In the above the light-shielding moisture-proof bag packaging the stacked photosensitive materials is placed in the vessel filled with water and the overflow was measured with a measuring cylinder. This measured volume is defined to be the volume of the light-shielding moisture-proof bag y.

The content of the light-shielding moisture-proof bag L is obtained by subtracting the volume of the bag itself from the volume of the light-shielding moisture-proof bag. The volume of the bag itself is obtained by conducting the same procedure as above on the bag after the stacked photosensitive materials were removed and the air in the bag was evacuated.

A sheet of the photosensitive material is randomly taken out from the light-shielding moisture-proof bag, and the thickness thereof is measured with a micron-micrometer. Thus, the theoretical thickness is obtained.

It is also characterized in that a plurality of single packaging bodies are formed into a collective packaging body as one boy.

Due to the foregoing constitution, the single packaging body and the collective packaging body for photosensitive materials of the present invention are characterized in that: a pushing force given to the packaging body from the outside is absorbed by the packaging body and the light-shielding moisture-proof bag in the process of conveyance or storage; and the photosensitive material is tightly held in the light-shielding bag in the packaging body. Therefore, problems such as scratches and fog caused on the surface of the photosensitive material can be solved. Further, the photosensitive material can be set to the apparatus in a bright room, and no problems are caused in the process of conveyance in the apparatus.

The size of the photosensitive materials in the invention is preferably $18 \times 24cm^2$ to $35.6 \times 43.2cm^2$, and more preferably $9 \times 12cm^2$ to $43 \times 110cm^2$. The stacked sheet number of the photosensitive materials

in the invention is preferably 50 to 100, and more preferably 10 to 100.

With reference to the accompanying drawings, examples of the packaging body and collective packaging body for photosensitive materials of the present invention will be explained as follows. However, it should be noted that the present invention is not limited to the specific example.

The packaging body for photosensitive material of the present invention is comprised of a light-shielding moisture-proof bag for accommodating a plurality of sheets of photosensitive materials and a packaging body for packaging the light-shielding moisture-proof bag. In the following example, packaging of X-ray films, which are sheet-shaped photosensitive materials, will be described below. Of course, the packaging body of the present invention is not limited to X-ray films.

With reference to Figs. 1 and 2, a light-shielding moisture-proof bag in which an integrated body of a plurality of sheets of photosensitive materials are accommodated will be explained as follows. Fig. 1 is a perspective view showing a condition in which a protective sheet is attached to the integrated body of photosensitive materials. Fig. 2 is a perspective view of the light-shielding moisture-proof bag in which the integrated body of photosensitive material is accommodated.

For example, sheets of photosensitive materials are X-ray films. As illustrated in Fig. 1, for example, 100 sheets of X-ray films are formed into an integrated body, and a protective sheet 2 is attached to the integrated body so as to protect the photosensitive materials. Under the condition that the protective sheet 2 is attached to the integrated body of the photosensitive material 1, the integrated body is accommodated in the light-shielding moisture-proof bag 3 as illustrated in Fig. 3. It is possible that the light-shielding moisture-proof bag 3 is put in a film magazine as it is so that the photosensitive material in the bag is used. It is also possible that one end portion 3a of the light-shielding moisture-proof bag 3 is cut away with a cutter, and the other end portion 3b on the opposite side of the light-shielding moisture-proof bag is held so as to be pulled out. The end portions 3a and 3b are opposed and respectively folded and adhered with an adhesive tape 5. In this way, the packaging body is formed. Label 4 for indicating a direction to set a film magazine is attached to the end portion 3b of the light-shielding moisture-proof bag 3.

The light-shielding moisture-proof bag 3 is made of a flexible sheet. In this example, the protective sheet 2 is attached to the integrated body of photosensitive materials 1, and then the integrated body is packaged by the light-shielding moisture-proof bag 3, however, the integrated body may be packaged only by the flexible sheet.

Examples of usable materials for the light-shielding moisture-proof bag 3 are: various types of paper, synthesized paper, polyethylene (HDPE, LDPE, MDPE, LLDPE), polypropylene, a polyester, a polyamide, polybutylene, an ethylene-ethylacrylate copolymer, an ethylene-methylacrylate copolymer, an ethylene-vinyl acetate copolymer, nylon or a mixture or laminated body thereof. It is preferable to use a sheet of aluminum foil, or a vapor-deposited film of metal such as Al, Sn, Zn, Co, Cr, Ni, Fe or Cu, and further it is preferable to use a vapor-deposited film of inorganic metal using Si.

Further, as an agent to provide light-shielding property to the light-shielding moisture-proof bag, carbon black is preferably used. In this case, carbon black may be made by any method of furnace type, channel type, acetylene type and thermal type. Examples of usable carbon blacks are: MA-600, #650B, #41, #3150, #3250, #3750, #3950, and MA-100 manufactured by Mitsubishi Kasei Co.; Carbon, VuLCAN, XC-72R, BLAC, Peaels700, and VulCAN•P manufactured by CABOT Co.; Ketchen Black EC manufactured by Lion Aczo Co.; and Asahi HS-500 manufactured by Asahi Carbon Co.

The addition amount of the material by which the light-shielding property is provided is preferably 3 to 15 weight percent with respect to resin. In order to maintain the quality of photosensitive materials during storage, it is preferable that the water-vapor permeability is not more than 8.0g/m^2 under the condition of 24 hours, 40 °C and 90% RH.

From the viewpoint of protecting the photosensitive material 1, card board of which the basis weight is 50 to 700g/m^2 is preferably used for the material to compose the protective sheet 2.

Next, with reference to Figs. 3 to 5, a packaging body for photosensitive materials in which the light-shielding moisture-proof bag is packaged will be explained below. Fig. 3 is a perspective view of the packaging body for photosensitive materials. Fig. 4 is a perspective view showing a condition in which the packaging body for photosensitive materials is opened. Fig. 5 is a development view of the packaging body for photosensitive materials.

The packaging body 10 for photosensitive materials comprises: the light-shielding moisture-proof bag 3 for accommodating an integrated body of a plurality of sheets of photosensitive materials; the packaging member 11 for packaging the light-shielding moisture-proof bag 3. This packaging member 11 is formed into a box-shape capable of being folded. Inside folding sections 11b are provided on both sides of the main body 11a. Further, an attaching section 11c is provided onto one side of the main body 11a, and a cover 11d covering the inside folding sections 11b is provided onto the other side of the main body 11a.

