PACKAGING STRUCTURE FOR PLANOGRAPHIC PRINTING PLATES AND METHOD OF PACKAGING THE SAME

In a method of packaging planographic printing plates disclosed herein, a stack is formed by planographic printing plates and interleaf sheets, or by only planographic printing plates. The stack is packaged with internal packaging paper without using conventional protective cardboard. In a packaging structure for planographic printing plates, the stack is loaded on a loading member and a top plate is placed on the stack. The stack and the loading member are integrally bound with a fixing band made of resin without using a conventional bolt-fastening operation. A reinforcing plate is fixed onto the top plate correspondingly to the fixing band so as to prevent bending or deformation of the top plate.
FIG. 15
PRIOR ART

[Diagram of a prior art structure with labeled parts 410, 412, 414, 416, 418, 420, 422]
PACKAGING STRUCTURE FOR PLANOGRAPHIC PRINTING PLATES AND METHOD OF PACKAGING THE SAME

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a packaging structure for planographic printing plates, and a method of packaging planographic printing plates for forming the packaging structure for planographic printing plates.

[0003] 2. Description of the Related Art

[0004] In recent years, planographic printing plates such as photosensitive printing plates, thermosensitive printing plates and PS plates have been widely used in plate-making methods including electrophotographic plate-making methods, so as to facilitate automation of plate-making processes. The planographic printing plates are generally produced by performing surface treatment, for example, graining, anti-oxidation, silicate treatment or other chemical conversion treatment solely or in combination on a support which is typically a sheet-shaped or a coil-shaped aluminum plate, and subsequently, applying a photosensitive layer or a thermosensitive layer onto the support and drying the layer, and thereafter, cutting the support with the layer applied thereon into a desired size. Hereinafter, the photosensitive layer and the thermosensitive layer will be collectively referred to as “coating films”, and a surface of the support with a coating film formed thereon is referred to as an “image forming surface”. The force is absorbed by the protective cardboard, thereby preventing the planographic printing plates from being deformed or flawed.

[0007] Accordingly, in order to protect the planographic printing plate, a piece of protective cardboard is disposed parallel to the planographic printing plate in many cases. Particularly, in a case in which a plurality of planographic printing plates are stacked to form a stacked sheaf, pieces of protective cardboard may be placed at every predetermined number of planographic printing plates so that the planographic printing plates can be reliably protected. The planographic printing plates with pieces of protective cardboard placed as described above are packaged in a packaging material such as internally packaging paper, and are then handled during transportation or keeping. When pieces of protective cardboard are thus placed, the planographic printing plates are not likely to be deformed or deflect, for example, at the time of handling. As a result, damage to the planographic printing plates is prevented. Further, even if external force acts on planographic printing plates, part of

[0008] When planographic printing plates are used, in many cases, a packaging material is opened, and thereafter, pieces of protective cardboard are removed and only a stacked sheaf of planographic printing plates can be taken out from the packaging material.

[0009] However, an operation of removing protective cardboard requires time and labor. Moreover, the protective cardboard may be fixed to the stacked sheaf by an adhesive tape or the like. In this case, the operation of removing protective cardboard requires much more time and labor.

[0010] Further, the removed protective cardboard becomes unnecessary because it does not any longer need to serve to protect planographic printing plates. A great deal of cost may be required for the disposal of spent protective cardboard. For example, when the protective cardboard is comprised of only paper which can be recovered as waste paper, it can be recovered. However, the recovery of waste paper generally requires expert skill and costs. Further, when the protective cardboard is formed so as to partially include, for example, resin material, it cannot be recovered as waste paper. In this case, much more costs are required for the disposal of the protective cardboard. In either case, it is necessary for a user of planographic printing plates to temporarily store disused protective cardboard. Therefore, costs are also required for storing the protective cardboard and a storage place thereof needs to be secured.

[0011] In addition, costs are also required for manufacturing the protective cardboard, and consequently are reflected in a packaging structure for planographic printing plates, or planographic printing plates themselves.

[0012] Next, the planographic printing plate is subjected to plate making processings including exposure, development, gum coating and the like. Subsequently, the planographic printing plate is set in a printing machine and ink is applied onto the planographic printing plate. As a result, characters, images or the like are printed on a paper surface.

[0013] In a case of handling such planographic printing plates, in order to perform transportation or storage at a low cost with a reduced number of times of handling, a large volume of planographic printing plates is stacked in a thickness direction to form a stacked sheaf of planographic printing plates, and the stacked sheaf may be placed and packaged on a loading member such as a pallet.


[0015] In a packaging structure 310 disclosed therein, an end plate 314 is disposed at each of both end surfaces of a stacked sheaf of planographic printing plates 312. The end plates 314 are fastened to each other by bolts 316.

[0016] However, the operation of fastening the end plates 314 by the bolts 316 is generally complicated. Further, there is no device for automatically performing the fastening operation, and therefore, much time and labor is required for the packaging. Moreover, the bolts 316 need to be removed
one by one at the time of unpacking, and efficiency of the unpacking operation is also deteriorated.

[0017] Further, fastening force from the bolts 316 locally acts on the end plates 314. Therefore, it is necessary to maintain the thickness of the end plate 314 so as to prevent depression or bending of the end plate 314, thereby resulting in a weight increase of the plate.

[0018] The aforementioned JP-A No. 3-73946 also proposes a packaging structure 410 shown in FIG. 15.

[0019] In the packaging structure 410 as well, a stack 418 comprised of a desired number of planographic printing plates 416 is made to lean against an end plate 414 which is formed upright in a slanting manner to a bottom plate 412. Thereafter, another end plate 420 is applied to a front side of the stack 418, and subsequently, the end plate 414 and the end plate 420 are fastened to each other by bolts 422 so that the stack 418 is fixed.

[0020] The end plates are thus fastened by the bolts 422, and therefore, in the same manner as in the packaging structure 310 shown in FIG. 14, efficiency of a packaging or unpacking operation was deteriorated. In addition, if the thickness of the end plate is maintained to prevent depression or deformation of the end plate, an increase in weight may be caused.

SUMMARY OF THE INVENTION

[0021] In view of the aforementioned circumstances, it is an object of the present invention to provide a packaging structure for planographic printing plates in which, when used, planographic printing plates in a packaged state can be taken out with no time or labor required and planographic printing plates can be packaged at a low cost, and also provide a packaging method of planographic printing plates, by which the packaging structure for planographic printing plates is formed.

[0022] Further, it is another object of the present invention to provide a packaging structure for planographic printing plates in which efficiency of a packaging or unpacking operation is improved and deformation of an end plate can be prevented with no increase in weight.

[0023] A first aspect of the present invention is a packaging structure for planographic printing plates in which planographic printing plates are packaged. The packaging structure for planographic printing plates comprises: a stack in which only a plurality of planographic printing plates, or a plurality of planographic printing plates and a plurality of interleaf sheets each protecting a coating film of the planographic printing plate are stacked in a thickness direction; and a packaging material for packaging the stack.

[0024] The “plurality of planographic printing plates and interleaf sheets” mentioned herein involves a case in which a stack is formed with a plurality of planographic printing plates and interleaf sheets being stacked. Accordingly, for example, a stack in which an interleaf sheet is disposed at every predetermined number of stacked planographic printing plates, or a stack in which an interleaf sheet is disposed so as to correspond to a coating film which is positioned at an end surface of the stack of planographic printing plates in the stacking direction is also involved. Be sure that, in a case of so-called dead plates, the surface of the planographic printing plates, which is positioned on the end surface of the stack in the stacking direction, also involves a surface which acts as an image forming surface regardless of the presence of a coating film.

[0025] As described above, the plurality of planographic printing plates is stacked so as to form a stack, and they can be transported or stored collectively. As a result, efficient handling becomes possible. Further, the stack is packaged with the packaging material, and therefore, damage, deformation or deterioration thereof is prevented.

[0026] Further, in this packaging structure for planographic printing plates, the stack of planographic printing plates is formed by only planographic printing plates, or planographic printing plates and interleaf sheets. The stack is directly packaged with the packaging material. In this structure, no protective cardboard is used unlike a conventional structure. Therefore, when planographic printing plates are taken out from the packaging structure for planographic printing plate and used, it is not necessary to remove protective cardboard. Accordingly, the planographic printing plates can be brought into use with no time or labor required. Further, a space in which used pieces of protective cardboard are stored is not required, and costs for the storage are reduced. Moreover, costs or labor for the disposal of used protective cardboard are reduced.

[0027] Even when the packaging structure for planographic printing plates is formed by packaging planographic printing plates, it is not necessary to provide pieces of protective cardboard. Therefore, the time or labor required for the packaging can be reduced, and costs for production of the protective cardboard are decreased. Accordingly, the planographic printing plates can be packaged at a low cost.

[0028] In the structure of the first aspect, the packaging material is not particularly limited. Further, the packaging material can comprise an internal packaging material for internally packaging the stack and an external packaging material for externally packaging the stack packaged with the internal packaging material in the same manner as in the structure according to the first aspect of the present invention. When the packaging material is thus formed by the internal packaging material and the external packaging material, materials having different protective abilities can be employed. Therefore, the planographic printing plates can be more reliably protected and packaged.

