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(71) Applicant: **Nautilus Hyosung Inc.**
Seoul 135-884 (KR)

(72) Inventors:
• **Park, Jung Ho**
158-758 Seoul (KR)
• **Cho, Sung Min**
463-749 Gyeonggi-do (KR)
• **Kim, Youn Jong**
437-756 Gyeonggi-do (KR)

(74) Representative: **Jansen, Cornelis Marinus et al**
V.O.
Johan de Wittlaan 7
2517 JR Den Haag (NL)

(54) **Locking device of a door**

(57) Disclosed is a locking device of a door which can stably maintain a locking state of the door. The locking device of a door for opening and closing a storage space of an object includes: a safety plate provided on an inner surface of the door so as to be broken when a forced shock is applied from outside; an auxiliary locking part for constraining the door to the object when the safety plate is broken by the forced shock; a guide bracket including a rotating deformation portion which is rotated and deformed when the forced shock is applied from outside, for being provided so as to slidably move on the inner surface of the door; and a locking member fixed to the rotating deformation portion so as to slidably move together with the guide bracket and selectively constrain the door to the object, in which as the rotating deformation portion rotates on the guide bracket and applies pressure to the safety plate when the forced shock is applied to the locking member, the safety plate is broken, and the door is constrained to the object by the auxiliary locking part.

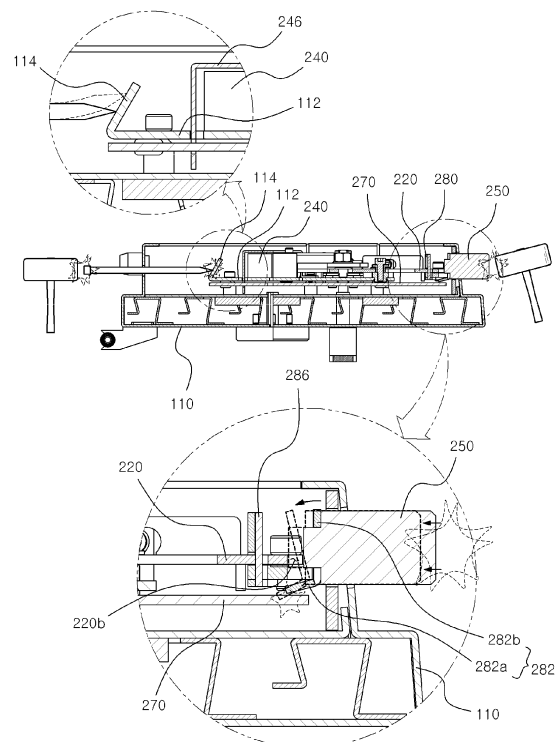


Fig. 4

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a locking device of a door, and more specifically, to a locking device of a door for safely protecting an object in need of protection such as a safe or an automated banking machine.

Background of the Related Art

[0002] Generally, a safe is a device for securing cash, securities, jewelry, important documents or the like, which is frequently used for preventing intrusion of a third party other than a formal user.

[0003] However, since techniques for illegally opening a safe are continuously improved in pace with techniques related to the safe are advanced, a safe which is further secure and further less probable to be robbed is required. Particularly, since automated banking machines which keep a large amount of cash are used in an open place, necessity of security on a safe is emphasized day by day.

[0004] A primary object of a safe is to prevent a third party from opening the safe whatever apparatus and method may be used, and a secondary object is to delay opening the safe by dragging time as long as possible although the safe is opened until the police or a private security organization takes a proper action. In these days when various cutting machines and welding apparatuses are developed, it is rather almost impossible to perfectly prevent opening a safe, and delaying a time for opening the safe as long as possible may be the most realistic measure.

[0005] For reference, observing the details related to Underwriters Laboratory (UL) certification, which is a specification related to safety in USA, it stipulates that a safe should not be opened by a safe expert for about thirty minutes to satisfy security regulation level 1. That is, in the case of a machine such as a cash dispenser that is difficult to move as a whole, safely protecting a safe as long as possible is a task of top priority.

SUMMARY OF THE INVENTION

[0006] The present invention provides a locking device of a door for safely protecting an object in need of protection such as a safe or an automated banking machine.

[0007] Particularly, the present invention provides a locking device of a door for stably maintaining a locking state of the door even when a forced attack is applied on a side surface of the door.

[0008] To accomplish the above objects, according to an embodiment of the present invention, there is provided a locking device of a door for opening and closing a storage space of an object, the device including a safety plate provided on an inner surface of the door so as to be bro-

ken when a forced shock is applied from outside; an auxiliary locking part for constraining the door to the object when the safety plate is broken by the forced shock; a guide bracket including a rotating deformation portion which is rotated and deformed when the forced shock is applied from outside, for being provided so as to slidably move on the inner surface of the door; and a locking member fixed to the rotating deformation portion so as to slidably move together with the guide bracket and selectively constrain the door to the object, in which as the rotating deformation portion rotates on the guide bracket and applies pressure to the safety plate when the forced shock is applied to the locking member, the safety plate is broken, and the door is constrained to the object by the auxiliary locking part.

[0009] Here, the object is a storage device for securing cash, securities, jewelry, important documents or the like, such as a general safe, an automated banking machine or the like.

[0010] A locking means for selectively constraining the door to the safe may be provided on the inner surface of the door. For reference, in the present invention, the locking means may be understood as a concept including both a constraint element for directly constraining the door and the safe and a linking element provided to be linked to (or associated with) the constraint element so as to indirectly constrain the door to the object. For example, the locking means may be configured to include a sliding member slidably moving on the inner surface of the door; a door locking part provided on the inner surface of the door and linked by the slide movement of the sliding member to selectively constrain the door to the object; and a locking assembly provided on the inner surface of the door to selectively constrain the slide movement of the sliding member, in which the guide bracket is fixed to the sliding member.

[0011] The locking assembly may be provided in a variety of structures that can selectively constrain slide movement of the sliding member. For example, the locking assembly may be configured to include a locking body fixed to the inner surface of the door; and a locking journal moving to a constraint position constraining the slide movement of the sliding member and a release position allowing the slide movement of the sliding member, in a direction straight with respect to the locking body.

[0012] The auxiliary locking part may be provided in a variety of structures that can constrain the door to the safe when the safety plate is broken by a forced shock greater than a predetermined level which is applied from outside. For example, the auxiliary locking part may be configured to include a locking rod provided on the inner surface of the door so as to straightly move to a constraint position constraining the slide movement of the sliding member and a release position allowing the slide movement of the sliding member; a connection member one end of which is connected to the safety plate and the other end of which is connected to the locking rod; and a locking spring for providing elasticity so that the locking

rod may move to the constraint position, in which a state of disposing the locking rod at the release position may be maintained by the connection member, and the locking rod moves to the constraint position by the locking spring when the safety plate is broken.

[0013] The guide bracket may be configured to be connected to a variety of parts or portions and slidably move depending on required conditions and design specifications. For example, the guide bracket may be configured to be directly connected to an end portion of the sliding member and slidably move together with the sliding member as the sliding member slidably moves.

[0014] For reference, in the present invention, being rotated and deformed of the rotating deformation portion when a forced shock is applied from outside may be understood as being deformed (e.g., deformation of being ripped or torn off) and rotated of a portion of the rotating deformation portion from an initial disposition state.

[0015] The rotating deformation portion may be provided in a variety of methods depending on required conditions and design specifications. For example, the rotating deformation portion may be formed by partially processing a portion of the guide bracket. In some cases, it is possible to separately manufacture the rotating deformation portion and mount the rotating deformation portion on the guide bracket. For example, the rotating deformation portion may be configured to include a fixing piece provided on the guide bracket to be rotated and deformed to fix the locking member, and a pressing piece that is bent at an end portion of the fixing piece in one piece and disposed to be adjacent to the safety plate. When a shock is applied to the fixing piece, the pressing piece may apply pressure to the safety plate as the fixing piece rotates on the guide bracket, and accordingly, the safety plate may be broken.