Perforations 11e are formed on the cover 11d. When these perforations 11e are separated, the packaging body is easily developed as illustrated in Fig. 4, so that the light-shielding moisture-proof bag 3 can be taken out of the packaging body. Packaging is executed in the following manner. The light-shielding moisture-proof bag 3 accommodating the integrated body of photosensitive materials is put in the main body 11a of this packaging member 11, and the inside folding sections 11b on both sides of the main body 11a are folded. The cover 11d covers these inside folding sections 11b, and is fixed to the attaching section 11c. In this way, the photosensitive materials are packaged. In this case, the size of the main body 11a is approximately the same as that of the sheets of photosensitive materials, and further the thickness of the main body 11a is approximately the same as that of the sheets of photosensitive materials. Therefore, the light-shielding moisture-proof bag is positively and tightly packaged by the packaging member 11, and the occurrence of scratches can be prevented.

With reference to Fig. 6, another packaging example will be explained as follows. Fig. 6 is a development view of the packaging body for photosensitive materials. In this case, the packaging body 20 for photosensitive materials is constructed in the same manner as that of the above example. However, the end of the attaching section 21c of the packaging body 21 is formed into a cutout shape as shown in Fig. 6, and the end of the cover 21d is formed into a protruding shape. Packaging is executed in the following manner. The light-shielding moisture-proof bag 3 accommodating the integrated body of photosensitive materials is put in the main body 21a of this packaging body 21, and the inside folding sections 21b on both sides of the main body 21a are folded. The attaching section 21c and the cover 21d cover these inside folding sections 21b, and the ends are butted and joined and fixed with a tape. Accordingly, when the tape is peeled off, the packaging body 21 can be easily developed, so that the light-shielding moisture-proof bag 3 can be easily taken out from the packaging body.

With reference to Fig. 7, another example will be explained below. Fig. 7 is a perspective view showing a condition in which the packaging body for photosensitive materials is opened. Although the packaging body 30 for photosensitive materials is constructed in the same manner as that described above, an attaching section 31c and a cover 31d of the packaging body 31 are butted at a position deviated from the center of the packaging body 31, and the butted portion is fixed by an adhesive tape 32. When the light-shielding moisture-proof bag 3 is taken out from the packaging body 31, a perforate portion 31e formed on the cover 31d is separated as illustrated in Fig. 7.

With reference to Figs. 8 and 9, another example of the packaging body will be explained below. Fig. 8 is a perspective view showing a condition in which the packaging body for photosensitive materials is opened. Fig. 9 is a development view of the packaging body for photosensitive materials. Although the packaging body 40 for photosensitive materials is constructed in the same manner as that described above, a perforate portion 41f is continuously formed in the main body 41a, attaching section 41c and cover 41d. When the light-shielding moisture-proof bag 3 is taken out from the packaging body 41, the perforate portion 41f is separated as illustrated in Fig. 8. In this way, the packaging body 41 is divided into 2, so that the light-shielding moisture-proof bag 3 can be easily taken out.

Card board and corrugated board are preferably used for the material of this packaging body. Card board and corrugated board impregnated or coated with resin are also used, and further a laminated resin film, plastic plate and plastic corrugated board may be used.

A folding portion of the packaging body is fixed by an adhesive tape, adhesive agent, hot melt and staples. In order to permit the packaging body to be opened easily, the perforate portion may be backed with a polyester film.

Fig. 10 is a perspective view showing an example of the collective packaging body for photosensitive materials. The collective packaging body 70 for photosensitive materials accommodates a plurality of packaging bodies 71 described above.

The collective packaging body 72 may be provided with partition walls 73 for sorting the packaging bodies 71. This partition walls 73 are provided for the following purposes. When the packaging body 71 is taken out, the remaining packaging bodies 71 are prevented from collapsing. Further, while the packaging bodies 71 are stored in the collective packaging body 72, they are prevented from being curved by the action of the partition walls 73. It is sufficient that the packaging bodies 71 are stably supported by the partition walls 73.

In the case where the collective packaging body 72 is made of corrugated board, it is preferable that a direction of the ridges of the flutes of the corrugated board is set to be vertical as shown in Fig. 10, because the strength of the collective packaging body 72 is enhanced. In the case where the packaging body 71 made of corrugated board is accommodated in the collective packaging body 72, it is preferable that a direction of the ridges of the flutes of the packaging body 71 coincides with that of the collective packaging body 72, because the packaging body 71 can be prevented from curving even when the

collective packaging body 72 is inclined in the process of storage, so that the photosensitive material accommodated in the packaging body 71 can be prevented from curving.

The same material as that of the packaging body 71 may be used for the packaging body 72.

Next, more specific examples of the packaging body for photosensitive materials will be explained together with comparative examples. However, it should be noted that the present invention is not limited to the specific examples.

EXAMPLE 1

A packaging body for photosensitive materials was prepared as follows.

1 Packaging Body

(a) Flat Compressive Strength

The material of the packaging body is as follows.

Both side type corrugated board of C_5B flutes was used, wherein the flat compressive strength was 65Kg/32.25cm^2 (measured according to JIS Z0401), the basis weight was C-class liner 170g/m^2, and the flute was 120g/m^2.

(b) The ratio of the volume of the photosensitive materials including the protective sheet to the content of the light-shielding moisture-proof bag was 1/1.20.

(c) The ratio of the volume of the light-shielding moisture-proof bagly to the content of the packaging body, Y

As shown in Table 1, the ratio was changed in accordance with the samples.

