

Description

The present invention relates to a heat resistant adiabatic bag for protecting valuables from accidents and disasters such as a fire and more particularly to a heat resistant adiabatic bag suitable for protecting valuables stored therein when stored within a safe.

Description of Related Art:

While valuables such as money, jewelry, important documents such as securities and recording medium such as floppy disks in which important data is recorded are normally stored and kept in a fireproof safe in order to protect them from damages caused by accidents and disasters such as a fire, it has been known that even if they are kept in the fireproof safe, they may be damaged by a fire when the fireproof safe is exposed to high temperature for a long period of time and the internal temperature of the fireproof safe becomes high. Then, in conformity with the specification of fire resistance of general papers of S1037 of Japanese Industrial Standard (JIS), ordinary fireproof safes are designed so that the temperature within the safe is kept to be less than 180°C during a heating test when the safe is heated within a heating furnace for two hours along a standard temperature curve.

However, as seen in the recent great earthquake, there is a case when a fireproof safe is exposed to a fire for a long period of time of more than two hours. Further, while there is often the case of recording important data in recording media such as a floppy disk and a compact disk and of storing and keeping them in a fireproof safe as valuables recently, such floppy disks and compact disks become unusable even in a relatively low temperature of about 60°C. Therefore, it has been demanded to improve the heat resistance of the fireproof safe further.

Meanwhile, there exists a fireproof bag made of a laminated sheet composed of a plurality of layers having excellent fireproofing and heat resistant properties such as a sheet member used for a fireman's cloth and such fireproof bag is used in the site of emergency medical treatment for example. Because such fireproof bag is made so as to be able to sustain partial heat such as sparks and flames and has a good and adequate heat retaining property, it is useful in keeping the quality of medicines and the like stored therein even when used in the open in winter season or in a cold district. Such fireproof bag is arranged so as to be able to open by a fastener or the like so that the contents such as medical equipments and medicines can be readily taken out.

By the way, while various fireproof safes which had been improved in correspondence to the demand related to the improvement of the adiabatic property and heat resistance of the fireproof safe itself which had increased lately due to the circumstances described above have come to be developed, it forces a considerable economical burden upon users to repeatedly replace the fireproof safes every time when improved one is represented. Then, as a result of study on how to extend the time during which valuables can be protected by using the existing fireproof safe, the present applicant has obtained an idea of protecting the valuables by the double fireproof and heat resistant structure of the fireproof safe and the bag by storing the valuables in the heat resistant bag and by storing the bag in the fireproof safe.

However, when a fire resistance test was carried out by storing the existing fireproof bag in the fireproof safe, it was clarified that the temperature within the fireproof bag increases almost equally with the temperature within the fireproof safe and the time during which the valuables can be protected is barely improved. When its cause was studied further, it was found that although the existing fireproof bag is made so as to be able sustain the increase of temperature in a short time when it is exposed to sparks and flames for example, the temperature within the fireproof bag increases together with the ambient temperature within the fireproof safe due to heat conduction from the sheet member of the fireproof bag and from the gap of opening/closing flaps and a fastener part for opening/closing an opening when the ambient temperature within the fireproof safe is kept high under the circumstance of fire for a long time.

Then, while the present applicant had proposed a heat resistant adiabatic bag described in Japanese Patent Application No. Hei. 8-320128, it has been found as a result of the further study and testing that the heat resistance of the adiabatic bag can be improved further by preventing heat from permeating from seams, openings and the like of the adiabatic bag.

Further, although the heat resistant adiabatic bag described in Japanese Patent Application No. Hei. 8-320128 had an excellent heat resistance, it had a problem in actually using it that all the contents have to be taken out once in order to confirm those stored inside because the opening is created only at one side of an inner bag to enhance its air-tightness.

Further, although the adiabatic bag had an adequate internal heat insulating property, it was undeniable that the internal temperature drops gradually along the decrease of the ambient temperature when the adiabatic bag is used in the outdoors in winter season or in a cold district. As a result, there might be a case when the contents are damaged or decomposed due to the drop of the internal temperature of the adiabatic bag when the contents are substances which are weak to low temperature such as a microfilm or chemicals whose quality change under the low temperature.

Then, the present invention has been devised in view of such circumstances and its object is to provide a heat resistant adiabatic bag which has an excellent adiabatic property against an increase of ambient temperature around

the adiabatic bag, which is useful and which has an excellent temperature insulating property even against a drop of ambient temperature around the adiabatic bag.

A heat resistant adiabatic bag described in Claim 1 comprises an outer bag made of a laminated sheet which has heat resistant and adiabatic properties and which shuts off aeration and an inner bag made of a laminated sheet which has heat resistant and adiabatic properties and which shuts off aeration. The inner bag can be inserted to the outer bag almost without any gap and a sealing sheet made of low fusion point resin is provided corresponding to outside air permeating points of at least the inner bag or the outer bag.

Because the outer bag is made of the laminated sheet having the heat resistant and adiabatic properties and which shuts off aeration and the inner bag inserted therein is made of the laminated sheet having the heat resistant and adiabatic properties and which shuts off aeration, permeation of heat from the surface to the outer bag and to the inner bag may be suppressed effectively. Further, because the sealing sheet made of the low fusion point resin is provided corresponding to the outside air permeating points of at least the outer bag or the inner bag, the sealing sheet melts when the ambient temperature around the sealing sheet exceeds the melting point of the low fusion point resin, thus filling up the outside air permeating points. Therefore, it becomes possible to suppress the high temperature air from permeating to the inside of the outer bag or the inner bag from the outside air permeating points or due to thermal conduction via air within the outside air permeating point.

Further, the adiabatic bag having the good touch can be realized because a flexible fabric or non-woven fabric may be used as the sealing sheet as far as it melts when the ambient temperature surrounding the adiabatic bag increases.

The heat resistant adiabatic bag described in Claim 2 is what the sealing sheet made of the low fusion point resin is laminated in a body with the laminated sheet of at least the outer bag or the inner bag. By composing as described above, the heat resistance of the sealing sheet of the adiabatic bag is enhanced by effectively shutting off the facial aeration of the adiabatic bag further and the attachment of the sealing sheet may be improved by laminating the sealing sheet in a body with the laminated sheet.

The heat resistant adiabatic bag described in Claim 3 is what the sealing sheet is provided along the seam of at least the outer bag or the inner bag. Although the adiabatic property normally drops because heat permeates from seam holes, the sealing sheet melts and fills up the seam holes when heat tries to permeate from the seam holes, so that the air-tightness of the outer bag and the inner bag may be enhanced and the permeation of heat into the adiabatic bag may be prevented effectively.

The heat resistant adiabatic bag described in Claim 4 is what the sealing sheet is provided at the overlap portion of the flaps for opening/closing the opening of at least the outer bag or the inner bag. Normally, the gaps of the overlap portion of the flaps tend to become the outside air permeating point and heat permeates from this part. However, when the sealing sheet is provided as described above, the sealing sheet melts and fills up the gap at the overlap portion of the flaps, so that the air-tightness of the outer bag and the inner bag may be enhanced, thus effectively preventing heat from permeating into the adiabatic bag.

The heat resistant adiabatic bag described in Claim 5 is what the opening of the outer bag is created so as to be openable by a fastener made of heat resistant synthetic resin having small thermal conductivity; a cover section for covering the fastener from the outside is created at the part facing to the opening of the outer bag; and the sealing sheet is provided along the part facing to the fastener of the cover section. By constructing as described above, the passage area of the heat permeating path may be reduced. The use of the fastener made of the heat resistant synthetic resin having the small thermal conductivity allows the increase of the temperature within the outer bag to be suppressed by suppressing thermal conduction via the fastener and the sealing sheet provided along the part of the cover section facing to the fastener melts and fills up the small gap, thus preventing heat from permeating to the inside of the outer bag.

The heat resistant adiabatic bag described in Claim 6 is what any one of polyimide resin, polyurethane resin or polyester resin is used as the sealing sheet made of the low fusion point resin. When such thermosetting resin is used as the raw material, the permeation of heat into the adiabatic bag may be suppressed effectively because the melting point of the sealing sheet is 80 to 90°C and the sealing sheet melts and fills up the outside air permeating points when the ambient temperature surrounding the adiabatic bag exceeds 100°C due to a fire or the like.

The heat resistant adiabatic bag described in Claim 7 is what is provided with a box-like storage case which can be inserted to the inner bag and in which a shock absorber is attached on the inner face. Because the shock absorber is attached on the inner surface of the storage case, the contents within the storage case may be favorably protected from a shock. Further, because the shock absorber is attached within the box-like storage case, the shock absorber may be assembled readily as compared to the case of attaching the shock absorber to the inner bag made of the soft laminated sheet.

The heat resistant adiabatic bag described in Claim 8 comprises a flat main body whose upper face may be opened in the horizontal position and a lid for opening/closing the upper face of the storage case. By constructing as described above, the contents can be visually confirmed just by opening the lid without taking out the contents one by one. Further, the shock absorber may be assembled readily therein.

The heat resistant adiabatic bag described in Claim 9 is provided with heating means which is actuated when inter-

nal temperature of the inner bag or the storage case drops below a certain temperature. When this adiabatic bag is used in the outdoor in a cold district for instance, although the internal temperature of the adiabatic bag drops gradually along the decrease of the atmospheric temperature, the provision of the heating means allows the internal temperature to be kept at a certain temperature because the heating means is actuated when the internal temperature drops below the certain temperature.