[0016] In addition, a deformation inducing slit for inducing rotation and deformation of the fixing piece is formed at the guide bracket to be adjacent to and around the fixing piece, and a guide slit for guaranteeing rotation of the pressing piece is formed at the guide bracket to be adjacent to and around the pressing piece. The deformation inducing slit and the guide slit may be formed in a straight shape or a bent shape depending on required conditions and design specifications.

[0017] In addition, one end of the pressing piece may be formed to be protruded from an inner side of the guide bracket facing the safety plate. For example, since the pressing piece is disposed to be inclined at a predetermined angle, one end of the pressing piece may be disposed to be relatively adjacent to the safety plate. In some cases, it is also possible to configure the pressing piece to have a relatively thick end so that the pressing piece may be disposed to be adjacent to the safety plate.

[0018] An end portion of the sliding member may be accommodated inside the guide bracket to be adjacent to an end portion of the locking member, and a rotating permission portion for allowing rotation of the rotating deformation portion 282 may be formed at the end portion

of the sliding member. In addition, a reinforcing member for preventing the locking member from being excessively pushed when a shock is applied to the locking member may be provided in the guide bracket.

[0019] In addition, a side protection portion for protecting a side surface of the locking assembly may be provided inside the door. The side protection portion may be provided in a variety of structures depending on required conditions and design specifications. For example, the side protection portion may be disposed to be inclined with respect to the side surface of the locking assembly. In some cases, it is possible to configure the side protection portion to be approximately parallel to the side surface of the locking assembly. However, when an attack is made through the side surface of the door using a drill or a chisel in the case where the side protection portion is disposed to be inclined with respect to the side surface of the locking assembly, the drill or the chisel is deviated along the slope of the side protection portion, and thus an effect of delaying intrusion time may be obtained. In addition, the side protection portion may be formed by partially bending a side end of the base plate described above. In some cases, it is possible to separately manufacture the side protection portion and combine the side protection portion with the base plate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 is a perspective view showing the structure of a safe applying a locking device of a door according to the present invention.

FIGs. 2 and 3 are views illustrating the structure of a locking device of a door according to the present invention.

FIG. 4 is a view showing an intrusion type of an intruder for forcibly opening a safe which applies a locking device of a door according to the present invention.

FIGs. 5 and 6 are views illustrating a locking device of a door according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0021] Reference will now be made in detail to exemplary embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The exemplary embodiments are described below in order to explain the present invention by referring to the figures.

[0022] FIG. 1 is a perspective view showing the structure of a safe applying a locking device of a door according to the present invention, FIGs. 2 and 3 are views illustrating the structure of a locking device of a door ac-

cording to the present invention, and FIG. 4 is a view showing an intrusion type of an intruder for forcibly opening a safe which applies a locking device of a door according to the present invention.

[0023] As shown in the figures, the locking device of a door according to the present invention is provided to selectively lock a door 110 which opens or closes a storage space of an object and includes a safety plate 270, an auxiliary locking part 260, a guide bracket 280 and a locking member 250.

[0024] For reference, the object is a storage device for securing cash, securities, jewelry, important documents or the like, such as a general safe, an automated banking machine or the like. In addition, the automated banking machine is an automated machine such as a cash dispenser, an automatic teller machine or the like which can provide basic banking services such as deposit or withdrawal without a teller regardless of time and space in relation to financial services. Hereinafter, a safe 100 applying a locking device of a door according to the present invention will be described as an example. The safe 100 has a storage space with an open front side, and the opening on the front side of the storage space is configured to be opened and closed by the door 110 combined with the safe 100 through a hinge coupling. The safe 100 is configured to selectively constrain a closed state of the door 110 by the locking device of a door.

[0025] A locking means for selectively constraining the door 110 to the safe 100 is provided on the inner surface of the door 110, and the structure and features of the locking means can be changed diversely depending on required conditions and design specifications.

[0026] For reference, in the present invention, the locking means may be understood as a concept including both a constraint element for directly constraining the door 110 and the safe 100 and a linking element provided to be linked to (or associated with) the constraint element so as to indirectly constrain the door 110 to the object. For example, the locking means may be configured to include a sliding member 220, a door locking part 230 and a locking assembly 240.

[0027] The sliding member 220 is provided to be parallel to the inner surface of the door 110 so that sliding movement is selectively allowed.

[0028] A base plate 112 may be fixed to the inner surface of the door 110 in one piece, and the sliding member 220 may be provided so as to slidably move on the base plate 112.

[0029] A guide slot 222 may be formed in the sliding member 220, and a linking projection 232a may move along the guide slot 222 when the sliding member 220 slidably moves, and a straight link member 232 may move in a straight direction as the linking projection 232a moves. For example, the guide slot 222 may be formed in the shape of an inclined straight section with respect to the sliding direction of the sliding member 220, and the straight link member 232 may move straightly along the vertical direction as the linking projection 232a moves

along the guide slot 222 when the sliding member 220 slidably moves. In some cases, the guide slot may be formed in the shape of a curved section, and the present invention is not limited or constrained by the shape and angle of the guide slot.

[0030] In addition, a door handle 210 may be combined on the outer surface of the door 110 so as to be rotatably handled, and the sliding member 220 may be configured to be linked and slidably move by the rotation handling of the door handle.

[0031] The linking structure between the door handle 210 and the sliding member 220 may be changed diversely depending on required conditions and design specifications. For example, a rotating piece 214 may be provided on the inner surface of the door 110 so as to rotate together with a shaft of the door handle 210 in one piece, and a guide slot 214a may be formed in the rotating piece 214. In addition, a guide projection 220a accommodated so as to move along the guide slot 214a may be formed in the sliding member 220. Accordingly, as the rotating piece 214 rotates by the rotation handling of the door handle 210, the sliding member 220 is linked and slidably moves by the guide projection 220a which moves along the guide slot 214a.

[0032] Although a door handle 210 provided to be rotatably handled is described as an example in an embodiment of the present invention, in some cases, the door handle may be provided so as to be slidably handled, and it is also possible to configure to link and slidably move the sliding member 220 by the slide handling of the door handle.

[0033] In addition, a constraint groove 221 may be formed at a side end of the sliding member 220, and as a locking journal 244 described below is constrained to the constraint groove 221 at a constraint position, sliding movement of the sliding member 220 may be constrained.

[0034] The constraint groove 221 may be provided in a variety of shapes depending on required conditions and design specifications. For example, the constraint groove 221 may be formed to penetrate the sliding member 220 along the inner direction of the door 110. That is, the constraint groove 221 may be formed in the shape of an open groove or step that can be constrained to the locking journal 244. Hereinafter, a constraint groove 221 formed at an edge of a side end of the sliding member 220 will be described as an example. For reference, in the present invention, the inner direction of the door 110 may be understood as a direction perpendicular to the plate surface of the door 110 (or a direction penetrating the door 110).

[0035] In addition, the constraint groove 221 may include a constraint wall 221a contacting with the locking journal 244, and the constraint wall 221a may be formed in one piece together with the sliding member 220 by bending a portion of the side end of the sliding member 220.

[0036] As described above, since the constraint groove 221 can be provided in the form of an open groove

or step, interference can be minimized when the locking journal 244 described below enters the constraint groove 221. In other words, when the constraint groove 221 is provided in the form of an open groove or step, the top and bottom sides thereof are open unlike a constraint groove formed in the shape of an enclosed hole, and thus interference generated by the surroundings of the constraint groove can be minimized.