2 Light-shielding moisture-proof bag for accommodating photosensitive materials

The following material was used for a light-shielding moisture-proof bag

Water-vapor permeability 3g/m^2, 40 °C, 90%RH, 24Hrs

Material: A black polyethylene sheet obtained by co-extruding the following three layers; a 42μ thick surface layer consisting of a high density polyethylene (HDPE) having a melt-flow rate of 0.03g/10 minutes, a density of 0.942g/cm^3 and a Vicat softening point of 119 °C, and containing carbon black in an amount of 11% by weight, a 70μ thick intermediate layer consisting of 30% by weight of a linear, low density polyethylene (LLDPE) having a melt-flow rate of 1.30g/10 minutes, a density of 0.915g/cm^3 and a Vicat softening point of 96.0 °C, 50% by weight of a high density polyethylene (HDPE) having a melt-flow rate of 0.03g/10 minutes, a density of 0.942g/cm^3 and a Vicat softening point of 119 °C and 20% by weight of carbon black, and a 28μ thick lower layer consisting of 40% by weight of a linear, low density polyethylene (LLDPE) having a melt-flow rate of 3.30g/10 minutes, a density of 0.907g/cm^3 and a Vicat softening point of 81.0 °C, 45% by weight of a low density polyethylene (LDPE) having a melt-flow rate of 0.3g/10 minutes, a density of 0.920g/cm^3, 9% by weight of kieselguhr and 4% by weight of an antistatic agent.

The melt-flow rate is measured according to JIS (Japan Industrial Standard) K7210 and the density is measured according to JIS K7112.

The lower layer has a heat sealing property and forms the inside of the bag.

The percentage of voids of the stacked photosensitive materials accommodated in this light-shielding moisture-proof bag is shown in Table 1. The percentage of voids is computed by the following Expression 1.

Expression 1

$$\text{Percentage of voids (\%)} = \frac{T-nt}{nt} \times 100$$

where T is a thickness of the stacked photosensitive materials, t is a theoretical thickness of one sheet of the stacked photosensitive materials, and n is the number of the sheets of the stacked photosensitive materials.

The percentage of voids was measured by the following means.

(a) The stacked photosensitive materials were accommodated in the light-shielding moisture-proof bag, wherein the thickness of the bag material had been previously measured. The bag was sealed changing the vacuum condition by a vacuum sealing machine. The overall thickness of the sealed bag was measured with a micron-micrometer from the outside of the bag, and the thickness of the bag material was subtracted from the total, so that the thickness of the stacked photosensitive materials was computed.

(b) Next, the thickness of a sheet of photosensitive material randomly taken out from the bag was measured by the micron-micrometer, so that the theoretical thickness was computed.

(c) According to the foregoing, the percentage of voids of the stacked photosensitive materials can be controlled by the degree of vacuum.

(d) The percentage of voids of the stacked photosensitive materials can be controlled not only by the degree of vacuum but also by changing a pushing force applied to the upper surface of the stacked photosensitive materials by a rubber roller or a metallic roller.

Micron-micrometer: accuracy 0.001mm type OMM-25 manufactured by Mitsutoyo Co., Ltd.

Vacuum sealing machine: Kashiwagi type sealing machine manufactured by Nippon Porisero Kogyo Co., Ltd.

Vacuum meter: digital manometer DM-1 manufactured by Shibata Co., Ltd.

Concerning the photosensitive material, 100 sheets of 14 × 17 inches orthochromatic type X ray film (manufactured by Konica Co., Ltd.) were accommodated in each light-shielding moisture-proof bag.

The packaging body comprising photosensitive materials shown in Table 1 was prepared from the packaging body of 1 above and the light-shielding moisture-proof bag of 2 above.

3 Collective Packaging Body

Each sample is a collective packaging body in which 5 packaging bodies described above are collectively packaged. Two side corrugated board was used for making the collective packaging body, and the detail of the corrugated board is described as follows. Flat compressive strength was 90kg/32.25cm^2. The two side corrugated board was of K_6B flute type. The basis weight was K liner 210g/m^2. The flute is 160g/m^2.

The collective packaging body was made in accordance with the direction of the ridges of the flutes of the corrugated board shown in Fig. 10, and the direction of the ridges of the flutes of the packaging body of item (1) was the same.

These collective packaging bodies were tested by a vibration testing machine.

Condition of Vibration Test

Type of the testing machine:	IS type vibration testing machine of type UBC-4
Amplitude:	4 mm
Frequency:	600 c.p.m.
Time:	4 hours

After the test, the photosensitive material was subjected to development, and then was evaluated for the occurrence of scratches on the surface of the photosensitive material.

These collective packaging bodies were left for 72 hours in the atmosphere of 50 °C, and then were observed whether or not the film sheets adhered to each other.

The results are shown on Table 1.

Table 1

Sample No.	Percentage of voids	Ratio of the volume of a light-shielding moisture-proof bag to the content of a packaging member	Occurrence of scratches	Occurrence of adhesion
1-1	0.01	1/1.04	O	X
1-2	0.01	1/1.07	O	X
1-3	0.01	1/1.33	O	X
1-4	0.01	1/1.56	O	X
1-5	0.01	1/1.75	△	X
1-6	0.02	1/1.04	O	△
1-7	0.02	1/1.07	O	△
1-8	0.02	1/1.33	O	△
1-9	0.02	1/1.56	O	△
1-10	0.02	1/1.75	△	△
1-11	0.10	1/1.04	O	O
1-12	0.10	1/1.07	O	O
1-13	0.10	1/1.33	O	O
1-14	0.10	1/1.56	O	O
1-15	0.10	1/1.75	△	O
1-16	0.50	1/1.04	O	O
1-17	0.50	1/1.07	O	O
1-18	0.50	1/1.33	O	O
1-19	0.50	1/1.56	O	O
1-20	0.50	1/1.75	△	O
1-21	2.00	1/1.04	O	O
1-22	2.00	1/1.07	O	O
1-23	2.00	1/1.33	△	O
1-24	2.00	1/1.56	△	O
1-25	2.00	1/1.75	X	O
1-26	2.50	1/1.04	X	O
1-27	2.50	1/1.07	X	O
1-28	2.50	1/1.33	X	O
1-29	2.50	1/1.56	X	O
1-30	2.50	1/1.75	X	O

[Evaluation of scratches]

O Number of scratches Less than 0.10/100cm^2
△ Number of scratches 0.10/100cm^2 to less than 0.3/100cm^2
X Number of scratches Not less than 0.3/100cm^2

[Evaluation of adhesion]

O No occurrence of adhesion
△ Area in which adhesion has occurred is smaller than 5% of the overall area of the film
X Area in which adhesion has occurred is not less than 5% of the overall area of the film

Instead of corrugated board, plastic corrugated board was used for the material of the packaging body, and the same samples were made and subjected to the same vibration test. The same result was provided by the test.