[0029] The external packaging material in the structure of the first aspect is usually made into a box made of corrugated fiberboard. In this structure, it is possible to set the shape or strength of the corrugated fiberboard box so that the box may absorb energy of external force in consideration of a case in which external force acts on the stack of planographic printing plates. Therefore, the planographic printing plates can be more reliably protected. Further, due to the external packaging material being made into the corrugated fiberboard box, reuse or recycle, and disposal thereof is facilitated.

[0030] In the present invention, usually, one of the aforementioned structures further comprises a loading member on which at least one packaged stack in the state of being packaged with the packaging material is loaded.

[0031] A plurality of stacks can be handled collectively in the state of being loaded on the loading member. Therefore,
the handling becomes further facilitated. Further, the planographic printing plates can be more reliably protected.

[0032] In the present invention, usually, one of the aforementioned structures further comprises a marker member which is disposed at every predetermined number of planographic printing plates constituting the stack.

[0033] In other words, the marker member allows an operator to take out the predetermined number of planographic printing plates, and handling of planographic printing plates becomes easy. The marker member may be a plate-shaped member different from an interleaf sheet, for example, a member of which thickness is larger than the interleaf sheet, or may be an interleaf sheet which may be deformed or colored so as not to affect properties or operating conditions of planographic printing plates.

[0034] In the present invention, in either of the aforementioned structures, the number of planographic printing plates which constitute the stack is not limited. However, it is preferably set in the range of 10 to 200. If the number of planographic printing plates is 10 or more, handling efficiency can be improved. Further, if it is 200 or less, the weight of the stack is limited. Therefore, an operating load at the time of handling is reduced.

[0035] A second aspect of the present invention is a method of packaging planographic printing plates in which any one of the aforementioned packaging structures for planographic printing plates is formed. This packaging method comprises the steps of: stacking a plurality of planographic printing plates to form a stack; and packaging the stack formed by the stacking step with the packaging material.

[0036] Any one of the aforementioned packaging structures can be obtained by only forming a stack with a plurality of planographic printing plates being stacked in a stacking process and packaging the stack in the packaging process.

[0037] Further, no protective cardboard is provided in either case. Therefore, the protective cardboard is not required and the time or labor required for forming the packaging structure for planographic printing plates is reduced. As a result, the packaging structure for planographic printing plates can be formed at a low cost.

[0038] A third aspect of the present invention is a packaging structure for planographic printing plates which comprises: a planographic-printing-plate loading member on which a stack formed by stacking a plurality of planographic printing plates in a thickness direction can be loaded; an end plate which is disposed in contact with the stack at a side opposite to the planographic-printing-plate loading member; a binding member for binding the planographic-printing-plate loading member, the stack and the end plate in the state of being wound thereon; and a reinforcing member mounted on the end plate so as to be positioned between the end plate and the binding member, the reinforcing member being provided so as to alleviate pressure from the binding member and make the pressure to act on the end plate.

[0039] The stack of planographic printing plates in the state of being loaded on the planographic-printing-plate loading member has an end plate which is disposed at the side opposite to the loading member. The loading member, stack and end plate are bound with the binding member, thereby forming the packaging structure for planographic printing plates. As a result, a plurality of planographic printing plates can be handled collectively.

[0040] Since the planographic-printing-plate loading member, stack and end plate are bound with the binding member, packaging efficiency improves compared with a conventional bolt-fastening method or the like. It is also possible to perform the binding using a common binding device. Further, an unpacking operation is facilitated by cutting and removing the binding member.

[0041] A reinforcing member is mounted on the end plate so as to be positioned between the end plate and the binding member, and pressure from the binding member is alleviated and acts on the end plate. Accordingly, the end plate is prevented from being recessed or bent due to binding force from the binding member. It is not necessary that the end plate may maintain a thickness. Therefore, the end plate can be made light in weight by being made smaller in thickness.

[0042] In the structure of the third aspect, usually, the reinforcing member has a rigidity higher than the end plate.

[0043] Accordingly, deformation of the end plate can be further effectively prevented.

[0044] A specific structure in which the rigidity of the reinforcing member is higher than that of the end plate is not limited. For example, the reinforcing member may be constituted from a material having a hardness higher than the end plate. Further, even when it is constituted from the same material as the end plate, a portion in which the reinforcing member is formed increases in thickness compared with a portion with only the end plate formed therein. As a result, the rigidity increases.

[0045] In the structure of the third aspect, more usually, the reinforcing member is formed so as to extend along the binding member continuously from one end of the end plate to the other end.

[0046] As a result, the total rigidity of the end plate and the reinforcing member further increases. Accordingly, bending of the end plate can be further reliably prevented.

BRIEF DESCRIPTION OF THE DRAWINGS

[0047] FIGS. 1A and 1B are perspective views showing processes for forming a packaging structure for planographic printing plates according to a first embodiment of the present invention.

[0048] FIG. 2 is a perspective view showing the packaging structure for planographic printing plates according to the first embodiment of the present invention.

[0049] FIG. 3 is a perspective view showing a packaging structure for planographic printing plates according to a second embodiment of the present invention.

[0050] FIG. 4 is a development view showing a packaging box for planographic printing plates, which forms the packaging structure for planographic printing plates according to the second embodiment of the present invention.

[0051] FIG. 5 is a perspective view showing a packaging structure for planographic printing plates according to a third embodiment of the present invention.
FIG. 6 is a perspective view showing a process of forming a packaging structure for planographic printing plates according to a fourth embodiment of the present invention.

FIG. 7 is a perspective view showing the packaging structure for planographic printing plates according to the fourth embodiment of the present invention.

FIG. 8 is a perspective view showing a process of forming a packaging structure for planographic printing plates according to a fifth embodiment of the present invention.

FIG. 9 is a perspective view showing a process of forming the packaging structure for planographic printing plates according to the fifth embodiment of the present invention.

FIG. 10 is a perspective view showing the packaging structure for planographic printing plates according to the fifth embodiment of the present invention.

FIG. 11 is a perspective view showing a packaging structure for planographic printing plates according to a sixth embodiment of the present invention.

FIG. 12 is a perspective view showing a packaging structure for planographic printing plates according to a seventh embodiment of the present invention.

FIG. 13 is a perspective view showing a packaging structure for planographic printing plates according to an eighth embodiment of the present invention.

FIG. 14 is a perspective view showing a conventional packaging structure for planographic printing plates.

FIG. 15 is a perspective view showing another conventional packaging structure for planographic printing plates.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1A and 1B show processes for packaging a stacked sheaf (stack) 12 of planographic printing plates 10 using a packaging structure 18 for planographic printing plates according to a first embodiment of the present invention. FIG. 2 shows the packaging structure 18 for planographic printing plates according to the first embodiment.

The planographic printing plate 10 is formed by applying a coating film (a photosensitive layer in a case of a photosensitive printing plate, or a thermosensitive layer in a case of a thermosensitive printing plate) onto a thin aluminum support which is formed into a rectangular plate. Further, an overcoat layer or a mat layer may be applied if necessary. This coating film is subjected to plate making processes including exposure, development, gum coating and the like. Then, the planographic printing plate 10 thus formed is set in a printing machine and ink is applied thereto, thereby allowing characters, images and the like to be printed on a paper surface. The planographic printing plate 10 of the present embodiment is one before the processings (such as exposure, development and the like) necessary for printing is carried out. The planographic printing plate 10 may be referred to as a planographic printing plate precursor or a planographic printing plate material in some cases.

A specific structure of the planographic printing plate 10 is not particularly limited so long as it has the aforementioned structure. For example, by making it a planographic printing plate for heat mode type and photon type laser printing, it is possible to provide a planographic printing plate which can be made directly from digital data.

Further, the planographic printing plate 10 can be made to correspond to various plate making methods by selecting various components in the photosensitive layer or the thermosensitive layer. Specific examples of the planographic printing plate 10 according to the present invention include the following (1) to (11).

A planographic printing plate in which the photosensitive layer contains an infrared ray absorbent, a compound which generates an acid when heated, and a compound which crosslinking is formed by an acid.

A planographic printing plate in which the photosensitive layer contains an infrared ray absorbent, and a compound which becomes soluble in alkaline when heated.

A planographic printing plate in which the photosensitive layer is comprised of two layers: an oxygen cutoff layer and a layer which contains a compound generating a radical by being irradiated with laser light, a binder soluble in alkali, and a multi-functional monomer or prepolymer.

A planographic printing plate in which the photosensitive layer is comprised of three layers, that is, a polymerization layer containing a multi-functional monomer and a multi-functional binder, a layer containing silver halide and a reducing agent, and an oxygen cutoff layer.

A planographic printing plate in which the photosensitive layer is comprised of two layers, that is, a layer containing novolak resin and naphthoquinonediazide, and a layer containing silver halide.

A planographic printing plate in which the photosensitive layer contains an organic photoconductor.

A planographic printing plate in which the photosensitive layer contains two or three layers, that is, a laser light absorbing layer which is removed by being irradiated with laser light, a lipophilic layer and/or a hydrophilic layer.

A planographic printing plate in which the photosensitive layer contains a compound which absorbs energy to generate acid, a high molecular compound having, in its side chain, a functional group which generates sulfonic acid or carboxylic acid by an acid, and a compound which absorbs visible light to impart energy to an acid generating agent.