[0037] Although a constraint groove provided in the form of an open groove or step that may constrain slide movement of the sliding member 220 simply with respect to the locking journal is described as an example in the embodiment of the present invention described above and shown in the figures, in some cases, the constraint groove itself may be formed in the shape of a kind of a hole or a cave which can accommodate an end portion of the locking journal therein.

[0038] The door locking part 230 is provided on the inner surface of the door 110 to be linked by the slide movement of the sliding member 220 and selectively constrain the door 110 to the safe 100.

[0039] The door locking part 230 is configured to include a straight link member 232 provided with a linking projection 232a moving along the guide slot 222 and linked by the slide movement of the sliding member 220 to move in a straight direction and a locking pin 234 connected to the straight link member 232 in one piece to move in a straight direction together with the straight link member 232 and selectively constraining the door 110 to the safe 100, and a binding groove (not shown) for accommodating a free end of the protruded locking pin 234 may be formed in the safe 100.

[0040] Hereinafter, a straight link member 232 provided on each of the upper and lower sides of the sliding member 220, linked by the slide movement of the sliding member 220, and moving straightly along the vertical direction will be described as an example. In some cases, although it may be configured to form a plurality of guide slots on the sliding member and move a plurality of straight link members straightly along each of the guide slots, the present invention is not limited or constrained by the number of straight link members and a structure of disposing the straight link members.

[0041] The locking assembly 240 is provided on the inner surface of the door 110 in order to selectively constrain the slide movement of the sliding member 220. For example, the locking assembly 240 includes a locking body 242 fixed to the base plate 112, and a locking journal 244 moving to a constraint position constrained to the constraint groove 221 and a release position released from the constraint groove 221, in a direction straight with respect to the locking body 242. That is, since the locking journal 244 is provided to move straightly along a direction perpendicular to the sliding direction of the sliding member 220 in front of the sliding member 220, the slide movement of the sliding member 220 can be allowed when the locking journal 244 is disposed at the release position, and the slide movement of the sliding member

220 can be constrained when the locking journal 244 is disposed at the constraint position since the constraint groove 221 of the sliding member 220 is constrained to the locking journal 244. In addition, when the locking journal 244 is disposed at the constraint position, the slide movement of the sliding member 220 in the release direction can be constrained. Here, constraint of the slide movement of the sliding member 220 in the release direction may be understood as a state of maintaining the locking state of the door 110 by the door locking part 230 described above.

[0042] In addition, a reinforcing cover member 246 may be provided on the inner surface of the door 110 in order to cover the locking body 242. For example, the reinforcing cover member 246 may be fixed to the base plate 112.

[0043] Although a locking journal configured to move in a straight direction with respect to the locking body is described as an example in an embodiment of the present invention, in some cases, the locking journal may be configured to move from the release position to the constraint position in another method such as a rotation method.

[0044] The locking journal 244 may have a variety of cross sectional shapes depending on required conditions and design specifications. For example, the locking journal 244 may be provided to have a rectangular cross sectional shape. In some cases, the locking journal may have a circular or non-circular shape, and the present invention is not limited or constrained by a cross sectional shape of the locking journal.

[0045] In addition, since the locking body 242 is mechanically or electrically connected to a locking module (not shown) installed on the outer surface of the door 110, the locking journal 244 may be selectively protruded by the operation of the locking module. A general key locking module, a dial style locking module, a keypad style locking module or the like which is generally used for a safe or the like can be used as the locking module so that only an authorized specific user may use.

[0046] In addition, a cover member (not shown) may be provided on the inner surface of the door 110 to cover the locking journal 244, and since a penetration portion (not shown) through which the locking journal 244 passes is formed on the side surface of the cover member, movement of the locking journal 244 along the inner direction of the door 110 may be constrained by the penetration portion.

[0047] For reference, the floating movement of the locking journal 244 along the inner direction may be understood as floating movement of the locking assembly 240 being lifted or separated from the door 110 by a forced shock applied from outside of the door 110.

[0048] The safety plate 270 is provided on the inner surface of the door 110 so as to be broken when a forced shock from outside is sensed. For example, the safety plate 270 may be provided between the inner surface of the door 110 and the base plate 112 and configured to

be broken when a forced shock greater than a predetermined level is applied from outside. Hereinafter, a safety plate 270 formed of a glass material that can be broken by a shock greater than a predetermined level will be described as an example. In some cases, the safety plate may be formed of another material that can be broken by a shock greater than a predetermined level, and the present invention is not limited or constrained by a material or a characteristic of the safety plate 270.

[0049] The auxiliary locking part 260 is configured to constrain the door 110 to the safe 100 when the safety plate 270 is broken by a forced shock greater than a predetermined level which is applied from outside. For example, the auxiliary locking part 260 may be configured to maintain the locking state of the door 110 by constraining the slide movement of the sliding member 220 when a forced shock greater than a predetermined level is sensed from outside.

[0050] Hereinafter, an auxiliary locking part 260 configured to include a locking rod 262 provided on the inner surface of the door 110 so as to straightly move to a constraint position constraining slide movement of the sliding member 220 and a release position allowing the slide movement of the sliding member 220, a connection member 264 one end of which is connected to the safety plate 270 and the other end of which is connected to the locking rod 262, and a locking spring 266 for providing elasticity so that the locking rod 262 may move to the constraint position will be described as an example. In addition, a constraint hole 226 may be formed at a side end of the sliding member 220, and the locking rod 262 can be constrained to the constraint hole 226 when the locking rod 262 is disposed at the constraint position.

[0051] Since the locking rod 262 is provided so as to move in a straight direction from a constraint position constraining slide movement of the sliding member 220 to a release position allowing the slide movement of the sliding member 220 on the base plate 112, the locking rod 262 disposed at the release position is supported by the connection member 264 to maintain the disposition state, and when the safety plate 270 is broken by a forced shock applied from outside, the locking rod 262 may move to the constraint position by the elasticity of the locking spring 266.

[0052] For example, a pair of locking rods 262 may be provided to be spaced apart from each other by a predetermined distance, and each of the locking rods 262 may be connected to the safety plate 270 by the connection member 264. Although the locking spring 266 provides elasticity so that each of the locking rods 262 may move to the constraint position, a state of disposing each of the locking rods 262 at the release position may be maintained by the connection member 264 until the safety plate 270 is broken. However, when the safety plate 270 is broken, the constrained state (a state of being constrained so as to be disposed at the release position) of each of the locking rods 262 is released and, at the same time, each of the locking rods 262 moves to the

constraint position by the elasticity of the locking spring 266, and thus slide movement of the sliding member 220 may be constrained.

[0053] The guide bracket 280 is provided so as to slidably move on the inner surface of the door 110 and includes a rotating deformation portion 282 which is rotated and deformed when a forced shock is applied from outside. For example, the guide bracket 280 may be configured to be directly connected to an end portion of the sliding member 220 described above so as to slidably move together with the sliding member 220 as the sliding member 220 slidably moves. In some cases, the rotating deformation portion may be connected to another part or portion instead of the sliding member so as to slidably move.

[0054] For reference, in the present invention, being rotated and deformed of the rotating deformation portion 282 when a forced shock is applied from outside may be understood as being deformed (e.g., deformation of being ripped or torn off) and rotated of a portion of the rotating deformation portion 282 from an initial disposition state.

[0055] The locking member 250 described below may be fixed to the rotating deformation portion 282, and the rotating deformation portion 282 may be rotated and deformed on the guide bracket 280 when a forced shock is applied to the locking member 250 from outside. One end of the rotating deformation portion 282 may apply pressure to the safety plate 270 when the rotating deformation portion 282 is rotated and deformed, and since the safety plate 270 is broken and the auxiliary locking part 260 may operate accordingly as described above, the constrained state of the sliding member 220 may be maintained by the auxiliary locking part 260.