EXAMPLE 2

A protective sheet for the photographic materials was used, the basis weight of which was 400g/m^2. The ratio of the volume of the stacked photographic materials including the protective sheet to the content of a light-shielding moisture-proof bag accommodating the stacked photographic materials, was changed as shown in Table 2, and other points were the same as those of Example 1. Under the above condition, the samples 2-1 to 2-7 were prepared.

The percentage of voids of the stacked photosensitive materials was 0.5%, and the ratio of the volume of the light-shielding moisture-proof bag to the content of the packaging body was set at 1/1.50.

In the case, the content of the light-shielding moisture-proof bag is defined as the sum of the volume of the photosensitive materials including the protective sheet accommodated in the light-shielding moisture-proof bag, and the volume of empty space in the light-shielding moisture-proof bag.

The content of the light-shielding moisture-proof bag can be controlled as follows"
After the stacked photosensitive materials including the protective sheet have been accommodated in the light-shielding moisture-proof bag, the bag is sealed with a vacuum sealing machine. At this time, the degree of vacuum is changed so as to control the content of the light-shielding moisture-proof bag.

Alternatively, as illustrated in Fig. 2, when the length of the folded portion of the end of the light-shielding moisture-proof bag is changed, the content can be controlled.

In the same manner as Example 1, the samples 2-1 to 2-7 were subjected to a vibration test. Then the photosensitive material sheet coming into contact with the protective sheet was subjected to development and evaluated for the occurrence of scratches.

The results are shown in Table 2.

Table 2

Sample No.	Ratio of the volume of the photosensitive material stacked including the protective sheet to the content of the light-shielding moisture-proof bag	Occurrence of scratches caused on the photosensitive material by the protective sheet
2-1	1/1.02	O
2-2	1/1.10	O
2-3	1/1.20	O
2-4	1/1.30	O
2-5	1/1.40	O
2-6	1/1.50	△
2-7	1/1.60	X

O Number of scratches Less than 0.10/100cm^2
△ Number of scratches 0.10/100cm^2 to less than 0.3/100cm^2
X Number of scratches Not less than 0.3/100cm^2

EXAMPLE 3

The flat compressive strength of the material used for the packaging body was changed to the values shown in Table 3, and other conditions were the same as those of Example 1. In this way, the samples 3-1

to 3-5 were made.

The percentage of voids of the stacked photosensitive materials was 0.5%; the ratio of the volume of the light-shielding moisture-proof bag to the content of the packaging body was 1/1.50; and the ratio of the volume of the piled photosensitive materials including the protective sheet to the content of the light-shielding moisture-proof bag was 1/1.20.

Ten packages of each of samples 3-1 to 3-5 were stacked and left for 2 months. Thereafter, the photosensitive materials were subjected to development. The developed photosensitive material positioned on the top in the bottom package was evaluated for occurrence of pressure. The results are shown in Table 3.

Table 3

Sample No.	Flat compressive strength kg/32.25cm^2	Occurrence of pressure
3-1	10	X
3-2	20	O
3-3	50	O
3-4	90	O
3-5	200	O

[Evaluation of pressure]

X Pressure occurred, and black density was 0.03.
O Pressure was not occurred.

The density was measured with Densitometer PDA65 (produced by Konica Corporation).

EXAMPLE 4

The packaging body as illustrated in Fig. 8 was prepared employing the materials used in EXAMPLE 1.

Table 4 shows the percentage of voids of the stacked photosensitive materials and the ratio of the volume of the light-shielding moisture-proof bag to the content of the packaging body.

Table 4

Sample No.	Percentage of void	Ratio of the volume of the light-shielding moisture-proof bag to the content of the packaging member
4-1	0.4	1/1.04
4-2	0.6	1/1.04
4-3	1.0	1/1.04
4-4	0.4	1/1.07
4-5	0.6	1/1.07
4-6	1.0	1/1.07

After the packaging had been opened, the light-shielding moisture-proof bag was pulled out and the photosensitive materials were subjected to development. Then the occurrence of scratches was visually judged. The results are shown on Table 5.

Table 5

Sample No.	Occurrence of scratches
4-1	O
4-2	O
4-3	O
4-4	O
4-5	O
4-6	O

O Number of scratches Less than 0.10/100cm^2
△ Number of scratches 0.10/100cm^2 to less than 0.3/100cm^2
X Number of scratches Not less than 0.3/100cm^2

Next, it was confirmed that the number of scratches on the films in the packaging bodies as illustrated in Figs. 4 and 8 was not more than 0.1/100cm^2. Then the packaging was opened and the light-shielding moisture-proof bag provided in the packaging body was pulled out. The photosensitive materials were subjected to development, and evaluated for the occurrence of scratches. The results are shown in Table 6.

Table 6

Sample No.	Occurrence of scratches in the packaging condition shown in Fig. 8	Occurrence of scratches in the packaging condition shown in Fig. 4
4-1	X	O
4-2	△	O
4-3	O - △	O
4-4	△	O
4-5	O	O
4-6	O	O

[Evaluation of scratches]

O No scratches
△ 2 to 3 scratches/14×17 inches film
X No less than 4 scratches/14×17 inches film

As a result, the following can be concluded: When a comparison is made between the packaging condition shown in Fig. 4 and that shown in Fig. 8, no scratches were recognized in the packaging condition shown in Fig. 4 when the light-shielding moisture-proof bag was pulled out from the packaging body.

Claims

1. A packaging body comprising a packaging member, a light-shielding moisture-proof bag and a plurality of photosensitive materials, the photosensitive materials being in sheet form and stacked in one body, the light-shielding moisture-proof bag packaging the stacked photosensitive materials and the packaging body packaging the light-shielding moisture-proof bag, wherein the following inequalities are satisfied;

$P > 0.62$

$1/1.50 \leqq \ell/L < 1/1.00$

$1/1.67 \leqq y/Y < 1/1.00$

$0.02 \leqq X \leqq 2.0$

wherein P is the flat compressive strength (Kg/cm^2) of a material of which the packaging member is made, ℓ is the volume of the stacked photosensitive materials, L is the content of the light-shielding moisture-proof bag, y is the volume of the light-shielding moisture-proof bag, Y is the content of the packaging member and X is the percentage of voids of the stacked photosensitive materials represented by the following expression,

$$X = (T - nt) \times 100 / nt$$

wherein T is a thickness of the stacked photosensitive materials, t is a theoretical thickness of one sheet of the stacked photosensitive materials, and n is the number of the sheets of the stacked photosensitive materials.