A planographic printing plate in which the photosensitive layer contains a quinonediazide compound and novolak resin.

A planographic printing plate in which the photosensitive layer contains a compound which is decomposed by light or ultraviolet ray and forms a crosslinking
structure in itself or with other molecules within the layer, and a binder which is soluble in alkali.

[0077] Particularly, planographic printing plates coated with a highly-photosensitive coating film which is exposed to a laser, and thermosensitive planographic printing plates have been used in recent years. Such printing plates are, for example, the aforementioned planographic printing plates (1) to (3), and the like. In a case in which these high-sensitivity type planographic printing plates are used, they are preferably packaged with the packaging structure for planographic printing plates according to the present invention.

[0078] A wavelength of the laser light mentioned herein is not particularly limited. For example, the following lasers can be used.

[0079] (a) A laser having a wavelength region of 350 to 450 nm, specifically, a laser diode having a wavelength of 405±5 nm.

[0080] (b) A laser having a wavelength region of 480 to 540 nm, specifically, an argon laser having a wavelength of 488 nm, an (FD) YAG laser having a wavelength of 532 nm, a solid laser having a wavelength of 532 nm, and a green Ne—Ne laser having a wavelength of 532 nm.

[0081] (c) A laser having a wavelength region of 630 to 680 nm, specifically, a Ne—Ne laser having a wavelength of 630 to 670 nm, and a red-light semiconductor laser having a wavelength of 630 to 670 nm.

[0082] (d) A laser having a wavelength of 800 to 830 nm, specifically, an infrared (semiconductor) laser having a wavelength of 830 nm.

[0083] (e) A laser having a wavelength of 1064 to 1080 nm, specifically, a YAG laser having a wavelength of 1064.

[0084] Among them, the laser lights of the above (b) and (c) can each be applied to the planographic printing plate having a photosensitive layer or a thermosensitive layer, which is described in the above (3) or (4). Further, the laser lights of the above (d) and (e) can each be applied to the planographic printing plate having a photosensitive layer or a thermosensitive layer, which is described in the above (1) or (2). Of course, the relationship between the wavelength region of laser light and the photosensitive or thermosensitive layer is not limited to the foregoing.

[0085] Further, the planographic printing plate 10 of the present embodiment, that is, planographic printing plates of all the above (1) to (11), are planographic printing plates which are set in an automatic plate making machine having a function of automatically feeding plates, or in a so-called plate setter in a state of being made into the stack 12, and supplied to a plate making process. Accordingly, deterioration of the image forming surface can be reliably prevented by the planographic printing plate of the present invention, without depending on how the planographic printing plates are fed, that is, if they are fed by a user using an automatic plate feeding mechanism, or they are fed manually by the user, or the like. Of course, planographic printing plates other than those of the above (1) to (11), which may possibly be set in an automatic plate making machine having an automatic plate feeding function or in a so-called plate setter and fed to a plate-making process, are all included in the planographic printing plates 10 of the present embodiment.

[0086] The shape of the planographic printing plate 10 is not particularly limited. For example, an aluminum sheet having a thickness of 0.1 to 0.5 mm, a longer side (width) of 300 to 2050 mm, and a shorter side (length) of 200 to 1500 mm, with a photosensitive or thermosensitive layer applied onto one surface of the plate, can be used.

[0087] As can be also seen in FIG. 1A, the stack 12 of the planographic printing plates 10 is formed in such a manner that interleaf sheets 14 for protecting the coating film and the planographic printing plates 10 are alternately stacked in a thickness direction. The number of the planographic printing plates 10 forming a single stack 12 is not particularly limited. However, from the standpoint of efficiency of transportation and storage, the number may be 10 to 200, for example. When the stack 12 is formed of 10 or more pieces of planographic printing plates 10, the plates can be handled more efficiently. When the stack 12 is formed of 200 pieces or less of planographic printing plates, the weight of the stack 12 is limited. Therefore, a work load for the handling can be reduced. Further, it is also possible that the stack 12 may be structured by a larger number of planographic printing plates 10 so as to transport and store the plates more efficiently. That is, handling can be carried out fewer times. For example, the maximum number of the planographic printing plates 10 may be set around 3000 pieces. Moreover, the interleaf sheets 14 may not be used depending on types of the planographic printing plates 10 and the stack 12 may be structured only by the planographic printing plates 10.

[0088] A coating film may be formed on both sides of the support depending on types of the planographic printing plates. A printing plate coated in this way is a so-called “double-coated plate”. When the stack 12 is structured by the double-coated planographic printing plates, one interleaf sheet 14 is also disposed under the lowermost planographic printing paper 10 in FIG. 1A. Accordingly, the number of the interleaf sheets 14 is larger than that of the planographic printing papers 10 by one. As a result, there is no possibility that the coating film of the planographic printing plate 10 is directly in contact with an internal packaging paper 16. Therefore, damage to the coating film, which is caused by the coating film and the internal packaging paper 16 directly in contact with each other, is prevented.

[0089] Further, in a case in which a coating film is applied onto only one surface of the support, the planographic printing plates 10 may be stacked so that the coating films thereof are oriented upward or they are oriented downward.

[0090] A specific structure of the interleaf sheet 14 is not particularly limited so long as it can protect the coating film, that is, an image forming surface, of the planographic printing plate 10. For example, paper containing 100% of wood pulp, paper not containing 100% of wood pulp but containing synthetic pulp, paper having a low density polyethylene layer provided on the surface of the above paper, and the like may be used. Particularly, in a case of paper not containing synthetic paper, material cost is decreased. Therefore, the interleaf sheets 14 can be produced at a low cost. A more specific example of the interleaf paper 14 is an interleaf sheet which is made from bleached kraft pulp and has a basic weight of 30 to 60 g/m², a density of 0.7 to 0.85 g/cm³, a moisture content of 4 to 8%, and a pH of 4 to 6. However, the interleaf sheet 14 is not limited to the same.
The process in which the planographic printing plates are stacked in the thickness direction to form the stack is not particularly limited. However, for example, a processing line of planographic printing plates, in which a web-shaped planographic printing plate is cut into a predetermined size while being conveyed in the longitudinal direction thereof, is generally provided with an accumulating device in which the planographic printing plates are sequentially accumulated. Therefore, the stacked plates may be formed using this accumulating device. Further, in this processing line, there are cases in which a web-shaped interleaf sheet is disposed on and in contact with the web-shaped planographic printing plate prior to the cutting, and thereafter, the web-shaped planographic printing plate and interleaf sheet are integrally cut into a predetermined size. In this case, during the accumulating operation in the accumulating device, the stacked plates are formed in a state in which the planographic printing plates and the interleaf sheets are alternately stacked. Of course, the stacked plates may be formed in such a manner that the planographic printing plates and the interleaf sheets are alternately stacked, and thereafter, the planographic printing plates are cut to an equal size by a cutter or the like.

The stack thus formed is, as shown in FIG. 2, packaged with the internal packaging paper. The internal packaging paper is comprised of paper having light-shielding and moisture-proofing properties. When the stack is packaged using the internal packaging paper so as to be completely cut off from the outside, the stack can be reliably shielded from light and protected from moisture.

A material of the internal packaging paper is not particularly limited so long as the stack can be packaged therein so as to be completely cut off from the outside. However, the internal packaging paper can be formed by, for example, one piece of rectangular non-bleached kraft paper having a predetermined size. Further, the kraft paper may also be used in a state in which a thin metal film having a predetermined thickness is applied to the paper, and when occasion demands, a resin layer having a predetermined thickness is applied onto the thin metal film. Moreover, kraft paper may be used, in which a low density polyethylene layer having a thickness of 10 to 70 μm is adhered to the aforementioned thin metal film and a black polyethylene film having a thickness of about 70 μm is adhered to the low density polyethylene film to increase the light-shielding and moisture-proofing properties. Generally, the photosensitive printing plate has a high photosensitivity, and even if it is exposed to faint light in a visible light wavelength region, the photosensitive layer undergoes a change. Therefore, the printed plates need to be shielded from light. Further, there are cases in which, in the thermosensitive printing plate as well, a thermosensitive layer is deteriorated due to heat energy of light applied thereto or the sensitivity thereof changes depending on the degree of extent of reaction. Therefore, it is preferable that the printing plates be appropriately shielded from light. Moreover, inconvenience may be caused, in which, when a sudden change in humidity or temperature is caused, either printing plate may be deteriorated due to dew condensation being produced on the photosensitive layer or thermosensitive layer, or may be adhered to the interleaf sheet. Therefore, these printing plates need to be protected from moisture. The internal packaging paper having the aforementioned structure has fixed light-shielding and moisture-proofing properties, and therefore, deterioration of the photosensitive layer or thermosensitive layer of the planographic printing plate is prevented, and the planographic printing plate is maintained in a constant quality. Of course, so long as the internal packaging paper can exhibit the aforementioned light-shielding and moisture-proofing properties, the low density polyethylene layer, the black polyethylene film and the like may not necessarily adhered thereto.