The heat resistant adiabatic bag described in Claim 10 is what the inner bag is inserted to the outer bag almost without any gap while directing the opening side of the inner bag to the back side of the outer bag. By constructing as described above, the increase of temperature within the inner bag caused by heat permeating from the opening is suppressed further because the heat transmission path reaching to the opening of the inner bag is extended. Still more, because the increase of temperature within the inner bag is suppressed further because the inner bag is inserted to the outer bag almost without any gap therebetween and a passage area of the heat transmission path becomes small.

The heat resistant adiabatic bag described in Claim 11 is what the flap for opening/closing the opening of the inner bag is provided in the inner bag and the flap can be closed by a heat resistant face fastener. Accordingly, heat may be suppressed from permeating from the opening of the inner bag while fully maintaining the operability of the opening of the inner bag.

The heat resistant adiabatic bag described in Claim 12 is what a magnetic proofing shield is built in the laminated sheet of the outer bag. Accordingly, it becomes possible to prevent the contents stored in a magnetic recording medium such as a floppy disk from being extinguished carelessly when it is stored within the adiabatic bag.

The above and other advantages of the invention will become more apparent in the following description and the accompanying drawings.

FIG. 1 is a perspective view of an outer bag and an inner bag;
 FIG. 2 is a perspective view of a storage case and the inner bag;
 FIG. 3 is a perspective view of an adiabatic bag in a state when an opening/closing flap is opened;
 FIG. 4 is a perspective view of the adiabatic bag;
 FIG. 5 is a perspective view of an outer bag having another structure;
 FIG. 6 is a longitudinal section view of a laminated sheet of the outer bag;
 FIG. 7 is a development view of the laminated sheet used as the ground of the outer bag;
 FIGs. 8a and 8b are section views showing a state when a sealing sheet melts;
 FIG. 9 is a perspective view of the inner bag;
 FIG. 10 is a longitudinal section view of a laminated sheet of the inner bag;
 FIG. 11 is a perspective view showing a state when the storage case is opened;
 FIG. 12 is a perspective view showing a state when a heater is provided in the storage case;
 FIGs. 13a and 13b are perspective views showing another mode of the storage case; and
 FIG. 14 is a graph showing a relationship between heating time and increase of temperature.

A preferred embodiment of the present invention will be explained with reference to the drawings.

As shown in FIGs. 1 and 2, a heat resistant adiabatic bag 1 of the present invention comprises an outer bag A, an inner bag B inserted to the outer bag A almost without any gap and a storage case C inserted to the inner bag B. While storing valuables in the storage case C, the storage case C is inserted to the inner bag B and the inner bag B is inserted to the outer bag A while directing its opening 30 side to the back side of the outer bag A. Accordingly, the valuables are protected from a fire and the like by the triple structure of the both bags A and B and the storage case C. It is noted that although it is preferable to use the adiabatic bag 1 by putting it into a fireproof safe as described later from the aspect of fully exhibiting its performance, it may be also used solely.

The outer bag A will be explained below at first.

As shown in FIGs. 1, 3 and 4, the outer bag A is made of a sealing sheet which has heat resistant and adiabatic properties and which shuts off aeration. It has an opening 10 created at its front and is provided with side flaps 12 which extend forward and which are made in a body respectively with side sheets 11 at the right and left of the opening 10 and an inner flap 14 which extends forward at a lower sheet 13 in a body with it.

A belt-like opening/closing flap 15 is attached near the front edge of the right side sheet 11. The opening/closing flap 15 is connected with the front edge of an upper sheet 17 and with the front edge of the lower sheet 13, respectively, through an intermediary of two streaks of fasteners 16 so as to be able to close the opening 10 of the outer bag A. The two streaks of fasteners 16 are provided inside from the upper and lower edge of the opening/closing flap 15 by a certain distance and cover sections 18 which cover the fasteners 16 from the outside by the upper and lower edges of the opening/closing flap 15 are created.

It is noted that it is desirable to make the fasteners 16 by synthetic resin having a heat resistance to at least around 200°C and small thermal conductivity such as phenol resin, melamine resin, epoxy resin, fluororesin, and polyimide.

Further, as shown in FIG. 5, it is also possible to provide only one streak of fastener 23 for opening/closing the

opening 10 of the outer bag A so as to be able to close the opening/closing flap 15 by two streaks of face fasteners 24 provided along the fastener 23 and to cover the fastener 23 by the opening/closing flap 15 in order to simplify the opening/closing operation of the outer bag A.

The opening/closing flap 15 is made so that an idle edge portion thereof can be adhered to and fixed near the front edge of the left side sheet 11 via a face fastener 19. However, it is also possible to arrange so as to extend the right and left side flaps 12 more than a half of the whole length of the opening 10 so as to be able to overlap each other. It is also possible to create an opening/closing flap which extends forward from the upper sheet 17 to overlap it with the opening/closing flap 15. Further, it is possible to provide a face fastener for adhering faces of the flaps 12, 14 and 15 to enhance air-tightness of the opening 10 when it is closed. It is noted that it is preferable to use a material having an excellent heat resistance and small thermal conductivity for the face faster used here.

Sealing sheets F made of low fusion point resin are provided at the regions hatched in the figure in the overlap portions of the flaps 12, 14 and 15. The sealing sheet F made of low fusion point resin is a woven cloth or non-woven cloth using fibrous low fusion point resin. Thickness of the sealing sheet F is set to be the optimum thickness corresponding to the location where it is provided and it is made to have a thickness which is enough for filling a gap at the overlap portion when it melts when it is provided at the overlap portion of the flaps 12, 14 and 15 for example. Further, because it is desirable to melt in temperature around 80 to 90°C and to have the heat resistance also thereafter, polyimide resin, polyolephine resin and polyester resin may be used solely or in combination as the fibrous low fusion point resin used as the raw material. Further, not only the fibrous low fusion point resin, but also thin film low fusion point resin may be used.

Further, in order to enhance the air-tightness of the outer bag A to prevent heat from permeating to the inside, the above-mentioned sealing sheet F is provided along the part facing to the fasteners 16 of the cover section 18 for covering the fasteners 16 provided at the opening 10 of the outer bag A from the outside. It is also possible to provide the sealing sheet F at the points where outside air permeates other than the parts illustrated above.

As the laminated sheet S making the outer bag A, four-layered sealing sheet composed of a surface layer 21, a first intermediate layer 22, a second intermediate layer 23 and an internal layer 24 is used. It is also possible to make a sheet made of a plurality of layers other than the four-layered structure.

The surface layer 21 is made of a fabric made of organic or inorganic fiber excellent in heat resistant and fire-proofing properties to which an aluminum coating is applied, an aluminum foil is laminated, aluminum is evaporated or heat resistant resin is coated on the outside. Alamide fiber or phenol resin may be used as the organic fiber and ceramic fiber, carbon fiber, silicon carbide fiber, asbestos fiber, glass fiber or rock fiber may be used as the inorganic fiber. Silicon resin may be used as the heat resistant resin to be coated. The heat resistance may be enhanced further by coating aluminum or laminating the aluminum foil because reflectivity of radiant heat increases.

The first intermediate layer 22 is made of the sealing sheet F whose raw material is the low fusion point resin. Since the sealing sheet F making the first intermediate layer 22 is laminated across the whole laminated sheet S in a body, its property of shutting off the facial aeration of the laminated sheet S is enhanced further during a fire, thus preventing the permeance of heat from the surface of the laminated sheet S as well as from a seam holes 25 more effectively. Since the sealing sheet F is attached in a body with the laminated sheet S as the first intermediate layer 22, it may be attached readily as compared to the case of attaching the sealing sheet F to the outer bag A separately.

Or, the sealing sheet F may be provided around a margin to seam 26 of the laminated sheet S cut for the outer bag A as seen in FIG. 7. This location is where the seam holes 25 are created in seaming the outer bag A, i.e. the location from which the outside air permeates. This case is preferable because an amount of sealing sheet F used is small. Further, the sealing sheet F may be provided along the seam holes 25 in seaming the outer bag A without providing it as the first intermediate layer 22 or may be pasted on the surface layer of the margin 26. It is preferable because the location where the sealing sheet F is provided may be readily defined.

The second intermediate layer 23 is made of a felt or a fabric made of organic or inorganic fiber excellent in heat resistant and fire-proofing properties. Alamide fiber or phenol fiber may be used as the organic fiber and ceramic fiber, carbon fiber and the like may be used as the inorganic fiber. The felt or the fabric may be coated by a polyimide film excellent in heat resistant and flame-proof properties. Or, it may be coated by the polyimide film hermetically to fill inert gas such as nitrogen gas therein. Or, a magnetic material such as alnico, ferrite, nickel and the like or a sheet member containing carbon may be interposed between the surface layer 21 and the internal layer 24 as a magnetic-proofing shield in consideration of storing a magnetic recording medium such as a floppy disk. It is noted that the first intermediate layer 22 and the second intermediate layer 23 may be arranged in the opposite way.

The internal layer 24 is a fabric or knit made of glass fiber, carbon fiber, alamide fiber, phenol fiber or the like which is coated by a resin coating such as silicon resin. However, the internal layer 24 may be formed to have a laminated structure of fabric or knit of the same component or different components.

It becomes possible to prevent heat from permeating into the outer bag A and the adiabatic property is enhanced further by the air within the first intermediate layer 22 and the second intermediate layer 23 sealed between the surface layer 21 and the internal layer 24 because the aeration through the surface layer 21 and the internal layer 24 may be

shut off by applying aluminum coating, laminating the aluminum foil, evaporating aluminum or applying the heat resistant resin coating to the surface layer 21 and by applying the resin coating to the internal layer 24. Although the seam holes 25 are created at seaming portions in manufacturing the outer bag A by using the laminated sheet S made as described above, the sealing sheet F melts and fills up the seam holes 25 as shown in FIG. 8 when the ambient temperature around the sealing sheet F exceeds the melting point of the low fusion point resin even if the outside heat surrounding the outer bag A tries to permeate to the inside through the seam holes 25 because the sealing sheet F is laminated in a body around the seam holes 25 as described above. Further, because the sealing sheet F is provided at the overlap part of the flaps 12, 14 and 15, the sealing sheet F melts and fills up the gap at the overlap part of the flaps where the outside air permeates even when heat permeates through this part. Similarly to that, because the sealing sheet F is provided in the cover section 18 along the part facing to the fasteners 16, the outside air permeating points of this part may be also filled up.