2. The packaging body of claim 1, wherein the light-shielding moisture-proof bag is comprised of polyethylene or an ethylene copolymer comprising carbon black in an amount of 3 to 15% by weight.

3. The packaging body of claim 2, wherein the polyethylene or ethylene copolymer is laminated.

4. The packaging body of claim 1, wherein the packaging body is contained in a box together with another packaging body.

FIG. 1

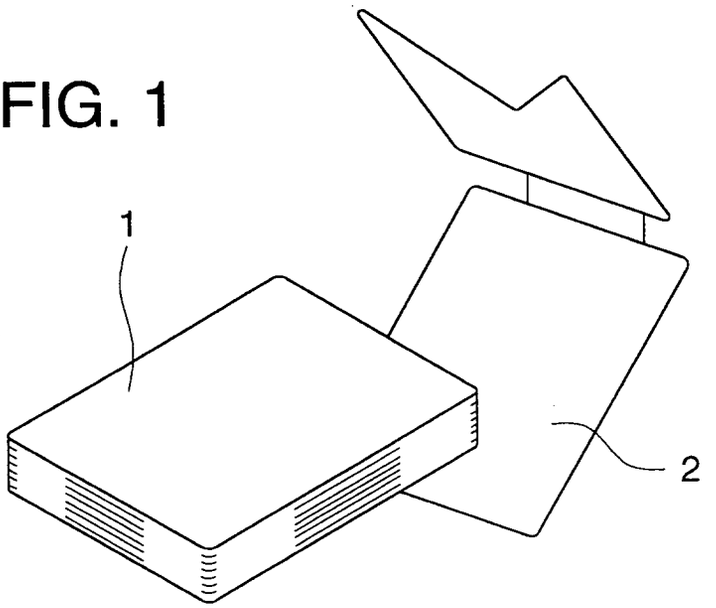


FIG. 2

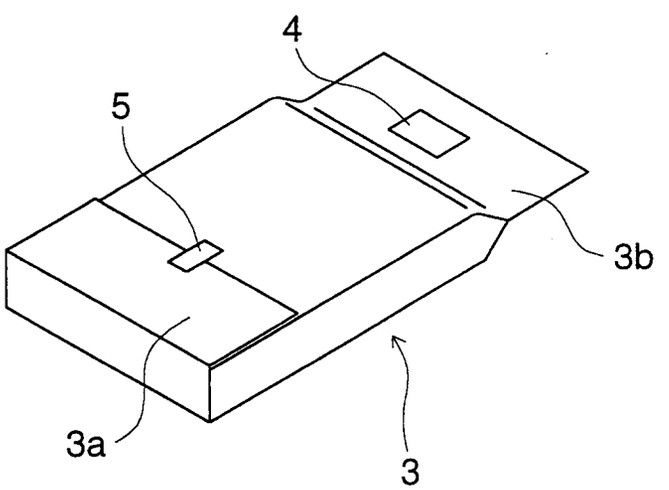


FIG. 3

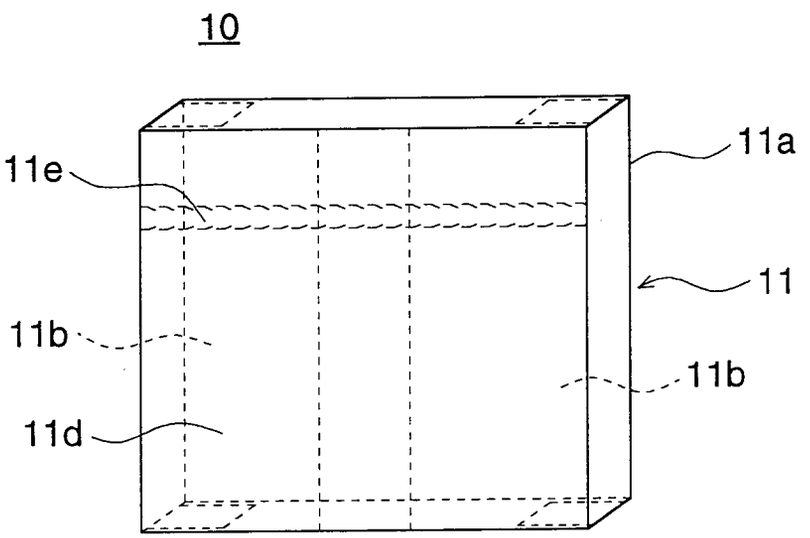


FIG. 4

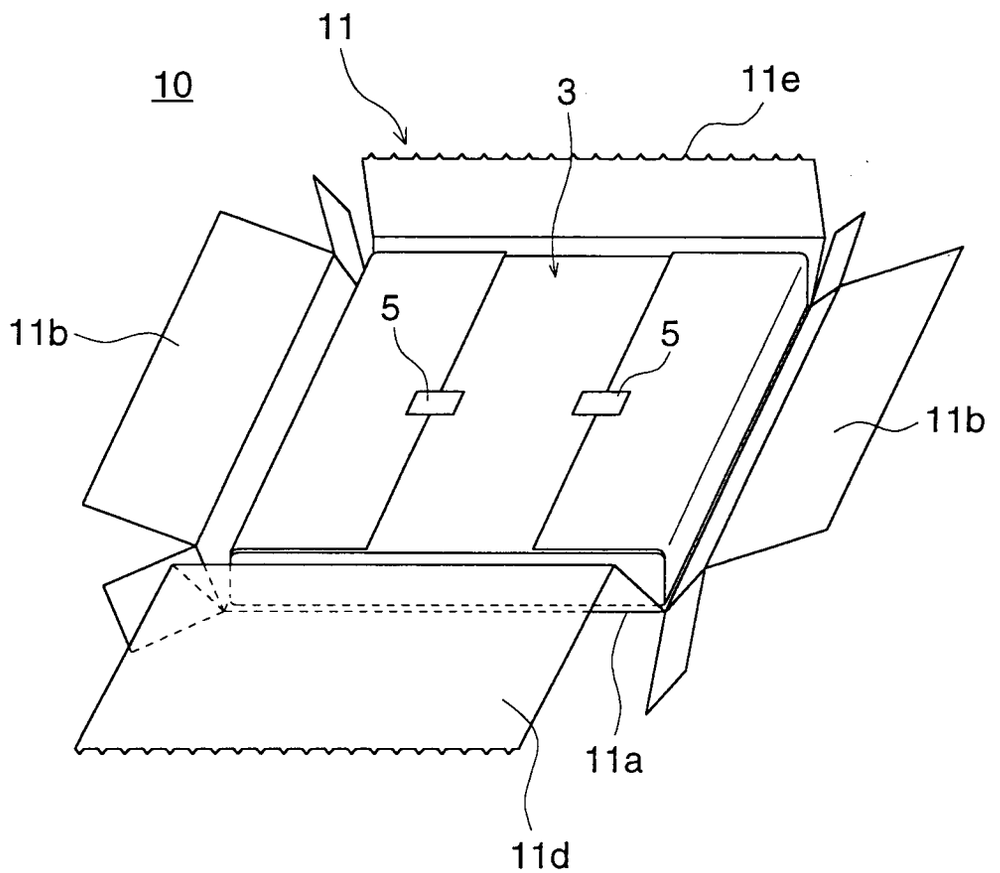


FIG. 5

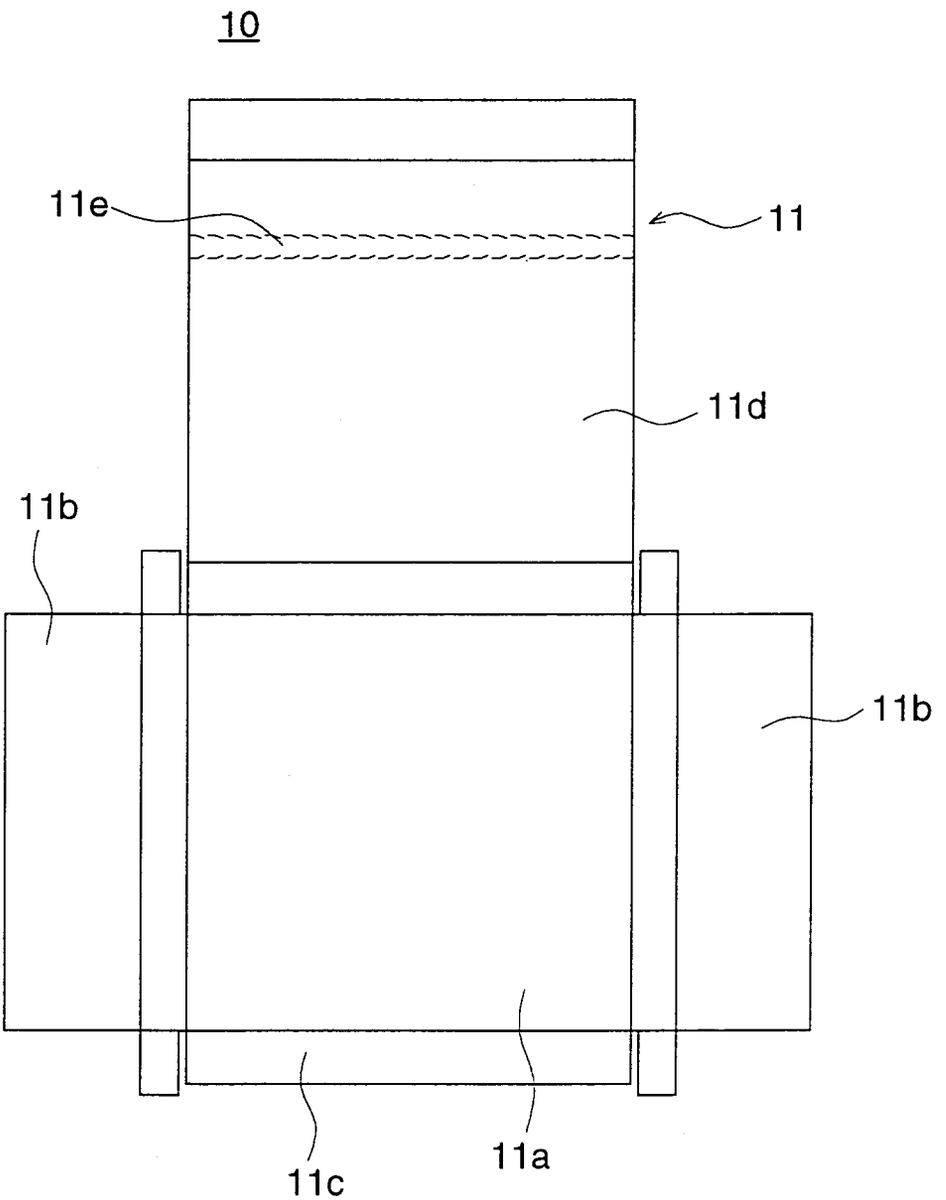


FIG. 6

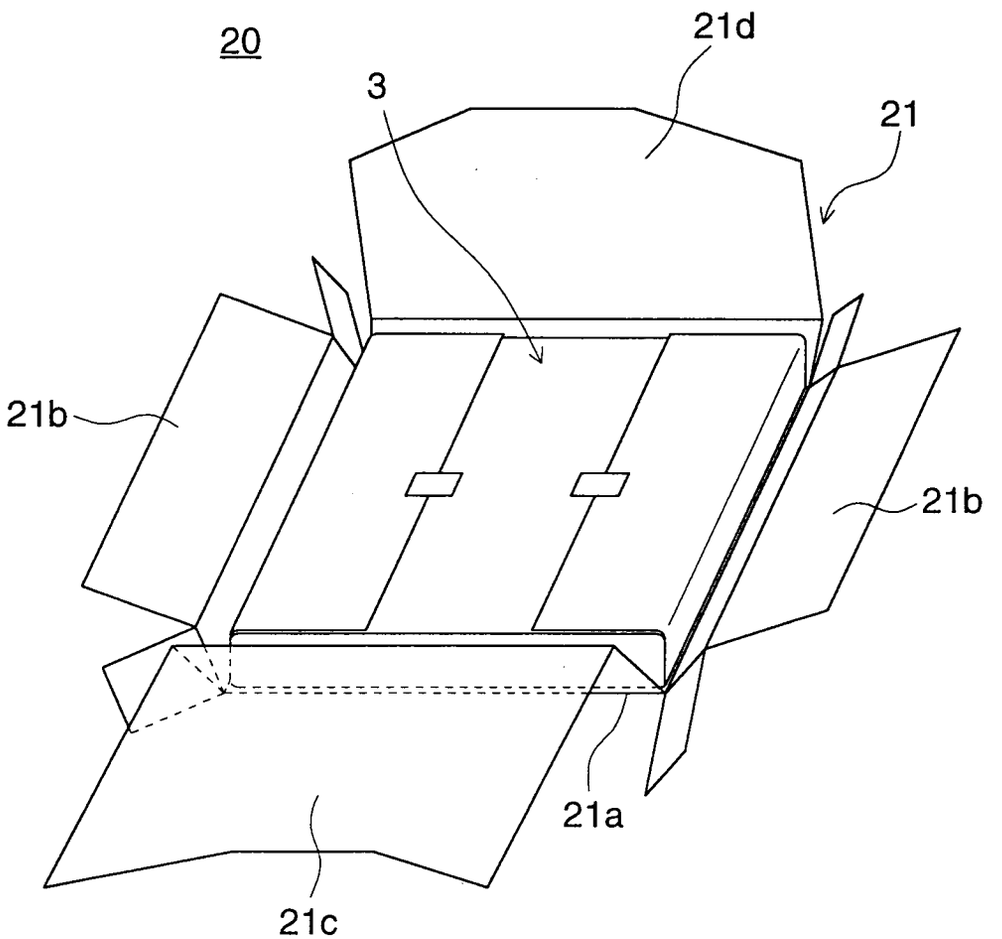


FIG. 7

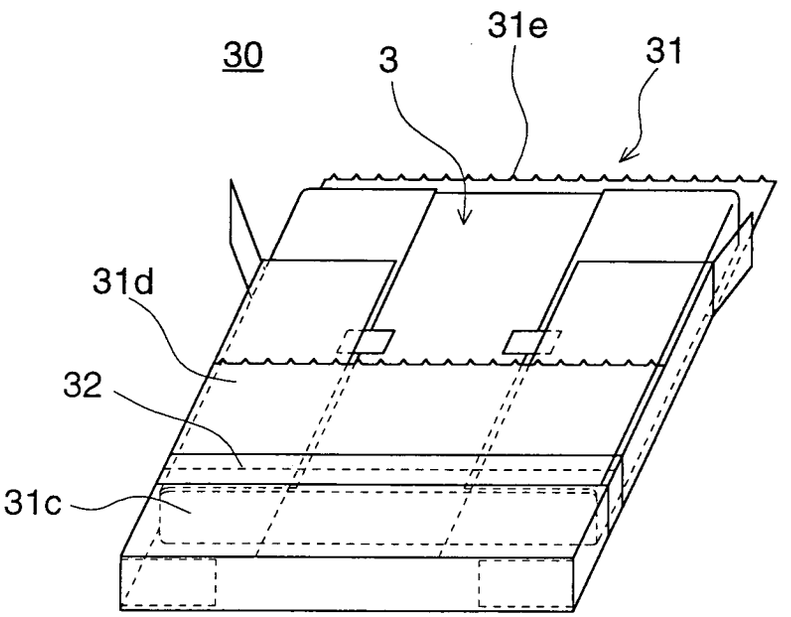