The shape and packaging structure of the internal packaging paper is not particularly limited so long as the stack can be protected from moisture and shielded from light by the internal packaging paper. However, for example, the length of a longer side of the internal packaging paper is made into a predetermined length such that shorter sides of the internal packaging paper partially overlap with each other (see FIG. 1B) in a state in which the stack is placed substantially at the center of the internal packaging paper with a longer side. Of the stack being disposed parallel to the shorter side of the internal packaging paper (see FIG. 1A) and the internal packaging paper is folded from both sides thereof along the longer sides of the stack. At this time, the internal packaging paper is formed in the shape of a flat cylinder, and therefore, the internal packaging paper overhangs from each of the shorter sides of the stack to form an overhanging portion.

Further, the length of the shorter side of the internal packaging paper is made into a predetermined length such that, when the overhanging portion is turned in from the upper side in a state in which the shorter sides partially overlap with each other (see FIG. 1B), the folded overhanging portion is made to overlap with the stack when seen from the upper side. Due to the stack being thus packaged with the internal packaging paper, the stack is entirely covered with the internal packaging paper as shown in FIG. 2.

Finally, the internal packaging paper is taped at predetermined positions by fixing means such as adhesive tapes. As a result, the internal packaging paper is fixed so as not to inadvertently loosen or fall off, and a packaging structure for planographic printing plates according to the present invention is formed.

In the packaging structure for planographic printing plates having the aforementioned structure, the interleaf sheet is disposed in contact with the coating film, and therefore, damage to the coating film, so-called film peeling, is prevented. Further, the stack is completely covered by the internal packaging paper having the light-shielding and moisture-proofing properties and shut off from the outside. Therefore, the planographic printing plates which constitute the stack are reliably shielded from light and protected from moisture.

When the packaged planographic printing plates are used in the packaging structure for planographic printing plates of the present embodiment, first, the adhesive tapes are removed and the internal packaging paper is opened. Then, the planographic printing plates in the form of the stack are set in an automatic plate making machine having a function of automatically feeding plates, or a so-called plate setter. Alternatively, the planographic printing plates may be manually set one by one as the
need arises. At this time, in the packaging structure 18 for planographic printing plates of the present invention, no conventional protective cardboard is used. Accordingly, it is not necessary to perform an operation of removing the protective cardboard or an operation of removing adhesive tapes for fixing the protective cardboard to the stack 12. As a result, the planographic printing plates 10 can be easily taken out and set.

[0099] Further, even after the packaging structure 18 for planographic printing plates is opened, no disused protective cardboard remains. Therefore, disposal of protective cardboard is not necessary and no cost required therefor occurs. Moreover, no space in which disused protective cardboard is stored is required and no cost or labor required for disposal of disused protective cardboard is also required.

[0100] No protective cardboard is used for the packaging structure 18 for planographic printing plates, and therefore, material costs are reduced. Still further, it is not necessary to locate the protective cardboard at a predetermined position in the stack 12, and therefore, the time and labor required by the packaging is also reduced.

[0101] FIG. 3 shows a packaging structure 21 for planographic printing plates according to a second embodiment of the present invention. In the packaging structure 21 for planographic printing plates, the stack 12 packaged with the internal packaging paper 16 in the same manner as in the packaging structure 18 for planographic printing plates of the first embodiment is further packaged in a packaging box 22 for planographic printing plates. In the second embodiment, the packaged stack 12 is referred to as an internally-packed stack 18 for convenience.

[0102] In the packaging box 22 for planographic printing plates, as can be seen from the development view of FIG. 4, a stack-forming bottom surface plate 30 are disposed adjacently to each shorter side of a bottom surface plate 24 and each shorter side of an upper surface plate 26, respectively. A plurality of fold lines 32 are formed in each of the stack-forming bottom surface plate 28 and the stack-forming upper surface plate 30. In the state in which the packaging box 22 is assembled as shown in FIG. 3, spiral-wound stack portions 34 and 36 are formed by bending the fold lines 32. Therefore, even if large force acts on the packaging box 22 for planographic printing plates from outside, the planographic printing plates 10 which constitute the stack 12 is reliably protected so that at least a flaw or deformation, which becomes a problem from the standpoint of quality, may not be caused. Further, a take-out opening (upper side) of the packaging box 22 for planographic printing plates is closed by the upper surface plates 26. The packaging box 22 is opened by opening the upper surface plates 26 as indicated by arrows H and the planographic printing plates 10 can be taken out therefrom.

[0103] Generally, the planographic printing plate 10 is formed in the shape of a thin plate. Therefore, when a corner or side of the plate is flawed or deformed, a drawback is likely to arise, in that an image may become fuzzy when developed, or ink may be applied irregularly when printing. Such damage or deformation of the planographic printing plate 10 can also be prevented by the packaging structure 18 for planographic printing plates of the first embodiment, which is not externally packaged in the packaging box 22 for planographic printing plates. When the planographic printing plates 10 are externally packaged in the packaging box 22 for planographic printing plates as in the packaging structure 21 for planographic printing plates of the second embodiment, damage to the planographic printing plates 10 can be reliably prevented. For example, even in a case of a long-distance transportation at the time of handling the planographic printing plates 10, there is no possibility that the planographic printing plates 10 may undergo a damage which becomes a problem from the standpoint of quality. Therefore, the internal packaging paper 16 has the function of preventing damage or deformation, which is caused by external force, of the printing plates. Thus, the planographic printing plates 10 can be packaged using a suitable combination of packages having excellent protective abilities for the planographic printing plates 10. As a result, the planographic printing plates 10 can be reliably protected.

[0104] In addition, the planographic printing plates 10 are packaged without using any protective cardboard in the same manner as in the packaging structure 18 for planographic printing plates of the first embodiment. Therefore, an operation of taking out the planographic printing plates 10 and setting the printing plates in an automatic plate making machine having the function of automatically feeding plates, or a so-called plate setter can be easily performed. Further, it is not necessary to carry out disposal of disused protective cardboard. Therefore, no cost required for the disposal occurs, and no space in which disused protective cardboard is stored is also required. Moreover, material costs of the packaging structure 21 for planographic printing plates decrease, and the time or labor required for the packaging is also reduced.

[0105] A material which constitutes the packaging box 22 for planographic printing plates is not particularly limited so long as it can protect the planographic printing plates from the external force as described above. For example, when the packaging box is made from corrugated fiberboard, the packaging box 22 for planographic printing plates can be made light in weight and at a low cost. Furthermore, preferably, after-use recycling or scrapping of the packaging box is facilitated.

[0106] FIG. 5 shows a packaging structure 42 for planographic printing plates according to a third embodiment of the present invention. In the packaging structure 42 for planographic printing plates, the stack 12 is directly packaged in the packaging box 22 for planographic printing plates as in the second embodiment without being packaged with the internal packaging paper 16.

[0107] Accordingly, in the packaging structure 42 for planographic printing plates of the third embodiment as well as the packaging structure 21 for planographic printing plates of the second embodiment, damage to the planographic printing plates 10 can be reliably prevented. For example, even in a case of a long-distance transportation at the time of handling the planographic printing plates 10, there is no possibility that the planographic printing plates 10 may undergo a damage which becomes a problem from the standpoint of quality.

[0108] In the packaging structure 42 for planographic printing plates of the third embodiment, no internal pack-
aging paper 16 is used. Generally, corrugated fiberboard, which constitutes the packaging box 22 for planographic printing plates, has predetermined light-shielding and moisture-proofing properties, and abutting portions of the corrugated fiberboard in the packaging state are reliably closed by a light-shielding member to maintain required light-shielding and moisture-proofing properties. Accordingly, deterioration of the coating film of the planographic printing plate 10 can be prevented. As the light-shielding member, the adhesive tape 38 can be used.

0109 The planographic printing plates 10 are packaged using no protective cardboard in the same manner as in the packaging structure 18 for planographic printing plates of the first embodiment and the packaging structure 21 for planographic printing plates of the second embodiment. Therefore, the operation of taking out the planographic printing plates 10 and setting the printing plates in an automatic plate making machine having the function of automatically feeding plates, or a so-called plate setter can be easily performed. Further, it is not necessary to carry out disposal of disused protective cardboard, and therefore, no cost required for the disposal occurs. No space in which disused protective cardboard is stored is also required. Moreover, material costs of the packaging structure 42 for planographic printing plates decrease, and the time or labor required for the packaging is also reduced.

0110 FIG. 6 shows a process for packaging the stack 12 of the planographic printing plates 10 using a packaging structure 130 for planographic printing plates according to a fourth embodiment of the present invention. FIG. 7 shows the packaging structure 130 for planographic printing plates of the fourth embodiment.

0111 The packaging structure 130 for planographic printing plates is structured by a loading member 132, corner covering plates 134, surface covering plate 136, and fixing belts 138. The loading member 132 is a so-called pallet or a skid on which the stack 12 is loaded. The stack 12 can be an internally-packaged stack 158, to which the corner covering plates 134 and the surface covering plate 136 are applied. The fixing belts 138 are for fastening and fixing the corner covering plates 134 and the surface covering plate 136 on the loading member 132.