That is, when the outer bag A is exposed to high temperature air or heat, the outside air permeating points are all filled up and the air-tightness increases, so that no heat permeates into the outer bag A and the temperature therein may be preferably suppressed from increasing.

Although it is conceivable to seal the outside air permeating points by some heat resistant resin or the like beforehand in order to enhance the air-tightness of the outer bag A without using the sealing sheet F, it is not preferable as a product because the resin part becomes stiff and the softness of the outer bag A drops, giving a bad touch. Further, although a film-like sheet may be used as the sealing sheet F, it is preferable to enhance the softness to improve the touch by making it by the fabric or non-woven fabric using fiber material made of the low fusion point resin because there remains stiffness more or less at the film part.

Further, although not shown, it is preferable to provide a shoulder strap or a hand strap so that the adiabatic bag 1 can be carried out right away in emergency.

Next, the inner bag B will be explained with reference to FIGs. 1, 2, 9 and 10.

As shown in FIG. 10, the inner bag B is made of a laminated sheet T which has a heat resistance and which shuts off aeration. It is provided with an opening 30 formed at its front, side flaps 32 which extend forward and are formed in a body with right and left side sheets 31, respectively, and an opening/closing flap 34 which extends forward and which is formed in a body with a lower sheet 33.

An idle end portion of the opening/closing flap 34 is arranged so as to be able to be adhered and fixed near the front edge of the upper sheet 36 via a face fastener 35 and the right and left side flaps 32 are arranged so as to be adhered and fixed at the middle portion of the opening/closing flap 34 via a face fastener 37. It is preferable to use fasteners made of a heat resistant material whose thermal conductivity is small as the face fasteners 35 and 37. It is also preferable to enhance the adiabatic property of the inner bag B by providing a thick sealing sheet F at the overlap portion of the side flap 32 and the opening/closing flap 34 similarly to the outer bag A, though the inner bag B is not required to have adiabatic property so much like the outer bag A.

As the laminated sheet T making the inner bag B, a laminated sheet T of three-layered structure of a surface layer 41, an intermediate layer 42 and an inner facial layer 43 is used as shown in FIG. 10. However, it is also possible to form a sheet composed of a plurality of layers other than three.

Similarly to the internal layer 24 of the outer bag A, the surface layer 41 and the internal layer 43 are made of a fabric or knit woven from glass fiber, carbon fiber, alamide fiber, phenol fiber or the like to which resin coating such as silicon resin is applied.

Similarly to the second intermediate layer 23 of the outer bag A, the intermediate layer 42 is made of a felt or fabric woven from heat resistant and fire-proofing organic/inorganic fiber. However, it is also possible to provide a fabric or knit woven from glass fiber to which silicon coating is applied at the inner side of the intermediate layer. Further, in consideration of storing ICs, LSIs, floppy disks and the like within the inner bag B, laminated sealing members made of electrostatic shielding urethane foam may be provided to prevent the devices from being destroyed by static electricity.

It is noted that it is also possible to enhance the adiabatic property of the inner bag B by laminating the sealing sheet F in a body or by pasting the sealing sheet F partially between the intermediate layer 42 and the surface layer 41 or between the inner facial layers 43 similarly to the case of the outer bag A.

It is desirable to insert the inner bag B in the outer bag A while directing the opening 30 side toward the back side of the outer bag A. Thereby, a path of heat is extended. Beside that, the insertion direction may be indicated by an arrow on the upper face of the inner bag B for example in order not to insert the inner bag B to the outer bag A in the opposite way. Further, it is preferable to arrange such that the further the back side of the outer bag A, the shorter the distance between the upper and lower sheets 17 and 13 becomes and the further the opening 30 side of the inner bag B, the shorter the distance between the upper and lower sheets 36 and 33 becomes in order not to allow to insert in the opposite direction, such that the further the back side of the outer bag A, the shorter the width, i.e. the length in the right and left direction, of the upper and lower sheets 17 and 13 becomes and the further the opening 30 side of the inner bag B, the shorter the width of the upper and lower sheets 36 and 33 becomes in order not to allow to insert in the opposite direction, or such that the outer bag A is connected with the inner bag B by a strap or the like in order not to allow to

insert in the opposite direction.

As described above, the present invention is very preferable because the heat resistance of the adiabatic bag 1 may be enhanced by the very simple arrangement that the sealing sheet F made of the low fusion point resin is laminated in a body with the laminated sheet S or the laminated sheets S and T.

Next, the storage case C will be explained. The storage case C allows the valuables stored in the adiabatic bag 1 to be confirmed or taken in and out readily. However, because the outer bag A and the inner bag B can maintain the enough adiabatic property, the storage case C may be omitted.

As shown in FIG. 11, the storage case C is a flat box-like case made of a thick paper or synthetic resin by which aeration is shut off and comprises a main body 50 and a lid 51. The lid 51 is openably linked to one side of the main body 50 through an intermediary of a connecting section 52. The connecting section 52 is connected to one side of a bottom plate 53 of the main body 50 and side walls 54 are provided at the remaining three side. Frame walls 56 are provided at the remaining three walls of the lid 51 except of the side of the connecting section 52. The frame walls 56 are formed so as to overlap with the above-mentioned side walls 55 when the lid 51 is closed as shown in FIG. 2. The frame walls 56 and the side walls 54 are provided with hook members for hooking the lid 51 when the lid 51 is closed. Although concave and convex hook members are shown in the figure, various methods other than that may be adopted like using face fasteners for example.

It is very practical because the contents may be readily and visually confirmed just by opening the lid 51 of the storage case C and the contents need not be taken out one after another by creating the storage case C as described above.

Further, a shock absorbing function may be added to the adiabatic bag 1 by providing a heat resistant shock absorber 60 within the storage case C. Because the storage case C is created as described above and is provided with a wide opening, the shock absorber 60 may be readily attached therein and the manufacturing process may be preferably simplified.

It is preferable to use a heat resistant closed cell type member such as Suntec Foam (manufactured by Asahi Chemical Industry Co., Ltd.) as the shock absorber 60.

That is, while there is a case when the fireproof safe receives a large shock as the fireproof safe drops when the floor gives way or columns and beams hit the fireproof safe during a fire, it becomes possible to protect the valuables from various shocks by providing the shock absorber 60.

Beside one shown in FIG. 11, a case whose lid can be separated completely from the main body 50 as shown in FIG. 13a or a case whose main body is connected directly with a lid 51 without the connecting section 52 as shown in FIG. 13b may be adopted as the storage case C.

It is noted that although it is conceivable to provide the shock absorber 60 within the inner bag B in order to add the shock absorbing function to the adiabatic bag 1, it is not preferable to provide the shock absorber 60 therein because the inner bag B has the structure in which the narrow opening 30 is provided only at the front as described above and thus the manufacturing process is complicated. Further, although it is conceivable to arrange the upper face sheet 36 or the lower face sheet 33 of the inner bag B to be openable to make it as an opening, it is not also preferable because the outside air permeating point is also widened in the same time and it becomes difficult to enhance the air-tightness, though the shock absorber 60 may be readily provided because the opening of the inner bag B is widened in such a structure.

The adiabatic bag 1 comprising the outer bag A, the inner bag B and the storage case C thus structured is very useful in keeping valuables as described below.

At first, valuables such as money, jewelry, important documents such as securities, recording media such as floppy disks in which important data is recorded are stored in the storage case C. Next, this storage case C is inserted to the inner bag B and the inner bag B is inserted to the outer bag A. The adiabatic bag 1 which is structured as described above and in which the valuables are stored is kept within a fireproof safe.

When the fireproof safe encounters a fire, it is heated up by flames to high temperature and the internal ambient temperature also increases rapidly up to about 100°C. That is, the ambient temperature around the adiabatic bag 1 also increases rapidly up to about 100°C. Then, although high temperature air and heat try to permeate into the adiabatic bag 1, the heat is prevented from permeating from the surface of the laminated sheet S because the outer bag A composing the adiabatic bag 1 is formed by the laminated sheet S which has the heat resistant and adiabatic properties and which shuts off aeration as described above. Although part of heat tries to permeate from the outside air permeating point, the sealing sheet F at the outside air permeating point melts by this heat and fills up the point, so that the outer bag A is put into the air-tight state, thus preventing the heat from permeating from that point. Thereby, it becomes possible to prevent the heat from permeating to the inside of the outer bag A more effectively.

Further, even if the heat permeates into the outer bag A, the heat cannot but permeate only from the outside air permeating point of the inner bag B similarly to the case of the outer bag A if it tries to permeate into the inner bag B. However, because the sealing sheet F made of the low fusion point resin is laminated in a body around the outside air permeating point of the inner bag B, similarly to the outer bag A, the inner bag B is put into the air-tight state similarly

to the outer bag A and no heat permeates into the inner bag B. Therefore, because no heat permeates into the storage case C, the valuables stored in the adiabatic bag 1 may be protected from the heat.

Then, even if the outer bag A and the inner bag B are kept in the air-tight state and the ambient temperature around the adiabatic bag 1 continues to be high, the heat resistant and adiabatic effects of the laminated sheets S and T are effective, so that the temperature within the adiabatic bag 1 may be suppressed from increasing. Therefore, the valuables stored in the adiabatic bag 1 may be kept without being exposed to the high temperature and heat.