[0056] The locking member 250 is fixed to the rotating deformation portion 282 and slidably moves together with the guide bracket 280, and the locking member 250 is provided to selectively constrain the door 110 to the safe 100. For example, the locking member 250 may be provided in the shape of a pin or a cylinder in plurality on the side surface of the door 110 to be spaced apart from each other by a predetermined distance. The locking member 250 may be selectively protruded toward the side surface of the door 110 as the guide bracket 280 slidably moves, and a side surface binding groove (not shown) for accommodating the protruded locking member 250 may be formed in the safe 100.

[0057] The rotating deformation portion 282 may be provided in a variety of methods depending on required conditions and design specifications. For example, the rotating deformation portion 282 may be formed by partially processing a portion of the guide bracket 280. In some cases, it is possible to separately manufacture the rotating deformation portion and mount the rotating deformation portion on the guide bracket.

[0058] Hereinafter, a rotating deformation portion 282 approximately formed in an "L" shape, including a fixing piece 282a provided on the guide bracket 280 to be ro-

tated and deformed to fix the locking member 250, and a pressing piece 282b that is bent at an end portion of the fixing piece 282a in one piece and disposed to be adjacent to the safety plate 270, will be described as an example. When a shock is applied to the fixing piece 282a, the pressing piece 282b may apply pressure to the safety plate 270 as the fixing piece 282a rotates on the guide bracket 280, and accordingly, the safety plate 270 may be broken.

[0059] In addition, a deformation inducing slit 283 for inducing rotation and deformation of the fixing piece 283a is formed at the guide bracket 280 to be adjacent to and around the fixing piece 282a, and a guide slit 284 for guaranteeing rotation of the pressing piece 282b is formed at the guide bracket 280 to be adjacent to and around the pressing piece 282b. Practically, since the deformation inducing slit 283 and the guide slit 284 are formed in a method of incising a portion of the guide bracket 280, the rotating deformation portion 282 may be formed using a portion of the guide bracket 280.

[0060] The deformation inducing slit 283 may be formed in a variety of shapes capable of inducing rotation and deformation of the fixing piece 282a depending on required conditions and design specifications. For example, the deformation inducing slit 283 may be formed to be adjacent to the fixing piece 282a on the left and right sides in the form of an approximate straight section. In some cases, the deformation inducing slit may be formed in a shape including a bent section.

[0061] Like this, since the locking member 250 may be formed in the shape of a pin and provided in plurality on the side surface of the door 110 to be spaced apart from each other by a predetermined distance, and the deformation inducing slit 283 may be formed around each of the plurality of the locking members 250, at least some of the shock force generated when a shock is applied to any one of the plurality of the locking members 250 may be absorbed as the rotating deformation portion 282 corresponding to the locking member to which the shock force is applied is rotated and deformed by the deformation inducing slit 283, and the other locking members among the plurality of the locking members 250 may maintain a state of constraining the door 110 to the object (a state unaffected by the shocking force).

[0062] In addition, one end of the pressing piece 282b may be formed to be protruded from an inner side of the guide bracket 280 facing the safety plate 270. For example, since the pressing piece 282b is disposed to be inclined at a predetermined angle, one end of the pressing piece 282b may be disposed to be relatively adjacent to the safety plate 270. In some cases, it is also possible to configure the pressing piece to have a relatively thick end so that the pressing piece may be disposed to be adjacent to the safety plate.

[0063] Meanwhile, an end portion of the sliding member 220 may be accommodated inside the guide bracket 280 to be adjacent to an end portion of the locking member 250, and a rotating permission portion 220b for al-

lowing rotation of the rotating deformation portion 282 may be formed at the end portion of the sliding member 220. Since the rotating permission portion 220b secures a certain space between the end portion of the locking member 250 and the end portion of the sliding member 220, rotation and deformation of the rotating deformation portion 282 may be guaranteed when a shock is applied to the locking member 250.

[0064] In addition, a reinforcing member 286 for preventing the locking member 250 from being excessively pushed when a shock is applied to the locking member 250 may be provided in the guide bracket 280. For example, the reinforcing member 286 may be configured to be accommodated inside the guide bracket 280 to be spaced apart from the end portion of the locking member 250 so as to constrain the locking member 250 when the locking member 250 is pushed backward more than a predetermined distance by a shock.

[0065] Meanwhile, a side protection portion 114 for protecting a side surface of the locking assembly 240 may be provided inside the door 110. That is, the side protection portion 114 may be provided to protect the locking assembly 240 when an attack is made from a side surface of the door 110.

[0066] The side protection portion 114 may be provided in a variety of structures depending on required conditions and design specifications. For example, the side protection portion 114 may be disposed to be inclined with respect to the side surface of the locking assembly 240. Of course, it is possible to configure the side protection portion to be approximately parallel to the side surface of the locking assembly. However, when an attack is made through the side surface of the door 110 using a drill or a chisel in the case where the side protection portion 114 is disposed to be inclined with respect to the side surface of the locking assembly 240, the drill or the chisel is deviated along the slope of the side protection portion 114, and thus an effect of delaying intrusion time may be obtained.

[0067] An angle for disposing the side protection portion 114 may be appropriately changed depending on required conditions and design specifications. Hereinafter, a side protection portion 114 disposed to be inclined at an angle of approximately 45° will be described as an example.

[0068] In addition, the side protection portion 114 may be formed by partially bending a side end of the base plate 112 described above. In some cases, it is possible to separately manufacture the side protection portion and combine the side protection portion with the base plate.

[0069] Meanwhile, as a method of opening an object such as the safe 100 described above, a method of breaking the locking member 250 through an attack on the side surface of the safe 100 can be expected. That is, as shown in FIG. 4, a method of breaking the locking assembly 240 through the sliding member 220 can be expected, in which the locking assembly 240 is broken by directly attacking the locking member 250 using a ham-

mer after making a hole on the outer wall of the side surface of the safe 100 with a drill. Since slide movement of the sliding member 220 can be allowed if the locking assembly 240 is broken like this, constraint of the door locking part 230 can be released using a handle.

[0070] However, in a structure of the present invention in which the rotating deformation portion 282 is rotated and deformed and the safety plate 270 can be broken when a shock is applied to the locking member 250, a state of constraining the slide movement of the sliding member 220 may be maintained comparatively stably although a forced shock is applied from outside.

[0071] That is, when a shock is applied to the locking member 250, an end portion connection part of the fixing piece 282a connected to the guide bracket 280 is torn apart and rotated by the shock, and since the pressing piece 282b applies pressure to the safety plate 270 accordingly, the safety plate 270 can be broken. Since the auxiliary locking part 260 may operate as the safety plate 270 is broken, the constrained state of the sliding member 220 can be maintained by the auxiliary locking part 260. Accordingly, the intruder should release the constrained state of the auxiliary locking part 260 or perform another release work in order to release the locking state of the door locking part 230. Accordingly, a time required to open the safe 100 is delayed as much, and the intruder cannot open the safe 100 within a short period of time as intended.

[0072] In addition, as another method of opening an object such as the safe 100 described above, a method of breaking the locking assembly 240 through an attack on the side surface of the safe 100 can be expected. That is, as shown in FIG. 4, a method of breaking the locking assembly 240 using a chisel or a hammer after making a hole on the outer wall of the side surface of the safe 100 with a drill can be expected. Since slide movement of the sliding member 220 can be allowed when the locking assembly 240 is broken like this, constraint of the door locking part 230 can be released using a handle.

[0073] However, in a structure of the present invention provided with the side protection portion 114 on the side surface of the locking assembly 240, when an attack using a drill or a chisel is made through the side surface of the door 110, the drill or the chisel is deviated along the slope of the side protection portion 114, and thus an effect of delaying intrusion time may be obtained.