0112 The loading member 132 has a pedestal portion 146 in which an upper plate 140 and a lower plate 142 each having a substantially rectangular configuration are connected by a plurality of elongated or block-shaped leg portions 144. An inserting portion 148 is formed between adjacent leg portions 144, and the loading member 132 can be lifted by inserting a fork of a fork lift or a hand lift into the inserting portions 148. In FIGS. 6 and 7, the leg portions 144 are each made elongate along the depth of the pedestal portion 146, that is, in the direction indicated by arrow D. The inserting portions 148 are also each formed so as to extend along the depth of the pedestal portion 146. However, for example, the leg portions 144 are each divided into blocks in the direction indicated by arrow D and the inserting portions 148 are also formed so as to extend not only along the depth of the pedestal portion 146 but also in the transverse direction, thereby allowing the fork to be inserted in either direction. The transverse direction is indicated by arrow W.

0113 A loading stand 150 having a substantially wedge-shaped configuration at the end surface thereof is fixed onto an upper surface of the upper plate 140 of the pedestal portion 146. As seen from FIGS. 6 and 7, the upper surface of the loading stand 150 is inclined to the upper plate 140 and is formed as a loading surface 152 on which the stack 12 is loaded.

0114 A flat plate-shaped supporting plate 154 is formed upright from a lower end portion of the loading surface 152. The surface of the supporting plate 154 toward the loading surface 152 is perpendicular to the loading surface 152 and is formed as a supporting surface 156 for supporting a portion of the load of the stack 12 loaded on the loading surface 152.

0115 The stack 12 is internally packaged with the internal packaging paper 16 in the state of being loaded on the loading surface 152. The stack 12 in the state of being internally packaged will be hereinafter referred to as an internally-packaged stack 158. In FIG. 6, a single stack 12 is shown, but a plurality of stacks 12 may be continuously stacked.

0116 Further, in the fourth embodiment, an insert sheet 44 whose thickness is different from the interface sheet 14 is disposed at every predetermined number of the planographic printing plates 10 which constitute the stack 12. The insert sheet 44 functions as a marker member of the present invention. When the stack 12 is seen from the side thereof, the insert sheet 44 is visually recognized as different from the planographic printing plate 10 or the stack 12. For this reason, when the planographic printing plates 10 are used, a predetermined number of the planographic printing plates 10 can be taken out for each time with the insert sheet 44 serving as a marker. The marker member of the present invention is not limited to the aforementioned insert sheet 44. Any marker member can be used so long as it can be recognized as different from the planographic printing plate 10 or the interface sheet 14 when seen from the side. For example, paper having the same structure as the interface sheet 14 may be colored so as not to affect the quality or handling of the planographic printing plates 10, or may be made to slightly protrude from the stack 12, thereby allowing it to be visually recognized by an operator. Further, in the first to third embodiments, the marker member may be disposed at every predetermined number of the planographic printing plates 10 which constitute the stack 12.

0117 In the present embodiment, as the internal packaging paper 16, craft paper having a size sufficient for integrally packaging a single or a plurality of stacks 12 loaded on the loading surface 152 and having an aluminum foil or a thin metal film of 6 to 7um applied thereto is used. When a plurality of stacks 12 are loaded, they may be packaged separately with the internal packaging paper 16.

0118 The plurality of stacks 12 are externally packaged with the internal packaging paper 16 in an integrated manner, and the end of the internal packaging paper 16 is fixed and adhered by fixing means such as adhesive tapes 160 to the loading stand 150 and the supporting plate 154. As a result, the internally-packaged stack 158 is formed.

0119 The corner covering plate 134 has a substantially L-shaped cross sectional configuration comprised of a wide portion 162 and a narrow portion 164, and is entirely made elongate. The wide portion 162 contacts a front surface 158L of the internally-packaged stack 158 loaded on the loading
surface 152, and the narrow portion 164 contacts a side surface 158S of the internally-packaged stack 158. Further, the length of the corner covering plate 134 is made substantially equal to or longer than the heightwise dimension of the internally-packaged stack 158.

[0120] The surface covering plate 136 is formed in an elongated configuration so as to have a thickness equal to or greater than the wide portion 162 of the corner covering plate 134, and is disposed substantially at a transverse-directional central portion of the front surface 158F of the internally-packaged stack 158.

[0121] The fixing belt 138 has a length sufficient for winding the internally-packaged stack 158, the corner covering plates 134, the surface covering plate 136 and the supporting plate 154 in the state in which the corner covering plates 134 and the surface covering plate 136 are applied to the internally-packaged stack 158. When a buckle 166 is operated in a state in which the fixing belt 138 is thus wound, the fixing belt 138 is gradually tightened and inward force acts on the internally-packaged stack 158, the corner covering plates 134, the surface covering plate 136 and the supporting plate 154. As a result, the internally-packaged stack 158, the corner covering plates 134, and the surface covering plate 136 can be easily fixed to the supporting plate 154. In the present embodiment, as the fixing belt 138, for example, a lashing belt having a predetermined strength is used.

[0122] In the packaging structure 130 for planographic printing plates of the fourth embodiment having the aforementioned structure, the planographic printing plates 10 are vertically loaded on the loading surface 152 with vertical-direction components and disposed parallel to the supporting surface 156. Therefore, regardless of the number of planographic printing plates 10, the heightwise dimension of the packaging structure 130 for planographic printing plates in the loaded state becomes substantially uniform. Accordingly, for example, in a case of storing the packaging structure 130 for planographic printing plates, it can be efficiently stored with no useless space being formed above the stack 12 so long as the heightwise dimension of a storage place may be properly determined.

[0123] Further, the planographic printing plates 10 are loaded with their weights in such a manner that lower edges thereof are made even along the loading surface 152. Therefore, when the planographic printing plates 10 are loaded in a plate making machine, for example, using an automatic feeding machine or the like, they can be loaded at a proper loading position. Moreover, the planographic printing plates 10 can be readily lifted, and therefore, an operation for transportation or displacement is facilitated.

[0124] The loading surface 152 is inclined to the upper plate 140 and the stack 12 is loaded slantingly at a fixed angle of inclination. A portion of the load of the stack 12 is supported by the supporting surface 156. The load of the stack 12 is thus supported so as to be distributed into two planes or in a bidirectional manner. Accordingly, there is no possibility that the stack 12 or the planographic printing plates 10 may inadvertently fall down or slip down in a state of being released from the package as will be described later.

[0125] As shown in FIG. 7, in the packaged state, the corner covering plate 134 is applied to the corner between the front surface 158F and the side surface 158S of the internally-packaged stack 158 and contacts these two surfaces of the internally-packaged stack 158. For this reason, even if the stack 12 is struck by any object from outside during transportation or storage, a corner portion of the planographic printing plates 10 which constitute the stack 12 is protected and no flaw or deformation occurs therein. Further, even if fastening force from the fixing belt 138 acts on the stack 12, the fastening force is distributed by the corner covering plate 134 in a heightwise direction, and does not locally act on the corner portion of the planographic printing plates 10, particularly in the vicinities of a position in which the fixing belt 138 is located. Accordingly, the corner portion of the planographic printing plates 10 does not deform. Moreover, even if the planographic printing plates 10 are about to bend due to the fastening force from the fixing belt 138, bending of the planographic printing plates 10 is prevented by the surface covering plate 136 and the planographic printing plates 10 are maintained in a flat manner. In a case in which there is no risk that deformation or damage may occur in the planographic printing plates 10, of course, the corner covering plate 134 or the surface covering plate 136 may be omitted to allow reduction in the number of parts which constitute the packaging structure 130 for planographic printing plates. Further, the corner covering plate 134 or the surface covering plate 136 may be replaced by a conventionally-used end plate or top plate. In other words, the end plate is made into a size which is substantially equal to or larger than the front surface 158F of the internally-packaged stack 158. When the end plate is disposed in contact with the front surface 158F, a peripheral edge of the end plate is made substantially even with the internally-packaged stack 158 or protrudes outward. As a result, the sides or corners of the internally-packaged stack 158, that is, the peripheral edges of the planographic printing plates 10 are protected from the external force, and deformation or damage of the planographic printing plates 10 is prevented. In the packaging structure 130 for planographic printing plates of the fourth embodiment as well, the planographic printing plates 10 are packaged using no protective cardboard in the same manner as in the packaging structure 18 for planographic printing plates of the first embodiment. Therefore, it is possible to easily perform an operation of taking out the planographic printing plates 10 and setting the printing plates in an automatic plate making machine having the function of automatically feeding plates, or a so-called plate setter. Further, disposal of disused protective cardboard is not necessary, and therefore, no cost required for the disposal occurs and no space in which disused protective cardboard is stored is also required. Thus, no cost or labor required for the disposal of disused protective cardboard is required. Further, material costs of the packaging structure 130 for planographic printing plates decreases and the time or labor required for the packaging is also reduced.

[0126] In the fourth embodiment, the planographic printing plates 10 loaded on the loading member 132 are not limited to the aforementioned internally-packaged stack 158. For example, the packaging structure 21 for planographic printing plates of the second embodiment or the packaging structure 42 for planographic printing plates of the third embodiment, that is, a structure in which the planographic printing plates 10 are externally packaged in the packaging box 22 for planographic printing plates may
be used and loaded on the loading member 132 into the packaging structure 130 for planographic printing plates of the fourth embodiment.