FIG. 8

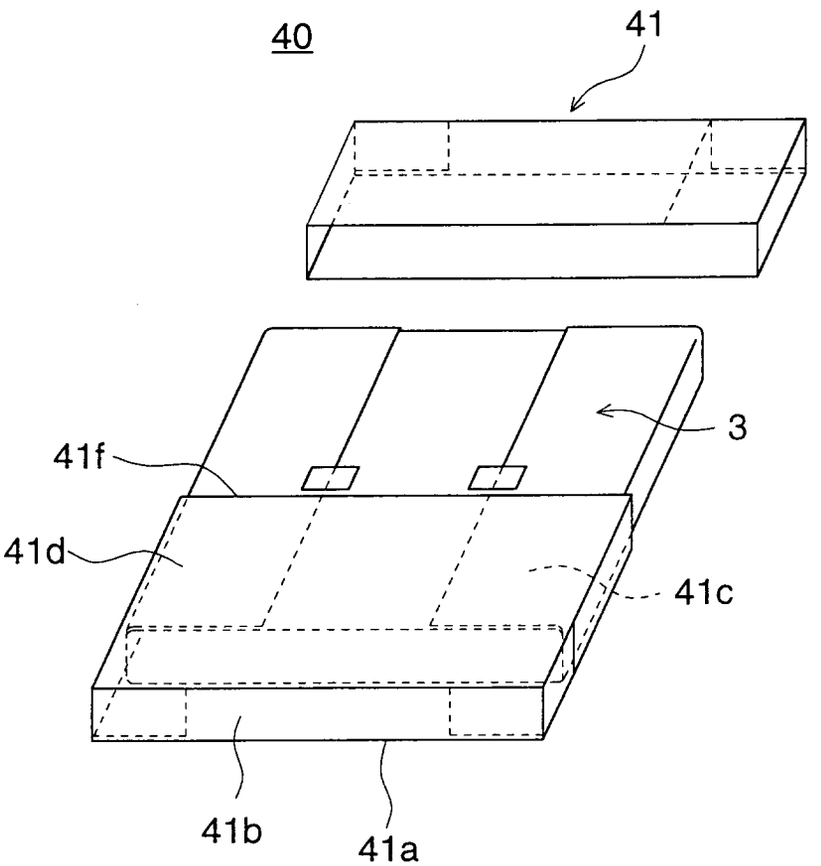


FIG. 9

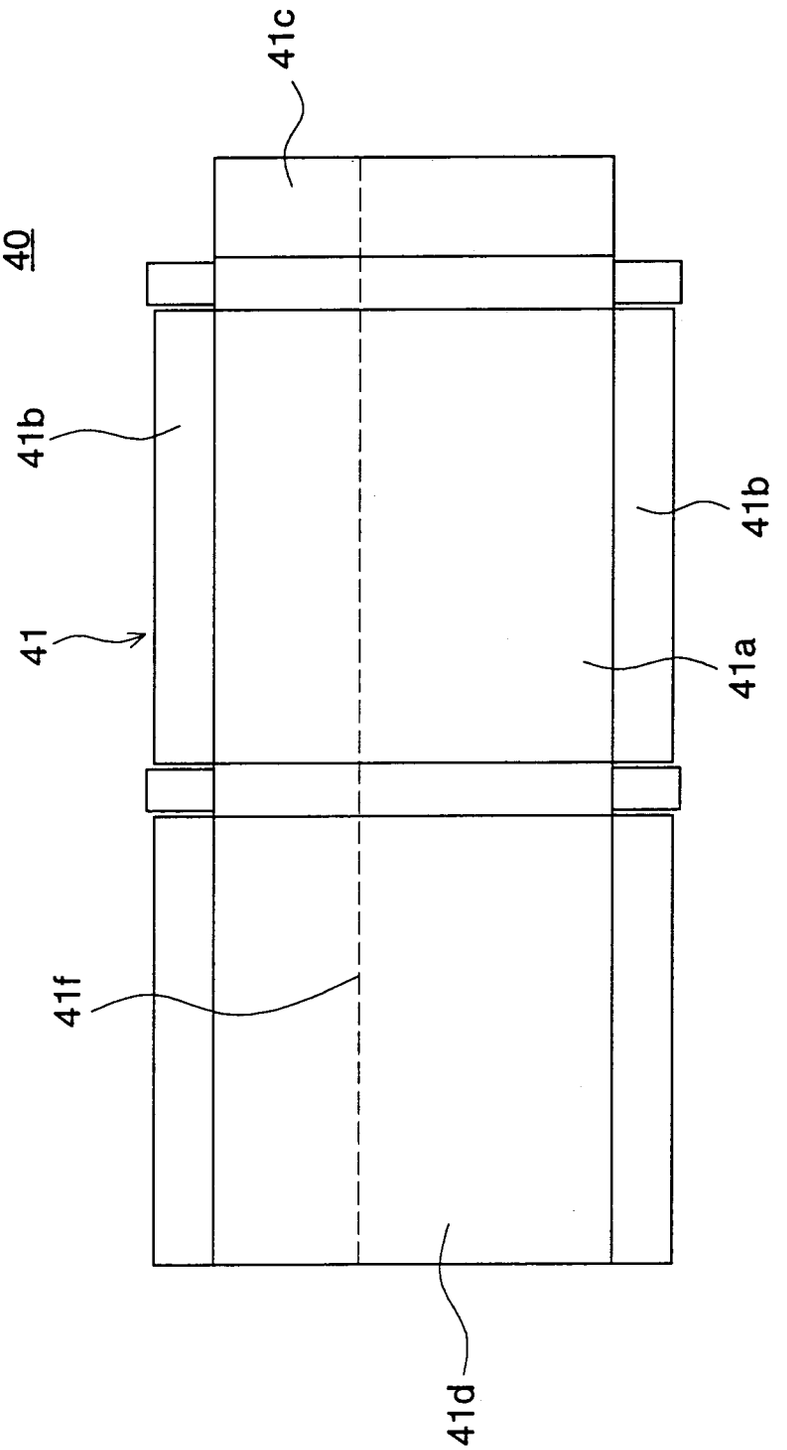
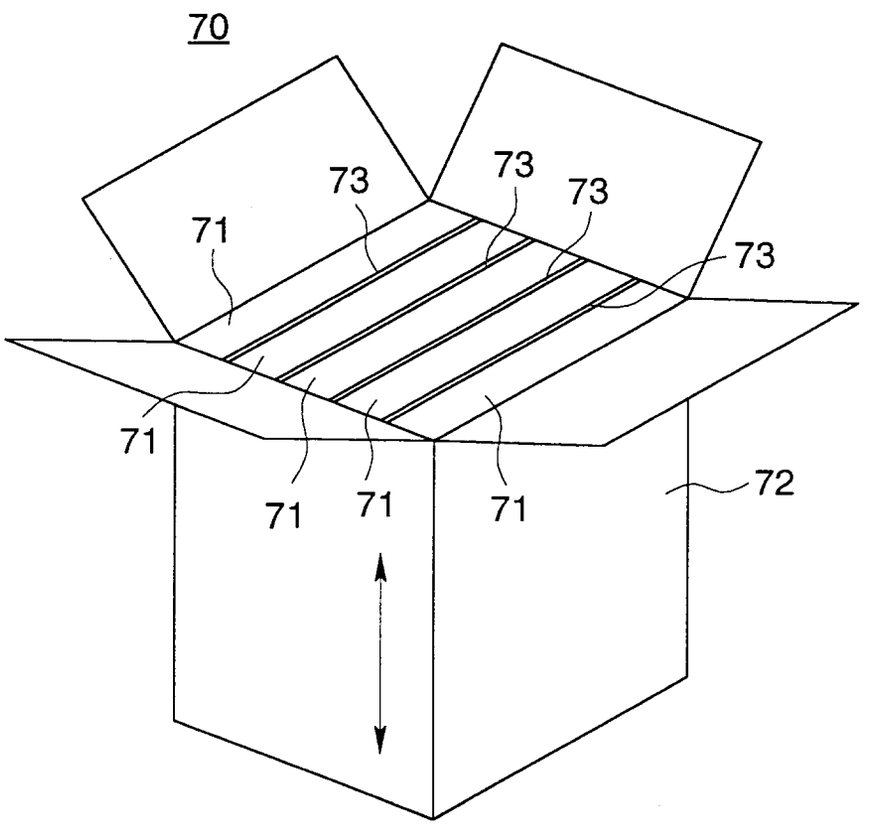


FIG. 10



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 94115249.8

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
A	US - A - 4 780 357 (AKAD) * Abstract; column 9, lines 34-63; table 4 * --	1-3	G 03 C 3/00
A	EP - A - 0 384 472 (FUJI PHOTO FILM CO., LTD.) * Claims; table 3 * --	1-3	
A	DE - A - 3 821 746 (AGFA-GEVAERT AG) * Abstract * ----	1,4	

TECHNICAL FIELDS SEARCHED (Int. Cl. 6)

G 03 C
B 65 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	01-12-1994	SCHÄFER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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