Although the heat resistant adiabatic bag 1 of the present invention has been explained by exemplifying mainly the case of fire, the adiabatic bag 1 is also effective in using for a certain period of time in the outdoor in a cold district in winter season because the internal temperature is hardly influenced by the outside ambient temperature. For instance, it is conceivable to be useful for emergency medical treatments in the outdoor in a cold district in winter season by storing emergency medical kits whose quality may drop under low temperature within the adiabatic bag 1. Beside them, it is expected to contribute in keeping the quality of a micro-film which is weak to low temperature by storing it within the adiabatic bag 1.

However, when the ambient temperature around the adiabatic bag 1 drops, the internal temperature of the adiabatic bag 1 also drops inevitably, so that the micro-film and the chemicals may be influenced by that.

In order to deal with such a case, a heater 70 having a simple structure may be provided as a heating means in the adiabatic bag 1 of the present invention. As shown in FIG. 12, the heater 70 comprises a film heater 71 built in the storage case C, a power source 72 of the film heater 71 and a switch 73 of the power source 72 of the film heater 71. Considering that the power source 72 is built in the storage case C, it is desirable to use a dry cell or a button type battery which need only a small space. The power switch 73 may be arranged such that a user operates it or it is actuated automatically when the ambient temperature within the storage case C drops below a certain temperature by using a thermostat. The heater 70 may be provided also within the inner bag B.

Because the internal temperature of the adiabatic bag 1 is always kept within a certain range by adopting such structure, valuables which are sensitive to changes of temperature may be suitably kept.

Next, a performance test carried out on the adiabatic bag will be briefly explained.

The adiabatic bag used in this performance test was a bag in which the storage case C and the sealing sheet F in the adiabatic bag 1 described above were omitted, the inner bag B was inserted to the outer bag A by directing the opening 30 side toward the back side of the outer bag A and the opening 10 of the outer bag A is opened/closed by using a fastener 16 made of a material whose thermal conductivity is small.

As the laminated sheet composing the outer bag A, a sheet in which the surface layer 21 is a fabric made of alamide fiber on which aluminum was evaporated, the first intermediate layer 22 is a felt made of ceramic fiber whose thickness is 12 mm and the internal layer 24 is a laminate of fabrics made of glass fiber to which silicon coating had been applied and of alamide fiber to which silicon coating had been applied.

As the laminated sheet composing the inner bag B, a laminate whose surface layer 41 and the inner facial layer 43 are a fabric made of alamide fiber to which silicon coating had been applied and the intermediate layer is made of a felt made of ceramic fiber whose thickness from the outer face is 6 mm and electrostatic urethane foam was used.

Then, the adiabatic bag was put into the fireproof safe and the fireproof safe was set within a heating furnace. The temperature within the furnace was increased along a standard temperature curve in conformity with the JIS Standard S1037 to set that the temperature within the fireproof safe increases gradually up to 180°C. The temperature within the fireproof safe and the temperature within the inner bag B were measured by every 30 minutes until the temperature within the fireproof safe reaches to 180°C. Then, the result shown in Table 1 was obtained. A diagram shown in FIG. 14 was prepared by using the data shown in Table 1.

Table 1

Time (min.)	Temperature within Safe (°C)	Temperature within Inner Bag (°C)			Temperature within Outer Bag (°C)		
		Right Opening Part	Middle Part	Left Bottom Part	Right Opening Part	Middle Part	Left Bottom Part
0	21.0	19.7	19.7	19.7	19.8	19.8	19.8
30	57.3	21.4	21.1	21.3	27.0	29.1	28.8
60	95.8	32.3	31.3	32.3	47.5	49.0	49.7
90	134.5	52.5	51.1	52.9	72.6	73.9	75.0
120	172.8	77.2	75.7	78.2	102.6	104.0	104.3

Table 1 (continued)

Time (min.)	Temperature within Safe (°C)	Temperature within Inner Bag (°C)			Temperature within Outer Bag (°C)		
		Right Opening Part	Middle Part	Left Bottom Part	Right Opening Part	Middle Part	Left Bottom Part
135	181.0	89.5	88.5	91.5	119.0	119.5	119.0

As shown in Table 1 and FIG. 14, it can be seen that the rate of increase of temperature within the inner bag B is slower than the rate of increase of temperature within the safe and within the outer bag A and that it is kept in low temperature of less than 60°C for about 100 minutes from the beginning of heating. That is, because accessories such as peal and opal and recording media such as a floppy disk tend to be deformed or affected when the temperature exceeds 60°C, they may be protected from being deformed or affected by heat for a long period of time by storing those valuables within the adiabatic bag and the safe by more than three time as compared to the case when they are just put into the safe.

It is noted that although no performance test was carried out on the adiabatic bag 1 using the sealing sheet F made of the low fusion point resin, the adiabatic bag 1 is considered to be able to realize excellent characteristics than the adiabatic bag whose performance had been tested because the sealing sheet F melts when the ambient temperature reaches around 80 to 90°C and fills up small gaps in the fastener 16 and the seaming holes 25.

As described above, according to the heat resistant adiabatic bag of the present invention, the heat resistance and adiabatic property against the increase of ambient temperature around the adiabatic bag may be improved considerably by the simple structure of making the outer bag by the laminated sheet which has the heat resistant and adiabatic properties and which shuts off aeration, of making the inner bag by the laminated sheet which has the adiabatic property and which shuts off aeration and of inserting the inner bag to the outer bag almost without any gap therebetween. Therefore, when this adiabatic bag is stored within a safe, the time during which valuables in the inner bag can be protected is prolonged considerably as compared to the case of storing the valuables just in the safe. Accordingly, it becomes possible to prevent the valuables stored in the inner bag from being burned or lost or from being deformed or affected by heat for a long period of time by using the existing safe.

Further, even if the adiabatic bag is exposed to high temperature continuously for a long period of time due to a fire or the like, the contents stored in the inner bag may be protected from heat by preventing it from permeating to the outer bag or the inner bag by using the sealing sheet made of the low fusion point resin which melts when it touches high temperature air and which fills up all the outside air permeating points. Accordingly, when valuables such as money, jewelry, important documents such as securities and recording media in which important data is recorded are stored within the adiabatic bag which is stored in the fireproof safe, the contents can be protected from heat because no heat permeates into the outer bag or into the inner bag even if the temperature within the fireproof safe rises up to around 100°C and the laminated sheet composing the adiabatic bag has the heat resistant and adiabatic properties.

It is very preferable because the flexible fabric or non-woven fabric using fibered low fusion point resin may be used as the sealing sheet attached in the adiabatic bag, so that the adiabatic bag having the good touch can be realized.

When the adiabatic bag is arranged as described in Claim 2, the heat resistance of the sealing sheet of the adiabatic bag is enhanced and the contents within the adiabatic bag may be protected from high temperature air or heat for a long period of time because the sealing sheet made of the low fusion point resin is laminated in a body with the laminated sheet of at least the outer bag or the inner bag. Further, because the sealing sheet may be attached readily in a body with the laminated sheet and the facial aeration of the adiabatic bag may be readily shut off, the air-tightness of the adiabatic bag may be enhanced.

When the adiabatic bag is arranged as described in Claim 3, the sealing sheet is provided along the seam of at least the outer bag or the inner bag, so that the sealing sheet fills up holes of the seam even when heat tries to permeate from the holes of the seam and the air-tightness of the outer bag may be enhanced effectively by the small amount of the sealing sheet. It then allows the production cost of the adiabatic bag to be decreased.

When the adiabatic bag is arranged as described in Claim 4, the sealing sheet is provided at the overlap portion of the flaps for opening/closing the opening of at least the outer bag or the inner bag, so that the sealing sheet provided at the gap of the overlap portion of the flaps fills up this part even when heat tries to permeate therefrom and the air-tightness of the outer bag may be enhanced effectively again by the small amount of the sealing sheet.

When the adiabatic bag is arranged as described in Claim 5, the increase of the ambient temperature within the outer bag may be suppressed while fully maintaining the operability of the opening of the outer bag. Further, even when heat tries to permeate, the sealing sheet at the cover section covering the fastener provided in the outer bag melts and fills up the opening, thus preventing high temperature air from permeating. Accordingly, it is very suitable in protecting

the contents.

While it has been known that the temperature within the fireproof safe rises rapidly up to about 100°C by a fire, the air-tightness of the adiabatic bag may be enhanced effectively even when the adiabatic bag is exposed to high temperature air or heat due to a fire or the like because the sealing sheet made of the low fusion point resin used in the inventive heat resistant adiabatic bag melts around 80 to 90°C when any one of polyimide resin, polyurethane resin or polyester resin described in Claim 6 is used.

Then, the adiabatic bag which can sustain a shock may be realized by storing the storage case described in Claim 7 within the inner bag further. For instance, even when the fireproof safe installed at a high floor drops due to a fire, the contents may be protected from the high temperature heat caused by the fire and from the shock caused by the drop.

When the adiabatic bag is arranged as described in Claim 8, it is very practical because the contents can be visually confirmed just by opening the lid without taking out the contents one by one. Such arrangement is very preferable because the shock absorber may be assembled readily therein, leading to the reduction of the production cost.

Because the temperature within the adiabatic bag is hardly affected by the outside temperature, the adiabatic bag may be used in the outdoor in a cold district for instance. In such a case, it is preferable to provide the heating means which is actuated when the internal temperature drops below a certain temperature within the inner bag or the storage case of the adiabatic bag as described in Claim 9 because the internal temperature of the adiabatic bag may be kept at a certain temperature by the heating means even when microfilms or chemicals which are weak to low temperature as the contents.