[0127] In the fourth embodiment, there was described an example of the structure in which the stack 12 of the planographic printing plates 10 is loaded on a so-called pallet or a skid. However, the loading structure of the stack 12 is not limited to the above. For example, a single or plurality of stacks 12 may be loaded on a common pallet or skid having no loading stand 150 having a wedge-shaped configuration at the end surface thereof or no supporting plate 154. Further, the planographic printing plates 10 may be stack flat on such a pallet or skid. For example, when the planographic printing plates 10 are stack flat on a skid in which the loading stand 150 and the supporting plate 154 are removed from the loading member 132 shown in FIGS. 6 and 7, the stack 12 is stacked so that the planographic printing plates 10 are placed parallel to the upper plate 140.

[0128] A material of the pallet or skid is not particularly limited so long as it has a required strength. Examples thereof include wood, metal, resin, corrugated fiberboard, cardboard, honeycomb-type structural material and the like.

[0129] The fixing means for fixing the stack 12 to the pallet or skid is not limited to the aforementioned fixing belt 138. For example, a structure may be applied in which a film which contracts under a constant condition is wound onto the stack 12 and the pallet or skid, and the stack 12 is fixed to the pallet or skid using contractive force of the film. Examples of this film include a shrink film which contracts due to a change in the temperature, but the present invention is not limited to the same.

[0130] FIG. 10 shows a packaging structure 232 for planographic printing plates according to a fifth embodiment of the present invention. FIGS. 8 and 9 show processes for forming the packaging structure 232 for planographic printing plates. The packaging structure 232 for planographic printing plates is structured in such a manner that the stack 12 of the planographic printing plates 10 is loaded on a planographic-printing-plate loading member 234, and a top plate 236 is placed on the stack 12, and further, the stack 12, the loading member 234 and the top plate 236 are integrally bound with a fixing band 238 made from resin. The planographic-printing-plate loading member 234 will be herein-after referred to simply as a “loading member 234”.

[0131] Further, the planographic printing plate 10 of the fifth embodiment, that is, planographic printing plates of all the above (1) to (11), are loaded on the loading member 234 of the present invention to form the packaging structure 232 for planographic printing plates without depending on how the planographic printing plates are fed, that is, if they are fed by a user using an automatic plate feeding mechanism, or they are fed manually by the user, or the like.

[0132] Moreover, among planographic printing plates, there exists a so-called waste plate or dead plate, which is set at a position with no ink applied (that is, in a non-printing region) for reasons of a paper surface depending on the type of a used printer. Such waste plates or dead plates are also included in the planographic printing plates 10 according to the present embodiment.

[0133] As can be seen from FIG. 8, the stack 12 of the planographic printing plates 10 is formed in such a manner that the interleaf sheets 14 for protecting coating films and the planographic printing plates 10 are alternately stacked in the thickness direction, and pieces of protective cardboard 222 are disposed at both end surfaces in the stacking direction, or at every predetermined number of planographic printing plates 10, and a structure thus obtained is internally packaged with internal packaging paper 250 having predetermined light-shielding and moisture-proofing properties. The stack 12 of the planographic printing plates 10 may be formed with one or both of the interleaf sheets 14 and the pieces of protective cardboard 22 being removed therefrom depending on the type of the planographic printing plates 10.

[0134] When the stack 12 is formed by double-coated planographic printing plates, the interleaf sheet 14 is disposed between the lowestmost planographic printing plate 10 and the protective cardboard 222 in FIG. 8. Accordingly, the number of the interleaf sheets 14 is greater than that of the planographic printing plates 10 by one. As a result, the coating film of the planographic printing plate 10 does not directly contact the protective cardboard 222, thereby preventing a damage to the coating film caused by the coating film and the protective cardboard 222 directly contacting each other.

[0135] Further, the protective cardboard 222, which is made from used paper and has a basic weight of 200 to 1500 g/m², a density of 0.7 to 0.85 g/cm³, a moisture content of 4 to 8%, Bekk smoothness of 3 to 20 seconds, and pH of 4 to 6, can be used. For example, when the stack 12 is formed by 10 to 100 planographic printing plates 10, the planographic printing plates 10 and the pieces of protective cardboard 222 may be fixed by a fixing means such as an adhesive tape so as not to be displaced from each other.

[0136] The process in which the planographic printing plates 10 are stacked in the thickness direction to form the stack 12 is not particularly limited. However, for example, in a processing line of planographic printing plates in which a web-shaped planographic printing plate is cut into a predetermined size while being conveyed in the longitudinal direction thereof, an accumulating device for sequentially accumulating planographic printing plates 10 is generally provided. Therefore, the stack 12 may be formed with planographic printing plates being accumulated using the accumulating device. Further, in this processing line, there are many cases in which a web-shaped interleaf sheet is disposed in contact with the web-shaped planographic printing paper prior to the cutting, and thereafter, the web-shaped planographic printing paper and interleaf sheet are integrally cut into a predetermined size. In this case, the stack 12 is formed with the planographic printing plates 10 and the interleaf sheets 14 being alternately stacked when accumulated using the accumulating device. Of course, the stack 12 may be formed in such a manner that, after the planographic printing plates 10 and the interleaf sheets 14 are alternately stacked, the edges of the planographic printing plates 10 are cut by a cutter or the like and made even.

[0137] The planographic printing plates 10, interleaf sheets 14 and pieces of protective cardboard 222 structured as described above are packaged with the internal packaging material 250. The internal packaging material 250 is constituted of paper having light-shielding and moisture-proofing properties. Due to the planographic printing plates 10 being packaged using the internal packaging material 250 so
as to be completely shut out from outside, and the stack 12 can be reliably shielded from light and protected from moisture.

[0138] A material of the internal packaging material 250 is not particularly limited so long as the stack 12 can be packaged therein so as to be completely shut out from the outside. However, the internal packaging material 250 can be formed by, for example, one piece of rectangular non-bleached kraft paper having a predetermined size. Further, the kraft paper may also be used in a state in which a thin metal film having a predetermined thickness is applied to the paper, and when occasion demands, a resin layer having a predetermined thickness is applied onto the thin metal film. Moreover, kraft paper may be used, in which a low density polyethylene layer having a thickness of 10 to 70 μm is adhered to the aforementioned thin metal film and a black polyethylene film having a thickness of about 70 μm is adhered to the low density polyethylene film to increase the light-shielding and moisture-proofing properties. Generally, the photosensitive printing plate has a high photosensitivity, and even if it is exposed to faint light in a visible light wavelength region, the photosensitive layer undergoes a change. Therefore, the printing plates need to be shielded from light. Further, there are cases in which, in the thermosensitive printing plate as well, a thermosensitive layer is deteriorated due to heat energy of light applied thereto or the sensitivity thereof changes depending on the degree of extent of reaction. Therefore, it is preferable that the printing plates be appropriately shielded from light. Moreover, inconveniences may be caused, in which, when a sudden change in humidity or temperature is caused, either printing plate may be deteriorated due to dew condensation being produced on the photosensitive layer or thermosensitive layer, or may be adhered to the interleaf sheet 14. Therefore, these printing plates need to be protected from moisture. The internal packaging material 250 having the aforementioned structure has fixed light-shielding and moisture-proofing properties, and therefore, deterioration of the photosensitive layer or thermosensitive layer of the planographic printing plate 10 is prevented, and the planographic printing plate 10 is maintained in a constant quality. Of course, so long as the internal packaging material 250 can exhibit the aforementioned light-shielding and moisture-proofing properties, the low density polyethylene layer, the black polyethylene film and the like may not necessarily adhered thereto.

[0139] The shape and packaging structure of the internal packaging material 250, or the way of folding the internal packaging paper is not particularly limited so long as the stack 12 can be protected from moisture and shielded from light by the internal packaging material 250.

[0140] As shown in FIG. 9, a fixing means such as an adhesive tape 52 is applied at a predetermined position on the internal packaging material 250. As a result, the internal packaging material 250 is fixed so as not to inadvertently loosen or fall off, and the stack 12 is completed. The fixing means is not particularly limited so long as it allows the internal packaging material to be fixed. For example, adhesive such as hot melt adhesive or paste may be used in place of, or together with the adhesive tape 52.

[0141] As shown in FIGS. 8 to 10, the loading member 234 has a plate-shaped stand 240. The stack 12 is loaded on the stand 240. The planographic printing plates 10 are loaded parallel to the stand 240. This is so-called flat stacking.

[0142] Leg portions 242 are provided so as to protrude downward from the stand 240, and a space formed between the stand 240 and a surface on which it is installed is formed as an inserting portion 248. The loading member 234 and the packaging structure 232 can be lifted by inserting, for example, a fork of a fork lift or hand lift in the inserting portion 248. The number or positions of the leg portions 242, and a material thereof are not particularly limited so long as they can reliably support the stand 240. In the present embodiment, four leg portions 242 are provided in the vicinities of corners of the stand 240, respectively. For example, a leg portion 242 may be additionally provided at the center of each side of the stand 240 to reliably prevent bending of the stand 240. Further, the shape or material of the stand 240 is not particularly limited so long as it has such a strength as not to inadvertently deflect or cause buckling in the state of the stack 12 loaded thereon.