[0074] Meanwhile, FIGs. 5 and 6 are views illustrating a locking device of a door according to another embodiment of the present invention. In addition, elements having like and equivalent functions will be denoted by like reference numerals and details thereon will not be repeated.

[0075] Referring to FIGs. 5 and 6, according to another embodiment of the present invention, there may be provided a rotation restricting portion 224 for restricting the rotation direction of the rotating deformation portion 282 so that the rotating deformation portion 282 may rotate only in a direction applying pressure to the safety plate

270 while the safety plate 270 is broken as the rotating deformation portion 282 rotates and applies pressure to the safety plate 270 when a forced shock is applied to the locking member 250.

5 **[0076]** Further specifically, when a forced shock is applied to the locking member 250 from outside, the rotation restricting portion 224 restricts clockwise rotation of the rotating deformation portion 282 and allows only counterclockwise rotation (rotation in a direction applying pressure to the safety plate) of the rotating deformation portion 282, and thus an error that may occur when the rotating deformation portion 282 rotates clockwise can be prevented in advance.

10 **[0077]** The rotation restricting portion 224 may be provided in a variety of methods depending on required conditions and design specifications. For example, the rotation restricting portion 224 may be provided in one piece together with the sliding member 220 which slidably moves on the inner surface of the door. Hereinafter, a rotation restricting portion 224 approximately formed in a "V" shape by partially incising a portion of the sliding member 220 and bending the incised portion to be adjacent to the safety plate 270 will be described as an example. Since the pressing piece 282b may be constrained to the bottom surface of the rotation restricting portion 224 by this structure when the rotating deformation portion 282 rotates clockwise, clockwise rotation of the rotating deformation portion 282 may be prevented in advance. In some cases, it is possible to separately form the rotation restricting portion and attach the rotation restricting portion to the sliding member in a general method, and alternatively, it is also possible to configure the rotation restricting portion to be connected to another part or portion instead of the sliding member. For reference, the shape and the number of the rotation restricting portions 224 may be appropriately changed depending on required conditions and design specifications.

30 **[0078]** In addition, a support portion 225 for stably supporting a disposition state of the rotation restricting portion 224 with respect to the sliding member 220 may be provided. The support portion 225 may be provided to support the rotation restricting portion 224 in a variety of methods depending on required conditions and design specifications. For example, an incision groove 223 may be formed at the sliding member 220, and the support portion 225 may be connected to the rotation restricting portion 224 in one piece and supported by one side of the incision groove 223. Since the support portion 225 stably maintains the disposition state of the rotation restricting portion 224 with respect to the sliding member 220 even when the rotating deformation portion 282 is pushed backward by a shock and strongly contacts with the rotation restricting portion 224, the rotation restricting portion 224 may stably perform its own function.

40 **[0079]** Preferably, the gap T1 between the rotation restricting portion 224 and the safety plate 270 may be formed to be relatively smaller than the thickness T2 of the rotating deformation portion 282. In such a structure,

an end portion of the rotating deformation portion 282 is prevented in advance from being escaped through the gap between the rotation restricting portion 224 and the safety plate 270.

[0080] According to the locking device of a door of the present invention, an object in need of protection such as a safe or an automated banking machine may be safely protected.

[0081] Particularly, according to the present invention, a locking state of a door may be stably maintained even when a forced attack is applied on the side surface of the door. That is, according to the present invention, when a forced shock is applied to the locking member, the rotating deformation portion is rotated and deformed and applies pressure to the safety plate so that the safety plate may be broken, and the auxiliary locking part operates as the safety plate is broken, and thus the locking state of the door may be further stably maintained.

[0082] In addition, according to the present invention, a constrained state of the sliding member can be maintained by the auxiliary locking part until the locking member is broken by a forced shock applied from outside, and a time for opening the safe by an intruder can be delayed as long as possible.

[0083] Furthermore, according to the present invention, when a shock is applied to the locking member, some of the shock is offset since the rotating deformation portion is rotated and deformed, and thus the shock delivered to the locking assembly through the sliding member can be mitigated, and breakage of the locking assembly by the shock can be delayed.

[0084] While the present invention has been described with reference to the particular illustrative embodiments, it is not to be restricted by the embodiments but only by the appended claims. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention.

Claims

1. A locking device of a door for opening and closing a storage space of an object, the device comprising:

a safety plate provided on an inner surface of the door so as to be broken when a forced shock is applied;

an auxiliary locking part for constraining the door to the object when the safety plate is broken by the forced shock;

a guide bracket including a rotating deformation portion which is rotated and deformed when the forced shock is applied from outside, for being provided so as to slidably move on the inner surface of the door; and

a locking member fixed to the rotating deformation portion so as to slidably move together with

the guide bracket and selectively constrain the door to the object, wherein as the rotating deformation portion rotates on the guide bracket and applies pressure to the safety plate when the forced shock is applied to the locking member, the safety plate is broken, and the door is constrained to the object by the auxiliary locking part.

2. The device according to claim 1, wherein the rotating deformation portion is formed by partially processing a portion of the guide bracket.

3. The device according to claim 1 or 2, wherein the locking member is provided in a shape of a pin, and the rotating deformation portion includes:
 - a fixing piece provided on the guide bracket so as to be rotated and deformed, for fixing the locking member; and
 - a pressing piece that is bent at an end portion of the fixing piece and disposed to be adjacent to the safety plate, wherein when a shock is applied to the fixing piece, the pressing piece applies pressure to the safety plate as the fixing piece rotates on the guide bracket, and the safety plate is broken.

4. The device according to claim 3, wherein a deformation inducing slit for inducing rotation and deformation of the fixing piece is formed at the guide bracket to be adjacent to and around the fixing piece, and a guide slit for guaranteeing rotation of the pressing piece is formed at the guide bracket to be adjacent to and around the pressing piece.

5. The device according to claim 3, wherein one end of the pressing piece is formed to be protruded from an inner side of the guide bracket facing the safety plate.

6. The device according to any one of the preceding claims, further comprising a reinforcing member provided in the guide bracket to be spaced apart from the locking member.

7. The device according to any one of the preceding claims, wherein the locking member is formed in a shape of a pin and provided in plurality on a side surface of the door to be spaced apart from each other by a predetermined distance, and a deformation inducing slit is formed around each of the plurality of the locking members, wherein at least some of a shock force generated when a shock is applied to any one of the plurality of the locking members may be absorbed as the rotating deformation portion corresponding to the locking member to which the shock force is applied is rotated and deformed by

the deformation inducing slit, and the other locking members among the plurality of the locking members may maintain a state of constraining the door to the object.

8. The device according to any one of the preceding claims, further comprising:

a sliding member slidably moving on the inner surface of the door;
a door locking part provided on the inner surface of the door and linked by the slide movement of the sliding member to selectively constrain the door to the object; and
a locking assembly provided on the inner surface of the door to selectively constrain the slide movement of the sliding member, wherein the guide bracket is fixed to the sliding member.

9. The device according to claim 8, wherein the locking assembly includes:

a locking body fixed to the inner surface of the door; and
a locking journal moving to a constraint position constraining the slide movement of the sliding member and a release position allowing the slide movement of the sliding member, in a direction straight with respect to the locking body.

10. The device according to claim 8 or 9, wherein the auxiliary locking part includes:

a locking rod provided on the inner surface of the door so as to straightly move to a constraint position constraining the slide movement of the sliding member and a release position allowing the slide movement of the sliding member;
a connection member one end of which is connected to the safety plate and the other end of which is connected to the locking rod; and
a locking spring for providing elasticity so that the locking rod may move to the constraint position, wherein a state of disposing the locking rod at the release position may be maintained by the connection member, and the locking rod moves to the constraint position by the locking spring when the safety plate is broken.