When the inner bag is inserted to the outer bag almost without any gap while directing the opening side of the inner bag to the back side of the outer bag as described in Claim 10, the increase of temperature within the inner bag caused by heat permeating from the opening is suppressed further and the performance for protecting the valuables from the heat may be improved further because the heat transmission path reaching to the opening of the inner bag is extended and the passage area thereof becomes small.

When the adiabatic bag is arranged as described in Claim 11, heat may be suppressed from permeating from the opening of the inner bag while fully maintaining the openability of the opening of the inner bag.

When the adiabatic bag is arranged as described in Claim 12, it becomes possible to prevent the contents stored in a magnetic recording medium such as a floppy disk from being extinguished carelessly when it is stored within the adiabatic bag.

While preferred embodiments have been described, variations thereto will occur to those skilled in the art within the scope of the present inventive concepts which are delineated by the following claims.

Claims

1. A heat resistant adiabatic bag, comprising:

an outer bag made of a laminated sheet which has heat resistant and adiabatic properties and which shuts off aeration; and
 an inner bag made of a laminated sheet which has heat resistant and adiabatic properties and which shuts off aeration;
 said inner bag being allowed to be inserted to said outer bag almost without any gap therebetween;
 a sealing sheet made of low fusion point resin being provided corresponding to outside air permeating points of at least said inner bag or said outer bag.

2. The heat resistant adiabatic bag according to Claim 1, wherein said sealing sheet is laminated in a body with a laminated sheet of at least said outer bag or said inner bag.

3. The heat resistant adiabatic bag according to Claims 1 or 2, wherein said sealing sheet is provided along a seam of at least said outer bag or said inner bag.

4. The heat resistant adiabatic bag according to any one of Claims 1 through 3, wherein said sealing sheet is provided at an overlap portion of flaps for opening/closing an opening of at least said outer bag or said inner bag.

5. The heat resistant adiabatic bag according to any one of Claims 1 through 4, wherein said opening of said outer bag is created so as to be openable by a fastener made of synthetic resin having small thermal conductivity and heat resistance;

a cover section for covering said fastener from the outside is created at the part facing to said opening of said outer bag; and

said sealing sheet is provided along the part facing to said fastener of said cover section.

5 6. The heat resistant adiabatic bag according to any one of Claims 1 through 5, wherein any one of polyimide resin, polyorephine resin or polyester resin is used as low fusion point resin used for said sealing sheet made of the low fusion point resin.

7. The heat resistant adiabatic bag according to any one of Claims 1 through 6, further provided with a box-like storage case which can be inserted to said inner bag and which is provided with a shock absorbing member.

10 8. The heat resistant adiabatic bag according to any one of Claims 1 through 7, wherein said storage case comprises a flat main body whose upper face may be opened in the horizontal position; and

a lid for opening/closing the upper face of said storage case.

15 9. The heat resistant adiabatic bag according to any one of Claims 1 through 8, wherein said inner bag or said storage case is provided with heating means which is actuated when internal temperature drops below a certain temperature.

20 10. The heat resistant adiabatic bag according to any one of Claims 1 through 9, wherein said inner bag is inserted to said outer bag almost without any gap while putting the opening side of said inner bag toward the inside of said outer bag.

25 11. The heat resistant adiabatic bag according to any one of Claims 1 through 10, wherein said inner bag is provided with a flap which can close said opening by a heat resistant face fastener.

12. The heat resistant adiabatic bag according to any one of Claims 1 through 11, wherein a magnetic-proof shield is incorporated in said laminated sheet of said outer bag.