[0143] A top plate 236 is placed on the upper surface of the stack 12 loaded on the loading member 234. The top plate 236 is formed into a plate having a size slightly larger than or substantially equal to the upper surface of the stack 12, that is, the planographic printing plates 10. Even when external force acts from the upper side of the stack 12, the energy is absorbed by the top plate 236, and deformation of the planographic printing plates 10 is restrained to the extent that no problem practically arises.

[0144] When the size of the top plate 236 is the same as the planographic printing plate 10, the top plate 236 is disposed so that the planographic printing plate 10 disposed on the upper surface of the stack 12 does not protrude from the top plate 236. In this case, preferably, the planographic printing plates 10 can be reliably protected. However, if the top plate 236 is made too larger, it protrudes from the loading member 234 when seen from the top, and handling efficiency deteriorates. Accordingly, from the standpoint of facilitating handling, the top plate 236 is preferably formed so as not protrude from the loading member 236 when seen from the top, that is, formed so as to have the same size as the loading member 234 at the utmost.

[0145] The packaging structure 232 for planographic printing plates of the present embodiment is formed by causing a fixing band 238 made from resin to be wound entirely onto the loading member 234, the stack 12 and the top plate 236 in an integrated manner. Accordingly, the loading member 234, the stack 12 and the top plate 236 can be integrally handled and may not be inadvertently displaced or loosen.

[0146] The number and positions of the pieces of fixing band 238 are appropriately determined in accordance with the shape or size of the stack 12. In the present embodiment, it is contemplated that the upper surface of the stack 12, that is, the shape of the planographic printing plate 10 is formed substantially into a square. Therefore, four pieces of fixing band 238 in total are disposed so as to cross each other.

[0147] Two reinforcing plates 244 are disposed on the upper surface of the top plate 236 parallel to the shorter sides 236S of the top plate 236, and another two reinforcing plates 246 are disposed thereon parallel to the longer sides 236L.
These reinforcing plates are fixed by fixing means such as adhesives or wood screws. The reinforcing plates 244 disposed parallel to the shorter sides 2365 are each formed so as to have the same length as the shorter side 2365 and has a length extending from one of the longer sides 2361 to the other. On the other hand, the reinforcing plates 246 disposed parallel to the longer sides 2361 are each shorter than the longer side 2361 and interposed between the reinforcing plates 244. These reinforcing plates 244 and 246 are fixed at predetermined positions so as to correspond to the pieces of fixing band 238 when the top plate 236 is seen from the top. Due to these reinforcing plates 244 and 246, a total rigidity of the top plate 236 and the reinforcing plates 244 and 246 becomes higher compared with a case in which only the top plate 236 is used.

[0148] Further, the shape of the reinforcing plate 244 is determined so that the pieces of fixing band 238 do not contact the top plate 236 in the vicinity of the shorter side 2365 of the top plate 236. A width W1 of the reinforcing plates 244 and 246 is made larger than a width W of the fixing band 238. Accordingly, compared with a case in which the fixing band 238 directly contacts the top plate 236, the binding force of the fixing band 238 when disposed via the reinforcing plates 244 and 246 is distributed in a wide area and acts on the top plate 236.

[0149] As described above, in the packaging structure 232 for planographic printing plates of the fifth embodiment, the stack 12 is loaded by a plurality of planographic printing plates 10 loaded on the loading member 234, and therefore, even a large quantity of planographic printing plates 10 can be handled in an integrated manner. The loading member 234, the stack 12 and the top plate 236 are integrally bound with the pieces of fixing band 238, and therefore, they are not inadvertently displaced or loosened. Further, the stand 240 and the top plate 236 are disposed respectively at both end surfaces of the stack 12 in the stacking direction. Therefore, deformation, damage or deterioration of the planographic printing plates 10 is prevented.

[0150] Furthermore, no bolt is used to integrally bind the loading member 234, the stack 12 and the top plate 236 unlike a conventional structure. Therefore, an operation of fastening bolts is not required and the packaging operation can be performed in a shorter time and with small labor. The binding with the fixing band 238 can also be carried out by a binding device generally used, for example, an automatic strapping machine. Due to the use of the binding device, the packaging operation can be performed in an even shorter time with smaller labor.

[0151] Even when the packaging structure 232 for planographic printing plates is unpacked, it can be unpacked only by cutting the pieces of fixing band 238 with a cutter knife depending on the type of the fixing band 238. As a result, operating efficiency improves.

[0152] In the state in which the loading member 234, the stack 12 and the top plate 236 are integrally bound with the pieces of fixing band 238, the pieces of fixing band 238 are principally in contact with the reinforcing plates 244 and 246 and are in contact with the top plate 236 only by a small portion. The binding force of the fixing band 238 acts on the top plate 236 principally via the reinforcing plates 244 and 246. The total rigidity of the top plate 236, and the reinforcing plates 244 and 246 is higher than that when only the top plate 236 is used. Therefore, it is possible to prevent bending of the top plate 236 caused by the binding force of the fixing band 238. Particularly, if the top plate 236 is made larger than the upper surface of the stack 12, the top plate 236 is apt to warp upward when the binding force of the pieces of fixing band 238 acts on the sides of the top plate 236. However, the present invention can reliably prevent warping of the top plate 236. Further, since the width of the reinforcing plates 244 and 246 is larger than that of the fixing band 238, local concentration of the binding force from the fixing band 238 is alleviated, and the top plate 236 is prevented from being partially recessed. The top plate 236 is thus prevented from being bent or recessed, and therefore, the binding state can be reliably maintained.

[0153] Furthermore, it is not necessary that the thickness of the top plate 236 be made larger to prevent bending of the top plate 236 or formation of a recess therein. For this reason, the binding operation and the unpacking operation can be more easily performed using the top plate 236 light in weight. The packaging structure 232 for planographic printing plates is also light in weight, and therefore, transportation thereof is also facilitated.

[0154] The shape of the top plate, the number, positions and shape of the reinforcing members, and the number and positions of the binding band are not limited to the aforementioned ones. In other words, proper number, shape and positions of each of these components are determined in accordance with the size of the stack 12, that is, the size or number of the planographic printing plates 10, required binding force, and the strength of the reinforcing members obtained correspondingly to the binding force. Examples thereof will be hereinafter described as sixth to eighth embodiments. In each of the embodiments, the basically same components and members as those of the aforementioned embodiments will be denoted by the same reference numerals, and a description thereof will be omitted.

[0155] FIG. 11 shows a packaging structure 262 for planographic printing plates according to a sixth embodiment of the present invention.

[0156] The sixth embodiment is structured in the same manner as in the fifth embodiment in that the reinforcing plates 244 are fixed to the top plate 236, but is different from the fifth embodiment in that four reinforcing blocks 264 are fixed in place of the reinforcing plates 246.

[0157] The reinforcing blocks 264 are each disposed at a position corresponding to the fixing band 238 between the reinforcing plate 244 and the shorter side 2365 of the top plate 236. When seen from the top, an end or an external end 264A of the reinforcing block 264 is made coincident with the shorter side 2365. Further, the other end 264B of the reinforcing block 264 is in contact with the reinforcing plate 244. The width W2 of the reinforcing block 264 is made larger than the width W of the fixing band 238.

[0158] In the packaging structure 262 for planographic printing plates of the sixth embodiment having the aforementioned structure as well, the loading member 234, the stack 12 and the top plate 236 are integrally bound by the pieces of fixing band 238 without using bolts. Therefore, operating efficiency of the packaging operation and the unpacking operation improves.

[0159] Further, it is possible to prevent bending of the top plate 236 by the reinforcing plates 244 and also prevent
formation of a recess in the top plate 236 by the reinforcing plates 244 and the reinforcing blocks 264. It is not necessary that the thickness of the top plate 236 be made larger to prevent the aforementioned bending and formation of a recess. Accordingly, the thickness of the top plate 236 is made smaller so as to be made light in weight, and the packaging operation, unpacking operation and transportation can be further facilitated.

[0160] FIG. 12 shows a packaging structure 272 for planographic printing plates according to a seventh embodiment of the present invention.

[0161] In the seventh embodiment, the reinforcing plates 244 and 246 are not fixed to the top plate 236. Instead, reinforcing blocks 274 and 276 having a substantially square-shaped configuration when seen from the top are fixed to the top plate 236.

[0162] A total of four reinforcing blocks 274 are provided and are each fixed so that one end 274A thereof becomes coincident with the shorter side 236S when seen from the top in the same manner as in the reinforcing blocks 264 of the sixth embodiment. Further, a total of four reinforcing blocks 276 are also provided and are each fixed so that one end thereof becomes coincident with the longer side 236L of the top plate 236. Moreover, these reinforcing blocks 274 and 276 are disposed at positions corresponding to the pieces of fixing band 238. The width W3 of the reinforcing blocks 274 and 276 is made larger than the width W of the fixing band 238.

[0163] In the packaging structure 272 for planographic printing plates of the seventh embodiment having the aforementioned structure as well, the loading member 234, the stack 12 and the top plate 236 are integrally bound with the pieces of fixing band 238 without using bolts. Therefore, the operating efficiency of the packaging operation and the unpacking operation improves.

[0164] Further, formation of a recess in the top plate 236 can be prevented by the reinforcing blocks 274 and 276. It is not necessary that the thickness of the top plate 236 be made larger to prevent formation of a recess. Therefore, the thickness of the top plate 236 is made smaller so as to be made light in weight, and the packaging operation, unpacking operation and transportation can be further facilitated.