11. The device according to claim 8, 9 or 10, wherein an end portion of the sliding member is accommodated inside the guide bracket to be adjacent to an end portion of the locking member, and a rotating permission portion for allowing rotation of the rotating deformation portion is formed at the end portion of the sliding member.

12. The device according to any one of the preceding

claims, further comprising a rotation restricting portion for restricting a rotation direction of the rotating deformation portion so that the rotating deformation portion may rotate only in a direction applying pressure to the safety plate.

13. The device according to claim 12, further comprising: a sliding member slidably moving on the inner surface of the door, wherein the guide bracket is fixed to the sliding member, and the rotation restricting portion is provided in the sliding member.

14. The device according to claim 13, wherein the rotation restricting portion is provided by partially incising a portion of the sliding member and bending the incised portion to be adjacent to the safety plate.

15. The device according to claim 13 or 14, further comprising a support portion for supporting a disposition state of the rotation restricting portion with respect to the sliding member.

16. The device according to claim 15, wherein an incision groove is formed at the sliding member, and the support portion is connected to the rotation restricting portion and supported by one side of the incision groove.

17. The device according to any one of the claims 13 to 16, wherein a gap between the rotation restricting portion and the safety plate is formed to be relatively smaller than a thickness of the rotating deformation portion.

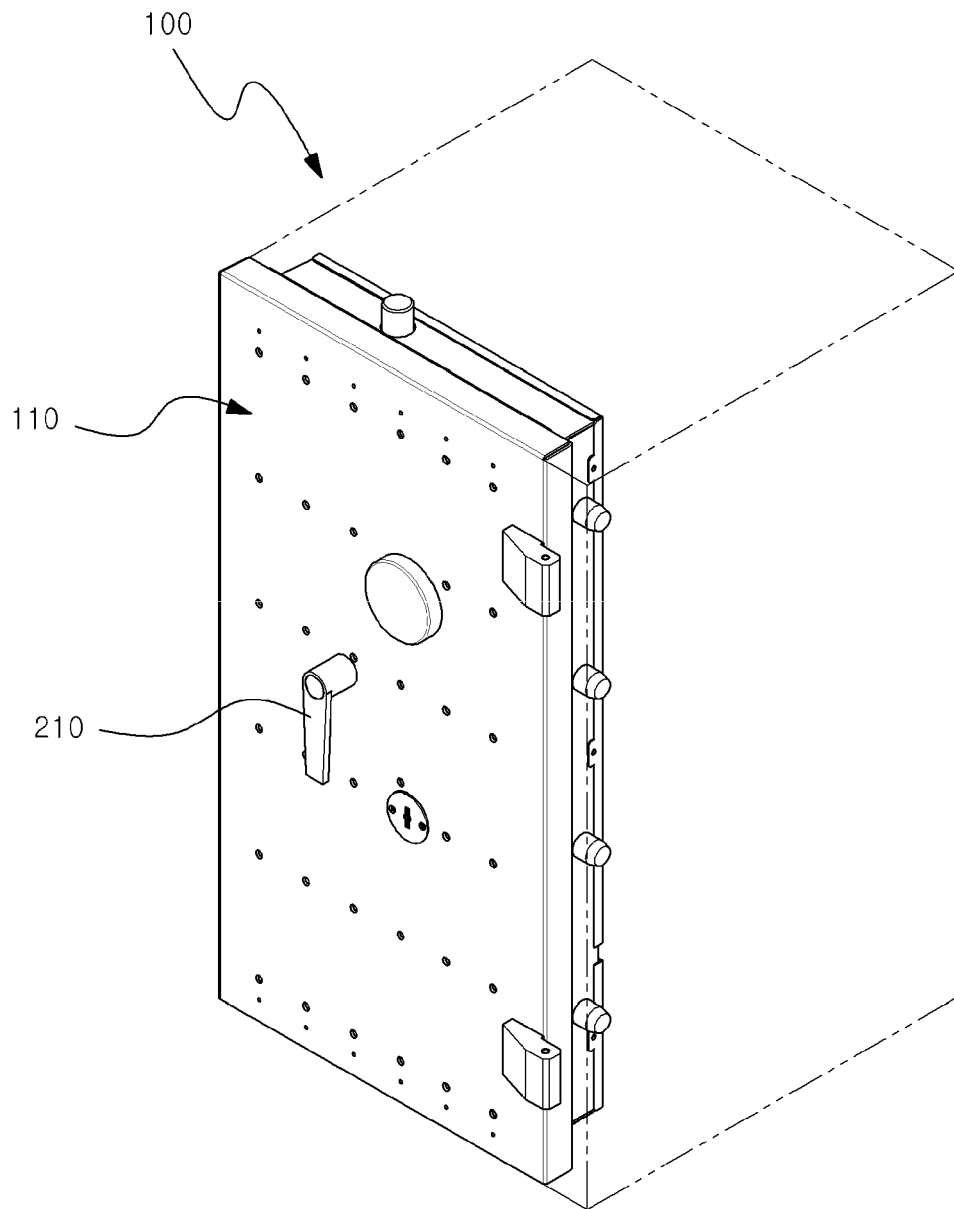


Fig. 1