Fig. 1

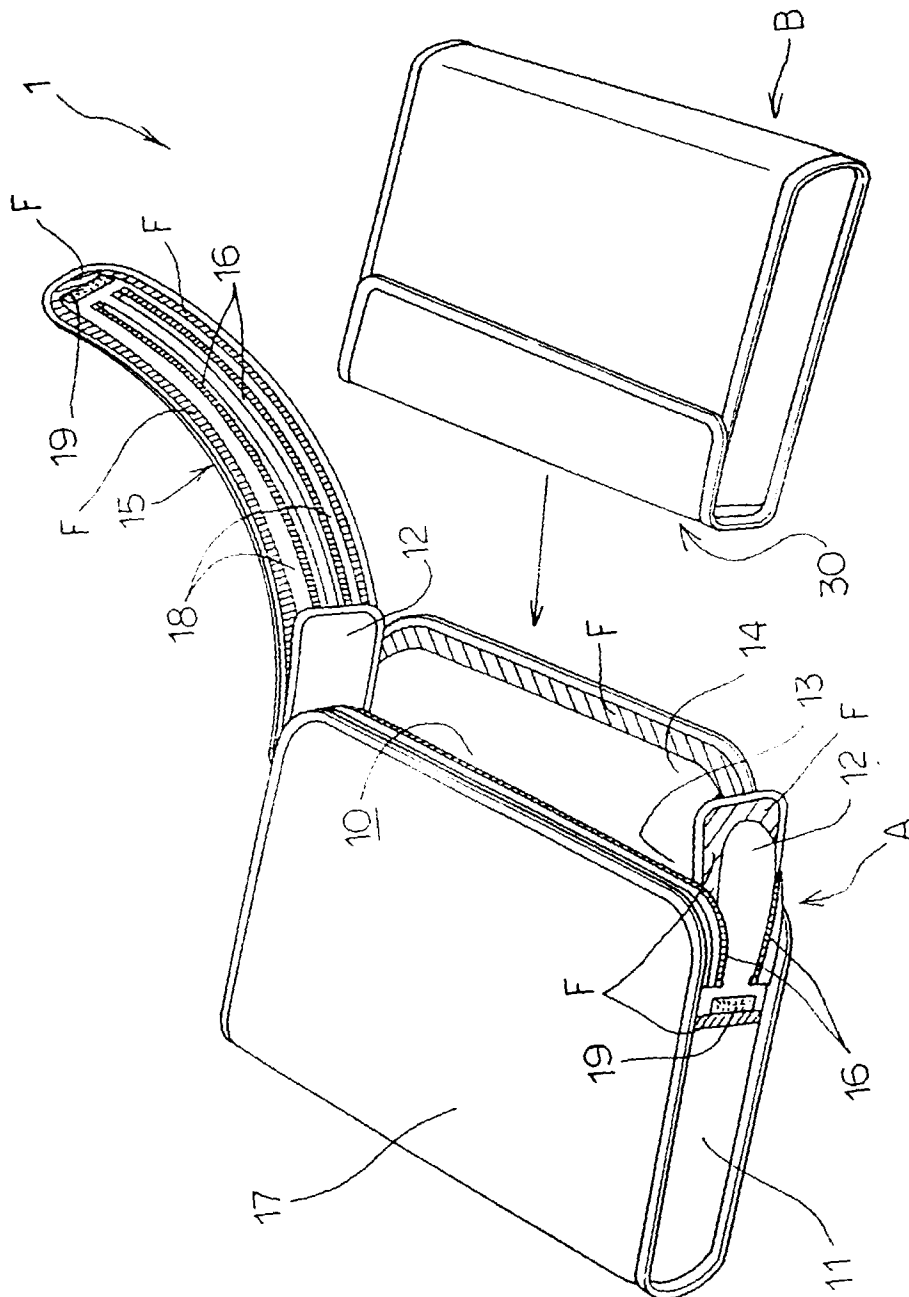


Fig. 2

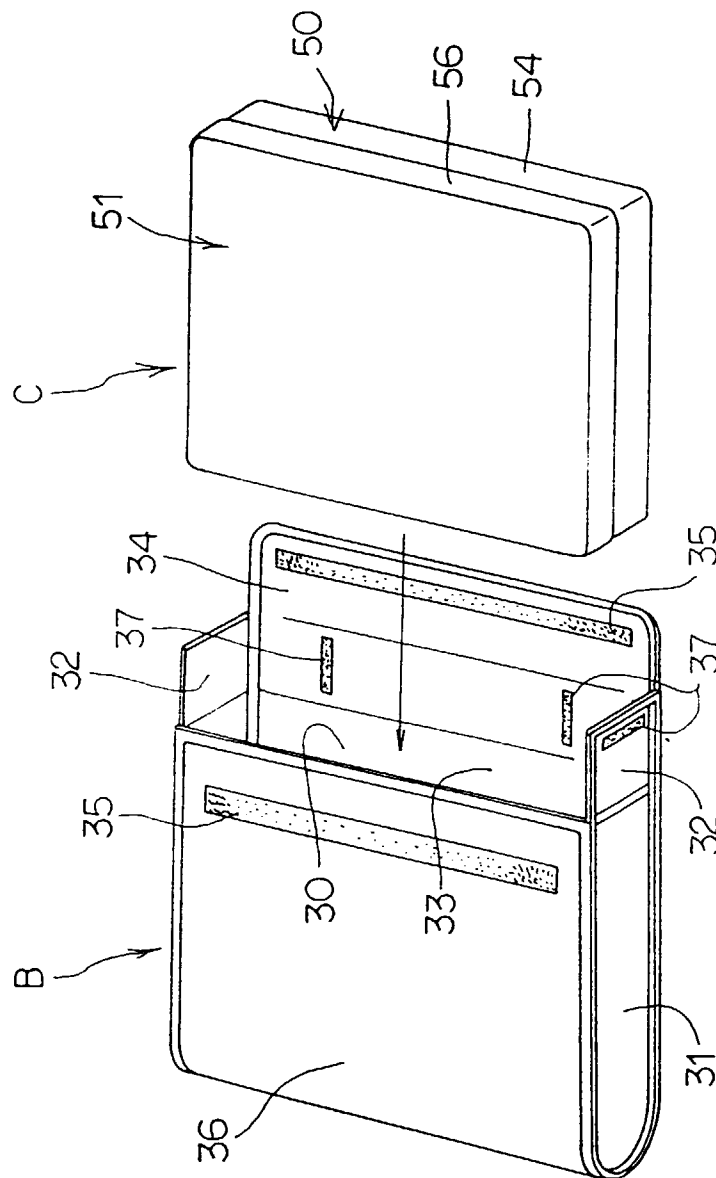


Fig. 3

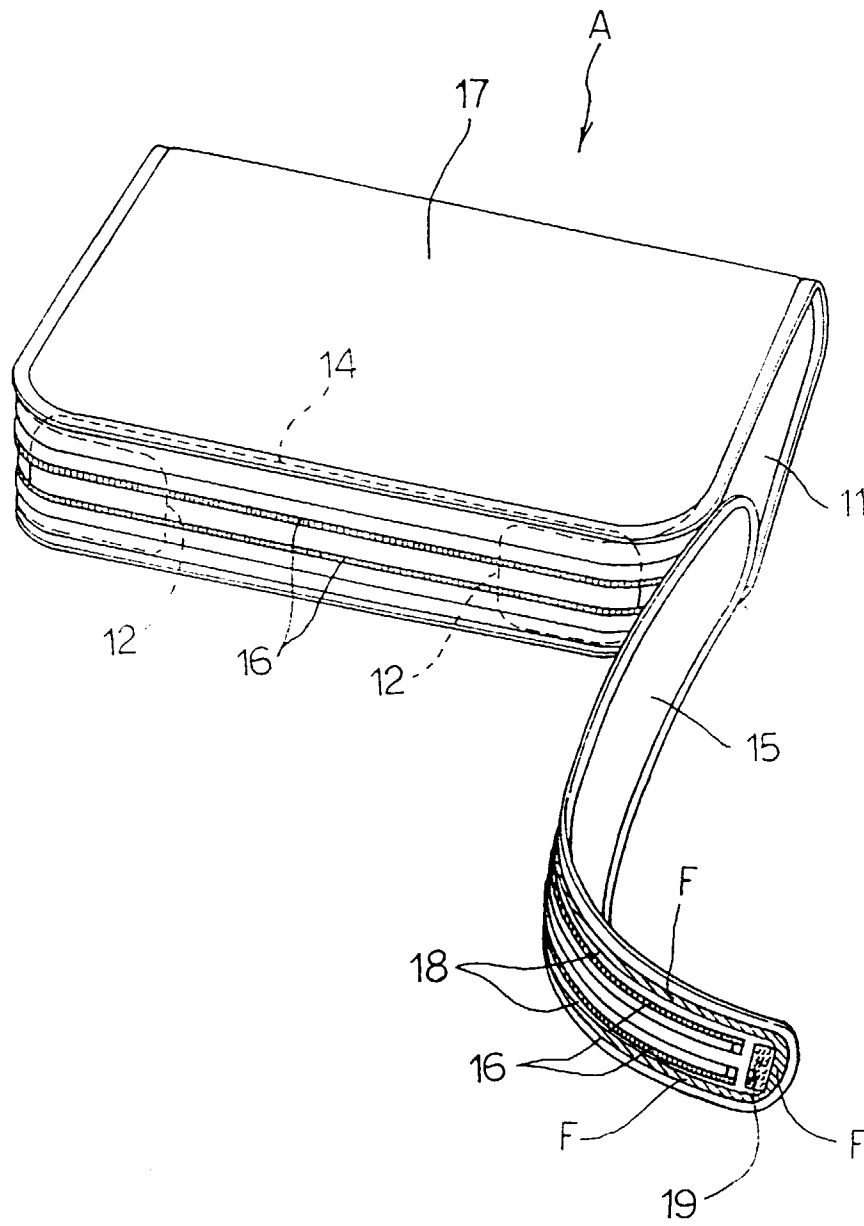


Fig. 4

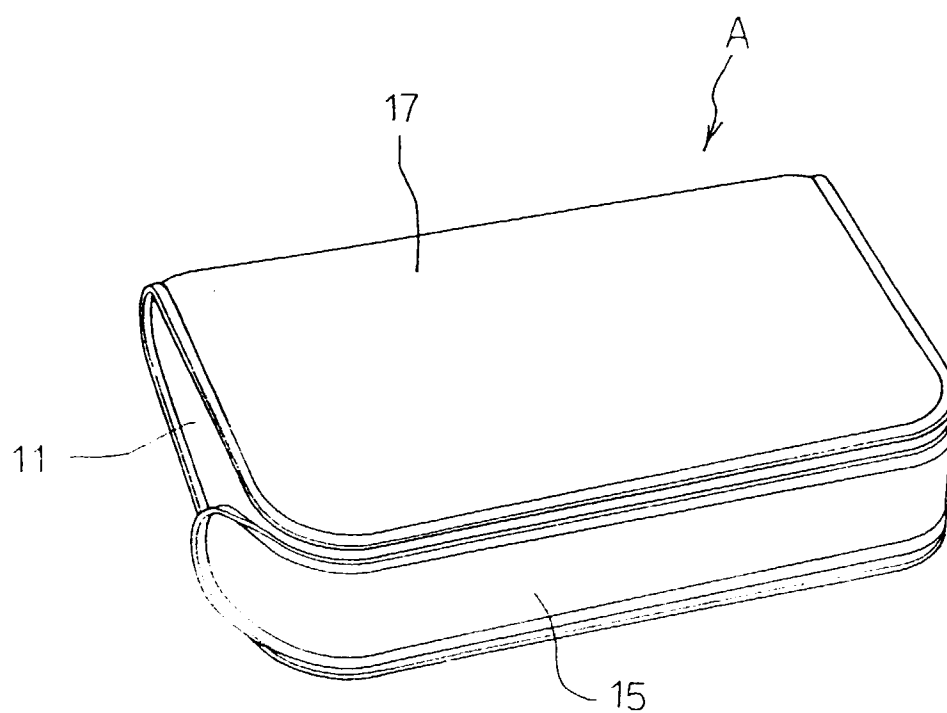


Fig. 5