[0165] From the standpoint of preventing bending of the top plate 236, usually, the size of the reinforcing blocks 274 and 276 is maintained so that the reinforcing blocks 274 and 276 each partially overlap with the stack 12 when the top plate 236 is seen from the top.

[0166] FIG. 13 shows a packaging structure 282 for planographic printing plates according to an eighth embodiment of the present invention.

[0167] In the eighth embodiment, the use of planographic printing plates which are made more elongate, that is, the ratio of the longer side to the shorter side is larger, is supposed unlike the fifth to seventh embodiments. Accordingly, the top surface of the stack 12 is made more elongated. The stand 240 and the top plate 236 are each correspondingly made more elongated than those of the fifth to seventh embodiments. Further, in the eighth embodiment, three pieces of fixing band 238 are wound at regular intervals and parallel to the short side 236S of the top plate 236, but no band is wound parallel to the longer side 236L.

[0168] Three reinforcing plates 284 are fixed to the top plate 236 parallel to the shorter side 236S and each has a length extending from one of the longer sides 236L to the other. Further, these reinforcing plates 284 are disposed at regular intervals so as to be located at positions corresponding to the pieces of fixing band 238.

[0169] The width W4 of the reinforcing plate 284 is made larger than the width W of the fixing band 238.

[0170] In the packaging structure 282 for planographic printing plates of the eighth embodiment having the aforementioned structure as well, the loading member 234, the stack 12 and the top plate 236 are integrally bound with the pieces of fixing band 238 without using bolts. Therefore, the operating efficiency of the packaging operation and the unpacking operation improves.

[0171] Further, it is possible to prevent bending of the top plate 236 by the reinforcing plates 284 and also prevent formation of a recess in the top plate 236 by the reinforcing plates 284. It is not necessary that the thickness of the top plate 236 be made larger to prevent the aforementioned bending and formation of a recess. Accordingly, the thickness of the top plate 236 is made smaller so as to be made light in weight, and the packaging operation, unpacking operation and transportation can be further facilitated.

[0172] As described above, in the present invention, the loading member 234, the stack 12 and the top plate 236 are integrally bound with the pieces of fixing band 238. Therefore, the packaging operation and the unpacking operation is further facilitated compared with a conventional case in which bolts are used. The material for the binding member of the present invention is not limited to resin as described above so long as it allows integral binding of the stack 12 and the top plate 236. The number of the binding member may be appropriately determined depending on the size or weight of the stack 12, or the like.

[0173] Further, in the present invention, bending of the top plate 236, or formation of a recess therein is prevented by providing, for the top plate 236, reinforcing members, that is, reinforcing plates 244 and 246, reinforcing blocks 264, 274 and 276, or reinforcing plates 284. The material, number and positions of the reinforcing members are not particularly limited so long as they can prevent bending of the top plate 236, or formation of a recess therein. For example, the reinforcing members may be formed from the same material as the top plate 236, or a different material. Generally, the top plate 236 is made of wood in many cases, and the reinforcing members can be made of wood correspondingly. Moreover, even when reinforcing members made of metal are fixed to the top plate 236 made of wood, the thickness of the top plate 236 can be made smaller in the present invention and it can be made light in weight compared with a top plate made of metal and having a strength or rigidity required therefor. Still further, corrugated fiberboard, paperboard, paper pulp, paper honeycomb, polyethylene foam, polystyrene foam, urethane foam, air cap and rubber can be used.

[0174] The positions at which the reinforcing members are disposed, may be such that four reinforcing plates are fixed so as to surround the top plate 236.
Further, it is not necessary that the end of the reinforcing member, for example, a longitudinal-direction end of the reinforcing member shown in FIGS. 8 to 11 or one end 264A of the reinforcing block 264 shown in FIG. 12 may coincide with the edge of the top plate 236. However, it is preferably that in order to reliably prevent bending of the top plate 236 or formation of a recess therein, the end of the reinforcing member may coincide with the edge of the top plate 236 when seen from the top.

In the foregoing, there was described a case in which the planographic printing plates 10 are stacked flat, but the direction in which the planographic printing plates are stacked is not limited to the same. For example, the stack 12 may lean on a loading member or the like so that the planographic printing plates 10 are disposed vertically. This is so-called vertical stacking. In the vertical stacking, there are cases in which the loading member has a supporting plate for slantingly supporting the stack 12 at one end surface thereof, and an end plate is disposed in contact with the stack 12 from an opposite side of the supporting plate. Accordingly, the end plate is provided with the reinforcing members of the present invention, and the end plate, the stack 12 and the supporting plate may be integrally bound, as a loading member, with the pieces of fixing band.

In the present invention according to the structures of the first to fourth embodiments, when planographic printing plates in the packaged state are used, they can be taken out from the package with no time or labor required. Moreover, the planographic printing plates can be packaged at a low cost.

Further, in the present invention according to the fifth to eighth embodiments, the operating efficiency in the packaging operation and unpacking operation can be improved and deformation of an end plate can be prevented without causing an increase in the weight.

What is claimed is:

1. A packaging structure for planographic printing plates in which planographic printing plates are packaged, comprising:

a stack in which only a plurality of planographic printing plates, or a plurality of planographic printing plates and a plurality of interleaf sheets each protecting a coating film of the planographic printing plate are stacked in a thickness direction; and

a packaging material for packaging the stack.

2. The packaging structure of claim 1, wherein the packaging material comprises an internal packaging material for internally packaging the stack, and an external packaging material for packaging the stack internally packaged with the internal packaging material.

3. The packaging structure of claim 1, further comprising a loading member on which at least one packaged stack in the state of being packaged with the packaging material is loaded.

4. The packaging structure of claim 1, further comprising a marker member which is disposed at every predetermined number of planographic printing plates constituting the stack.

5. The packaging structure of claim 2, wherein the external packaging material is a box made of corrugated fiberboard.

6. The packaging structure of claim 3, wherein the number of planographic printing plates which constitute the stack is approximately in the range of 10 to 200.

7. A method of packaging planographic printing plates in which a packaging structure for planographic printing plates, comprising a stack in which only a plurality of planographic printing plates, or a plurality of planographic printing plates and a plurality of interleaf sheets each protecting a coating film of the planographic printing plate are stacked in a thickness direction, and a packaging material for packaging the stack, is formed, said method comprising the steps of:

stacking a plurality of planographic printing plates to form a stack; and

packaging the stack formed by the stacking step with the packaging material.

8. The method of claim 7, wherein the packaging material comprises an internal packaging material for internally packaging the stack, and an external packaging material for packaging the stack internally packaged with the internal packaging material.

9. The method of claim 7, wherein the packaging structure further comprises a loading member on which at least one packaged stack in the state of being packaged with the packaging material is loaded.

10. The method of claim 7, wherein the packaging structure further comprises a marker member disposed at every predetermined number of planographic printing plates constituting the stack.

11. The method of claim 7, wherein the number of planographic printing plates constituting the stack is approximately in the range of 10 to 200.

12. The method of claim 8, wherein the external packaging material is a box made of corrugated fiberboard.

13. A packaging structure for planographic printing plates, comprising:

a planographic-printing-plate loading member on which a stack formed by stacking a plurality of planographic printing plates in a thickness direction can be loaded; an end plate which is disposed in contact with the stack at a side opposite to the planographic-printing-plate loading member; a binding member for binding the planographic-printing-plate loading member, the stack and the end plate in the state of being wound thereon; and a reinforcing member mounted on the end plate so as to be positioned between the end plane and the binding member, the reinforcing member being provided so as to alleviate pressure from the binding member and make the pressure to act on the end plate.

14. The packaging structure of claim 13, wherein the reinforcing member has a rigidity higher than the end plate.

15. The packaging structure of claim 13, wherein the reinforcing member is formed so as to extend along the binding member continuously from one end of the end plate to the other end.

16. The packaging structure of claim 13, wherein the reinforcing member comprises first reinforcing plates, and second reinforcing plates, the first reinforcing plates disposed and fixed on the end plate parallel to shorter sides of
the end plate, the second reinforcing plates disposed parallel to longer sides of the end plate and interposed between two of the first reinforcing plates.

17. The packaging structure of claim 13, wherein the reinforcing member comprises reinforcing plates, and four reinforcing blocks, the reinforcing plates disposed and fixed on the end plate parallel to shorter sides of the end plate, the reinforcing blocks each interposed between the reinforcing plate and the shorter side of the end plate, and a side of each of the reinforcing blocks coinciding with the shorter side of the end plate.

18. The packaging structure of claim 13, wherein the reinforcing member comprises first reinforcing blocks, and second reinforcing blocks, a side of each the first reinforcing blocks coinciding with the shorter side of the end plate, a side of each the second reinforcing blocks coinciding with the longer side of the end plate.

19. The packaging structure of claim 14, wherein the loading member includes a supporting plate for slantingly supporting the stack leaning on the loading member, the end plate contacting with the stack and facing the supporting plate, the binding member integrally binding the end plate, the stack and the supporting plate.

20. The packaging structure of claim 15, wherein the binding member includes fixing bands disposed approximately parallel to a shorter side of the end plate.