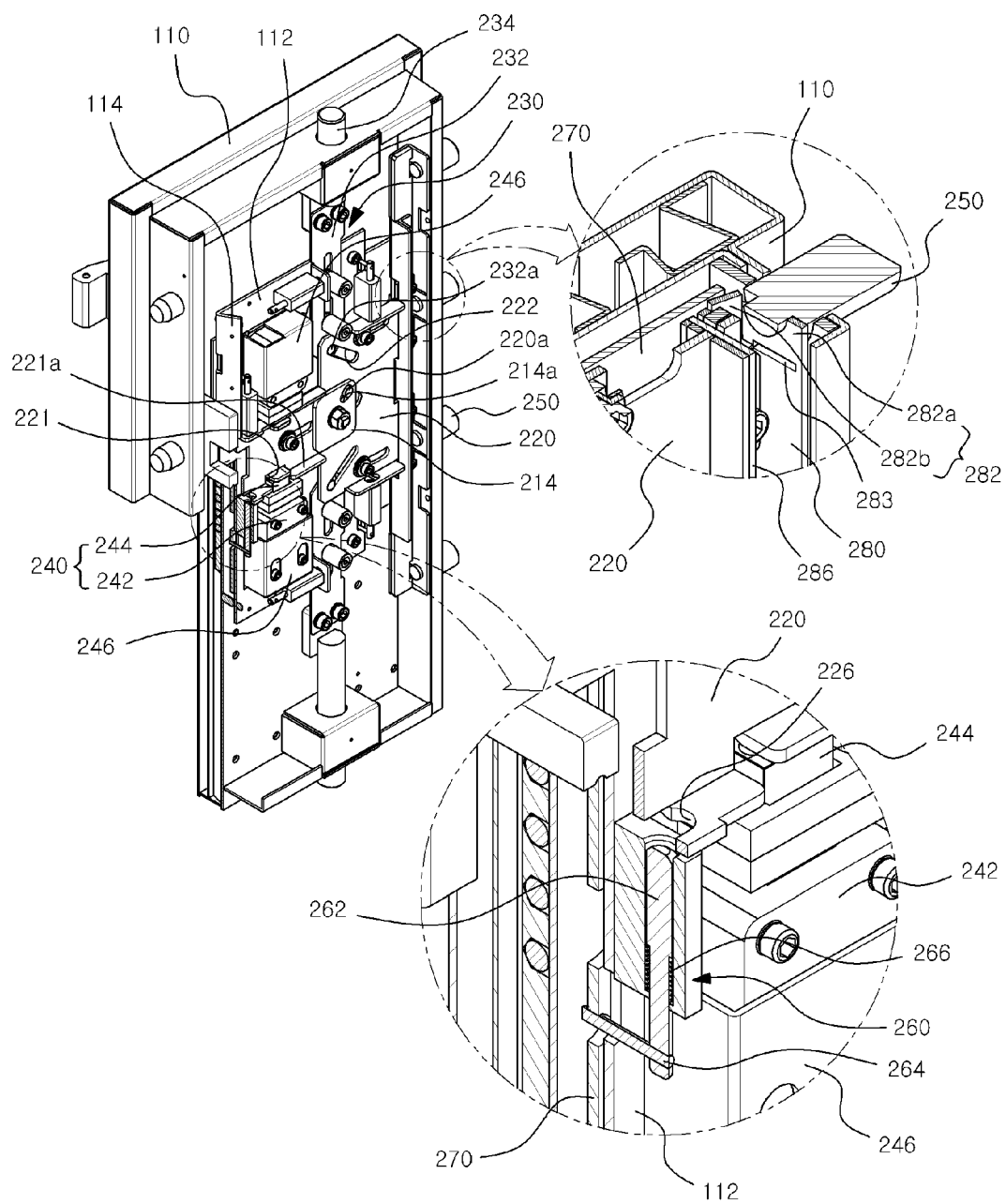


Fig. 2

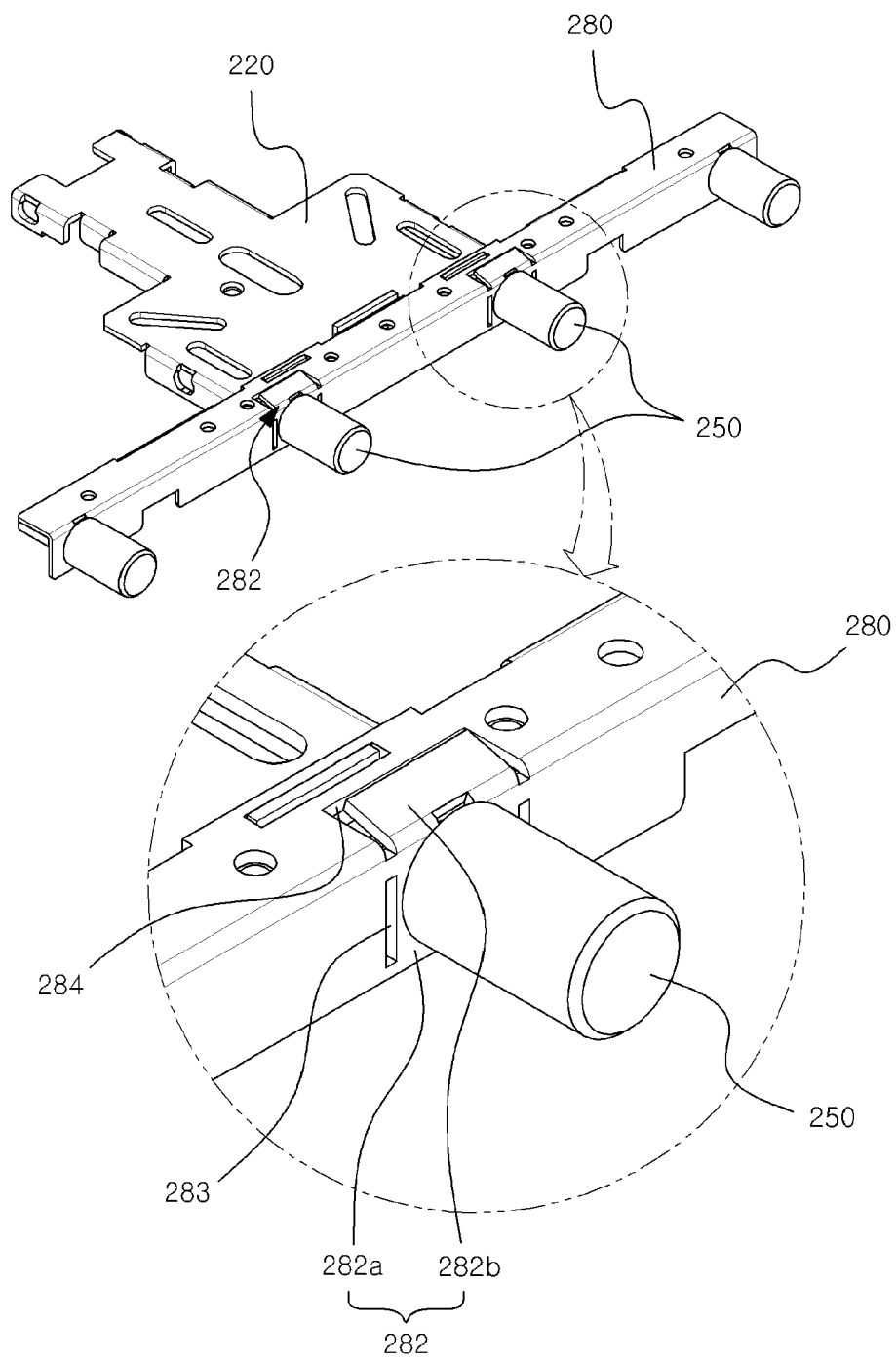


Fig. 3

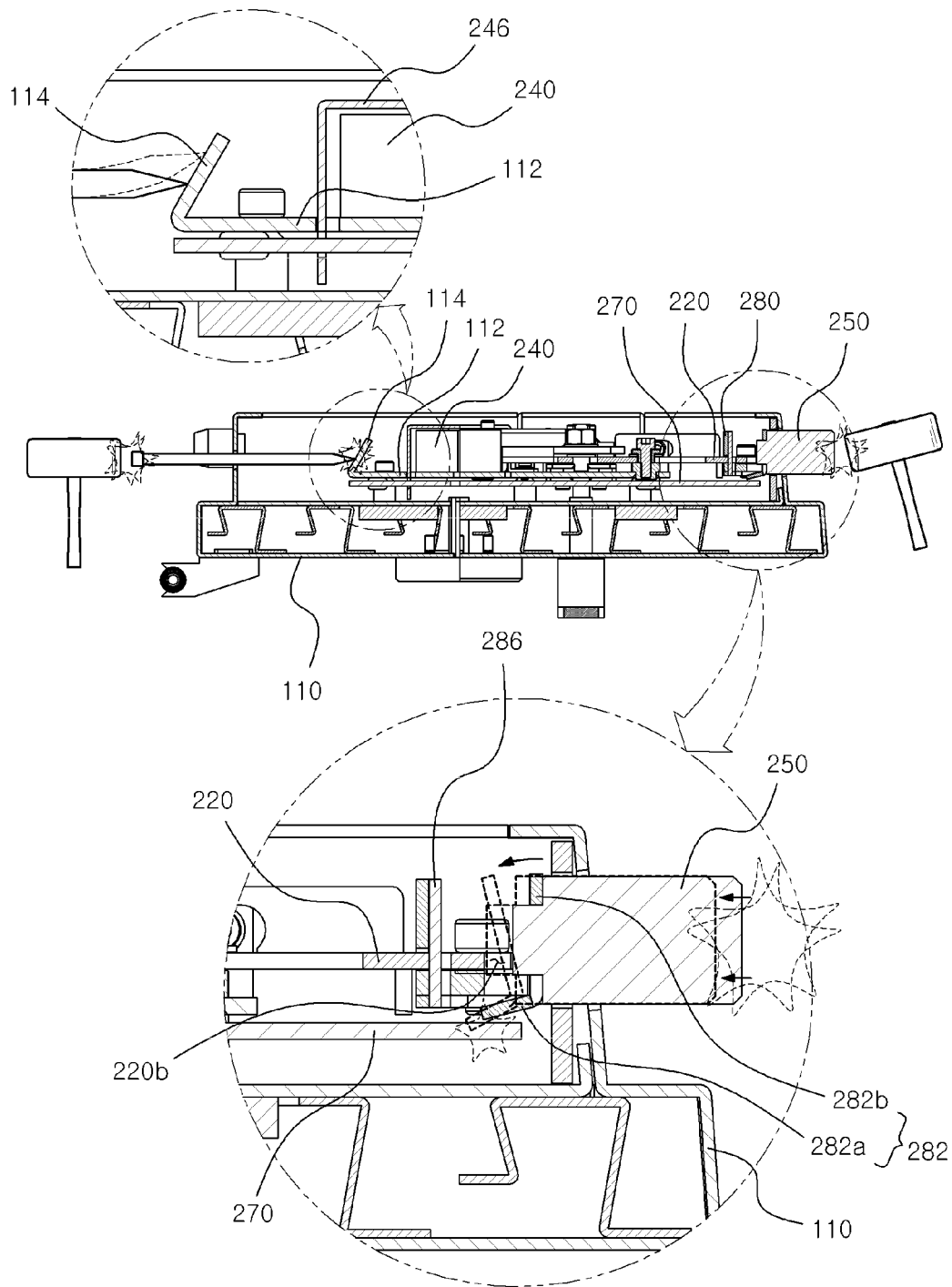


Fig. 4

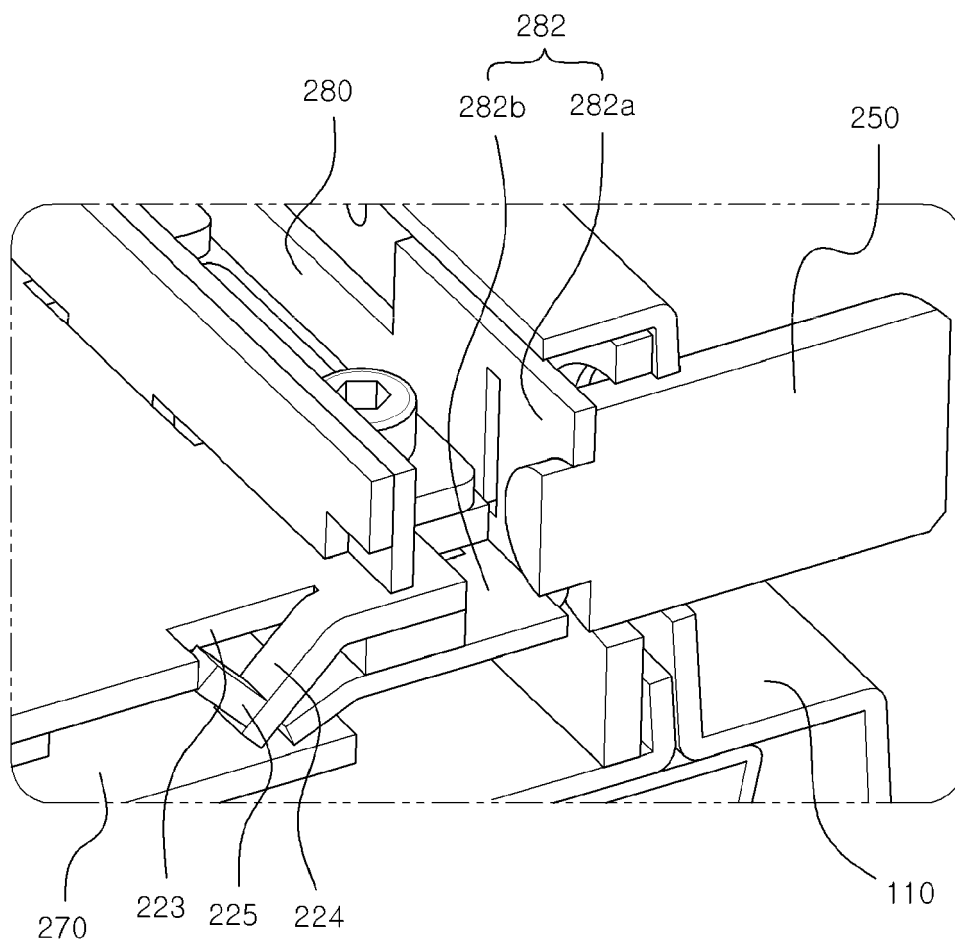


Fig. 5

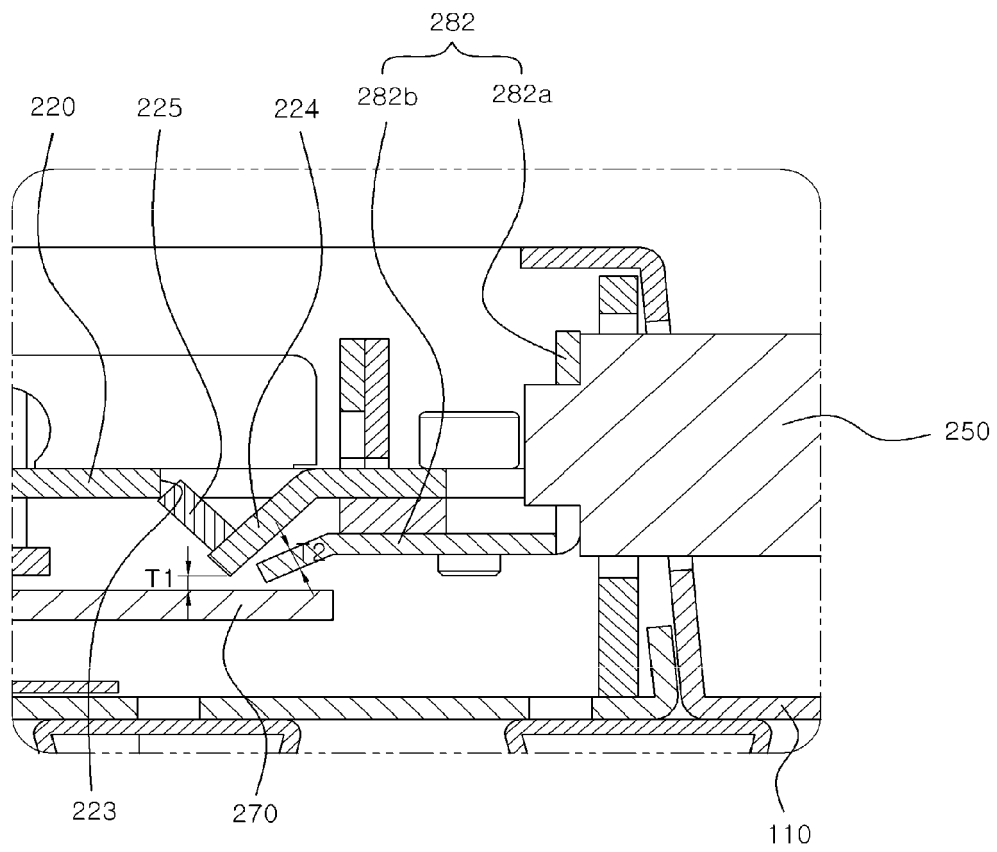


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 13 16 2521

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 555 374 A1 (WINCOR NIXDORF INT GMBH [DE]) 20 July 2005 (2005-07-20) * the whole document *	1-3,5, 8-11	INV. E05G1/04 E05B17/20 E05B65/00
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			TECHNICAL FIELDS SEARCHED (IPC)
			E05B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 August 2013	Examiner Westin, Kenneth
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 16 2521

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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23-08-2013

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