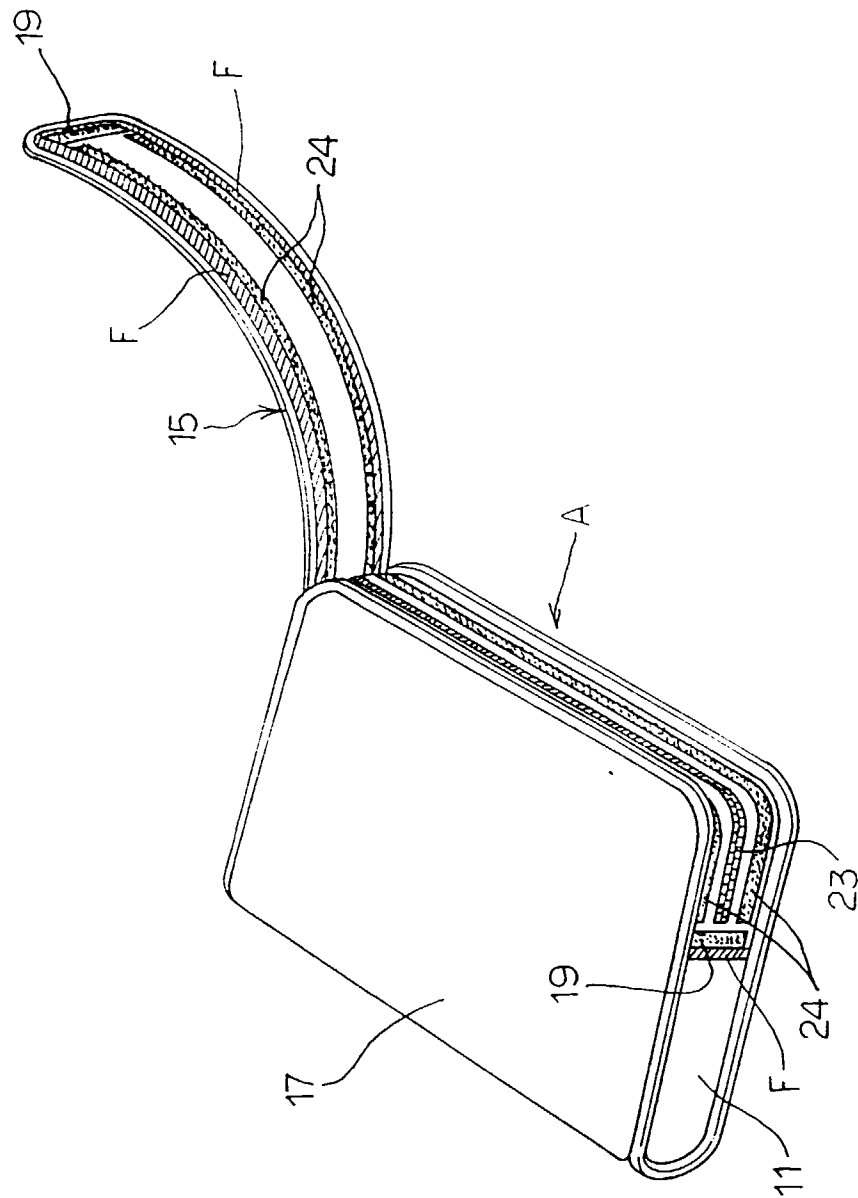


Fig. 6

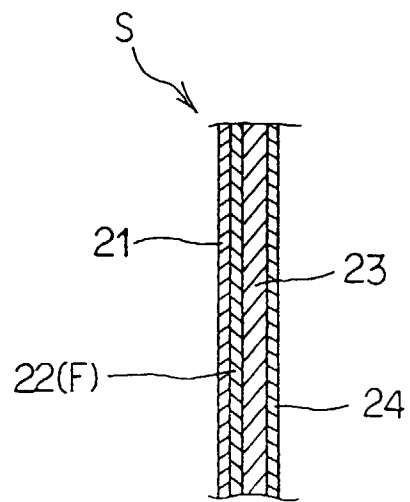


Fig. 7

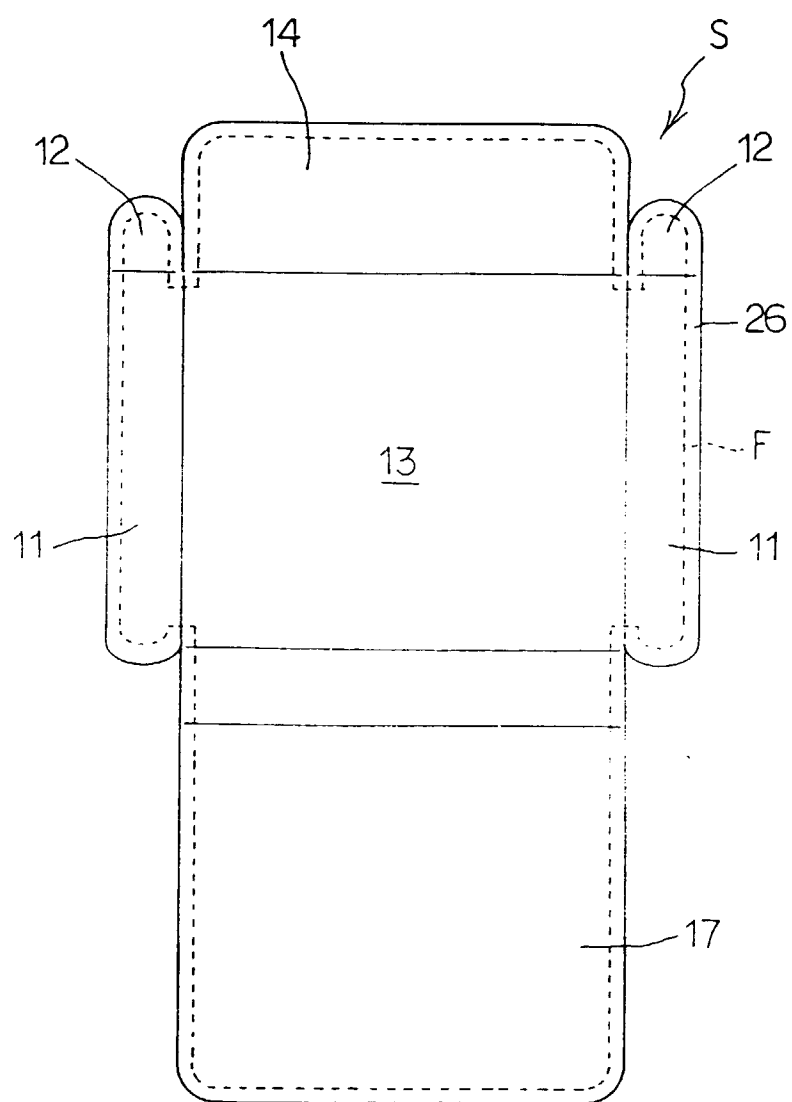


Fig. 8

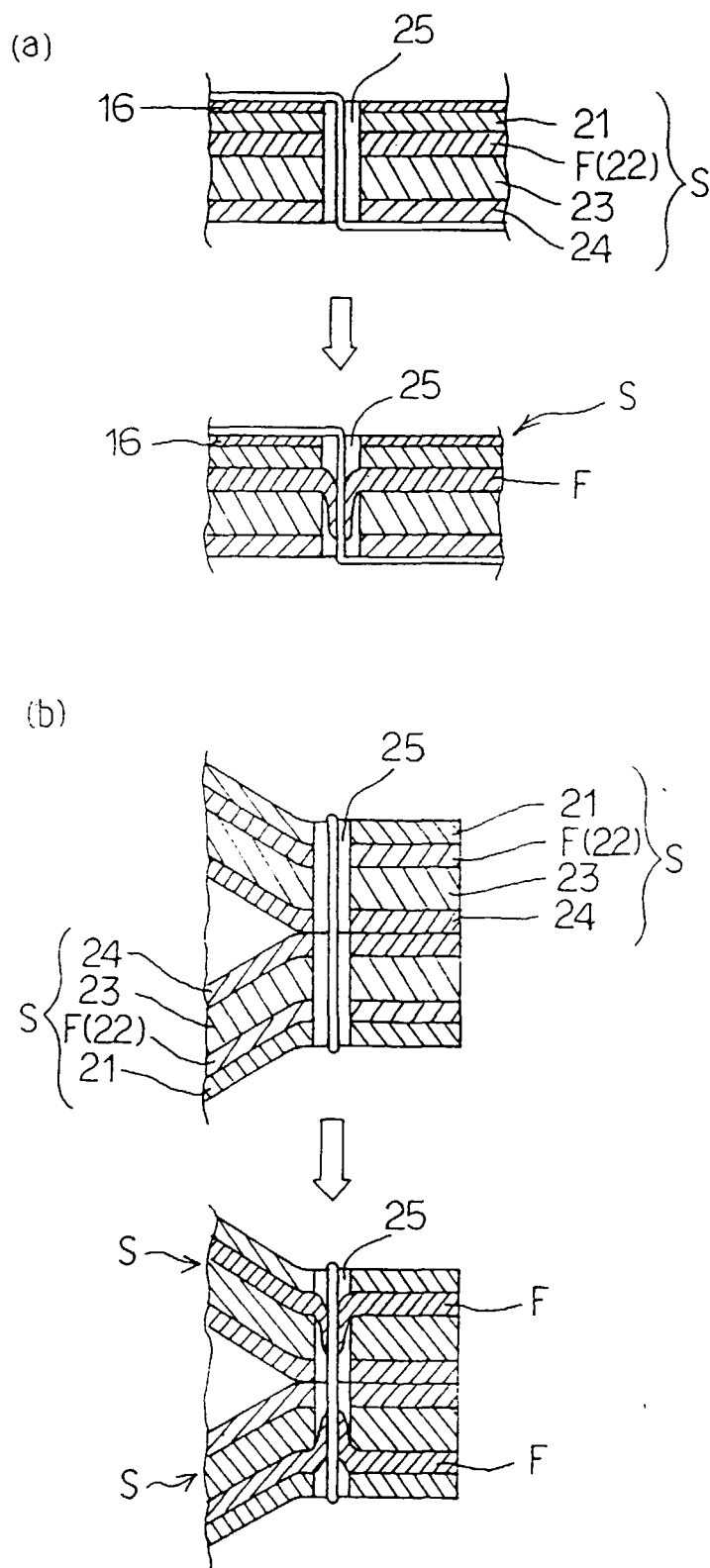


Fig. 9

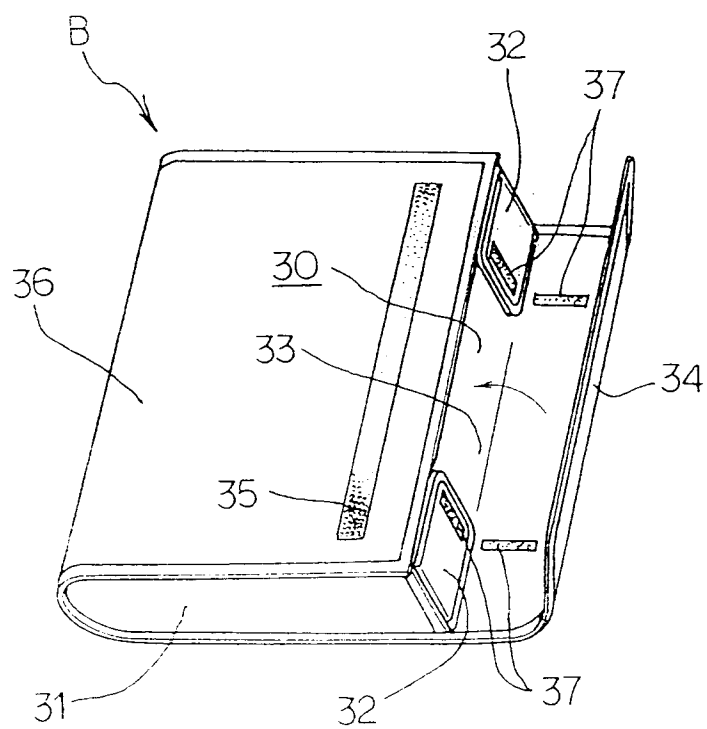


Fig. 10

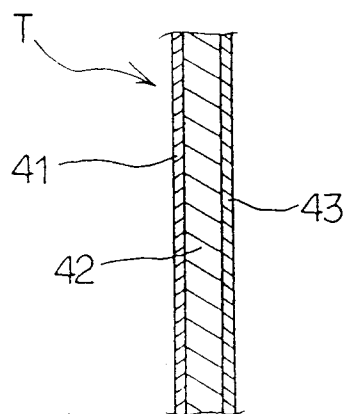


Fig. 11

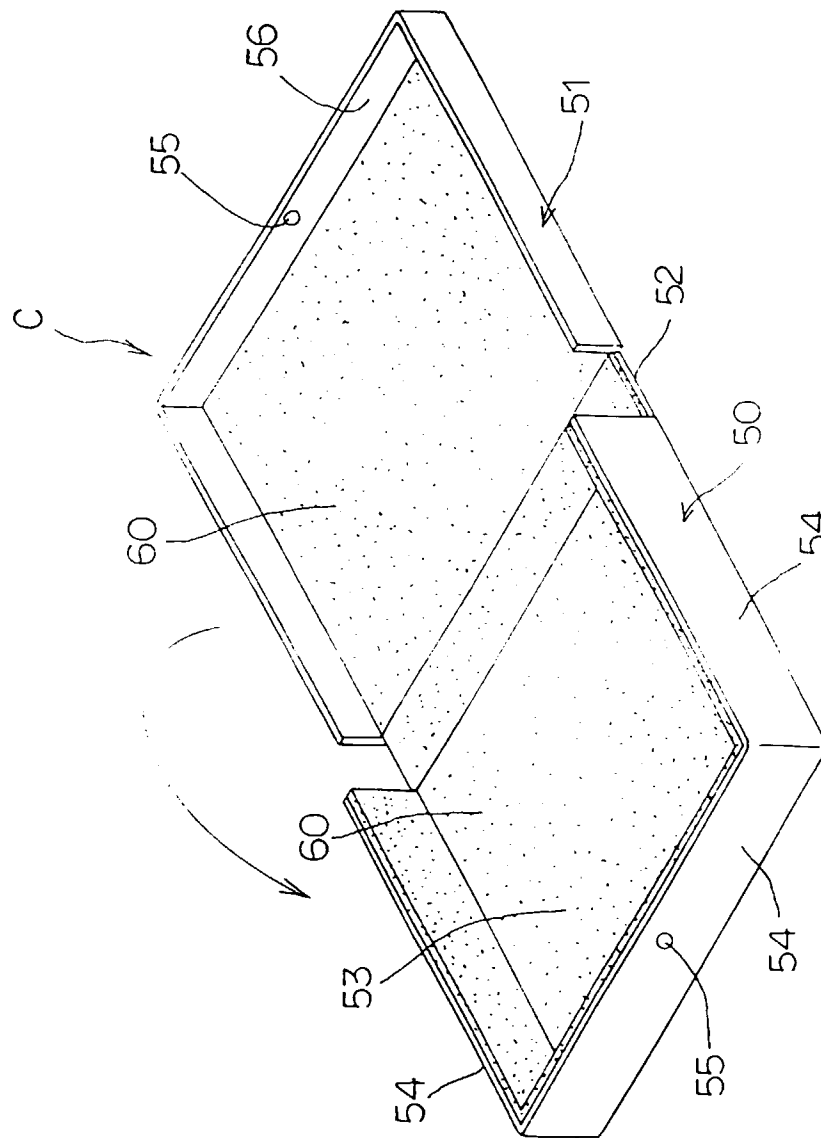


Fig. 12

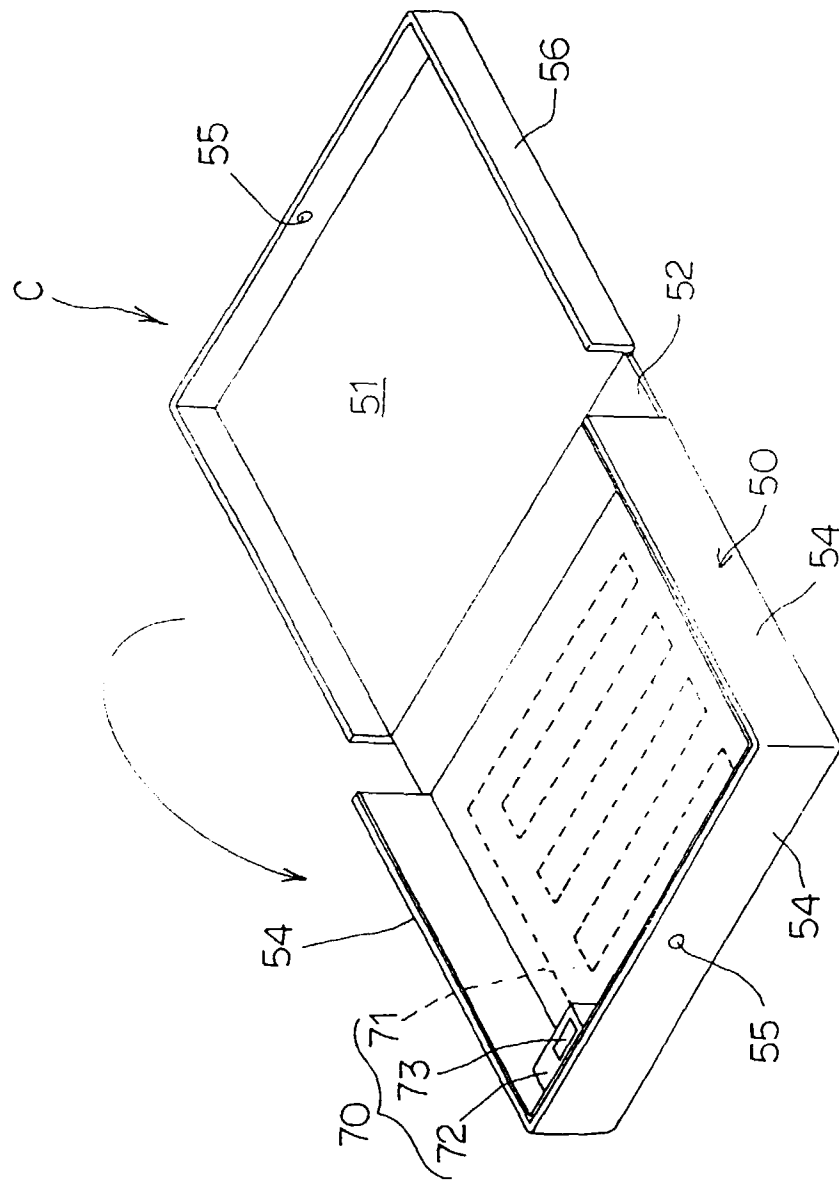


Fig. 13

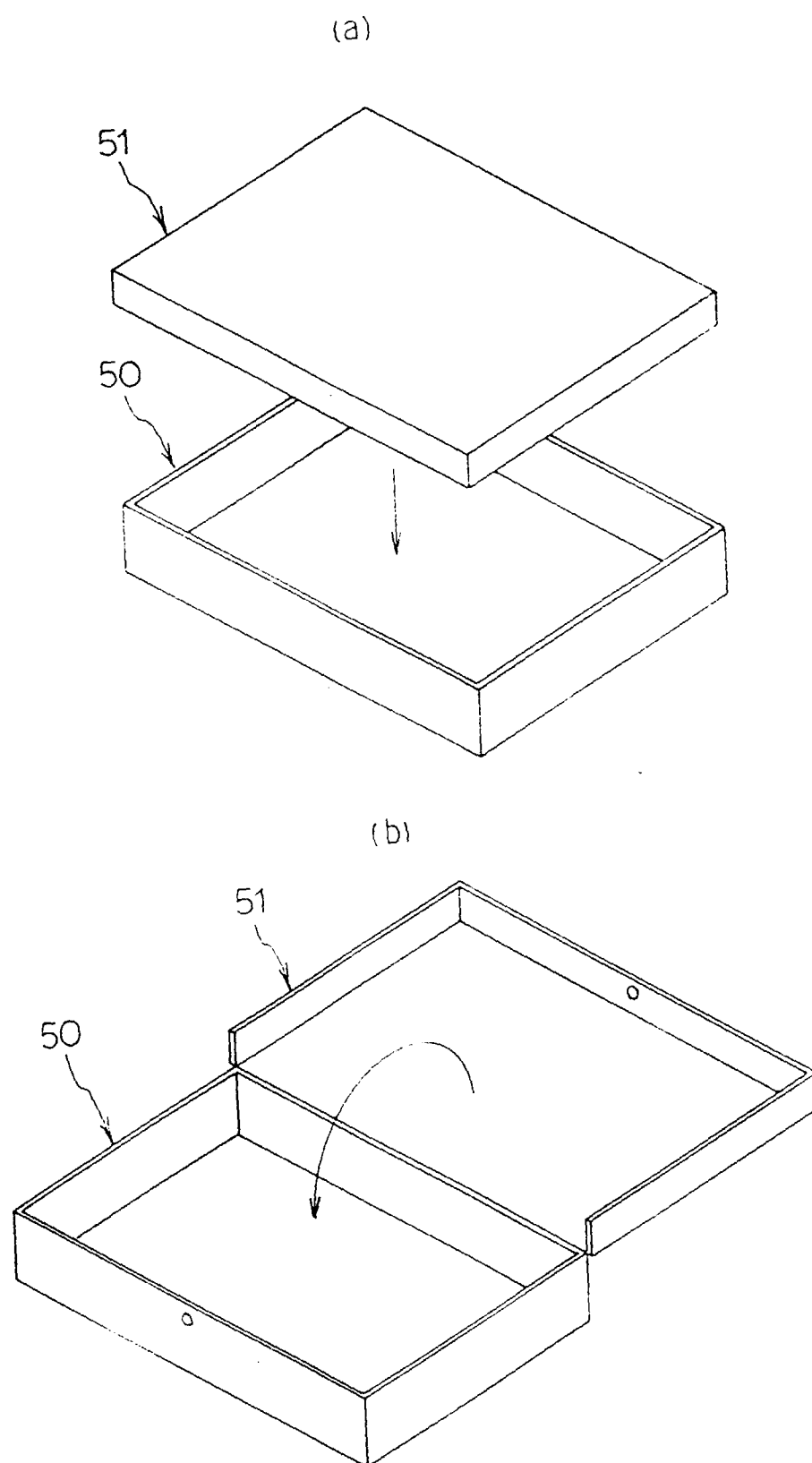


Fig. 14

