A container unit is composed of a lid and a unit body. A holder is a concave portion formed at a lower portion of the unit body. The lid is exposed at a lower surface of a camera body. The lid is slidably between a lock position where the lid is adjacent to a first inner surface of the holder, and a release position where the lid is adjacent to a second inner surface of the holder opposite to the first inner surface. An end portion of the lid is provided with a rotary shaft. Both ends of the rotary shaft engage with two elongate holes formed in lateral sides of the holder. The lid is slidably and rotatably retained by the holder.
LID OPENING AND CLOSING DEVICE

FIELD OF THE INVENTION

[0001] The present invention relates to a lid opening and closing device in which a lid rotatably supported by a case is rotated between a closed position where a slot formed in the case is covered and an open position where the slot is exposed.

BACKGROUND OF THE INVENTION

[0002] In recent years, portable small-sized electronics devices of an electronic camera and so forth are popularized. In this kind of the electronics devices, a battery of a rechargeable battery and so forth is used as a power source and is loaded in a case of the device. Therefore, such an electronics device is provided with a lid for inserting and removing the battery into and from the device case.

[0003] As a mechanism for opening and closing such a lid, there are known mechanisms in which a lid provided for closing a slot formed in a case is slid between a lock position, where the lid covers the slot and is retained by the case so as not to be opened, and a release position, where the lid is released from the case (see Japanese Patent Laid-Open Publication Nos. 06-89710, 10-3893, 2003-142841 and 2004-79543, for instance). The lid is rotated to an open position via the release position to expose the slot. The lid opening and closing mechanisms described in the above Publications are provided with a slide mechanism for protruding the lid from an outer side of the case, and a lock mechanism for inhibiting rotation of the lid. In this lid opening and closing mechanism, when the lid has been slid so as to protrude to the outside of the case, the lock of the lock mechanism is released to make the lid openable.

[0004] In the lid opening and closing mechanisms described in the above-noted Publications, however, it is necessary to form lid-opening lines on two surfaces of the case because the lid is slid so as to protrude to the outside of the case. Thus, there arises a problem in that members for composing the case are complicatedly processed and the cost increases. Further, since the lock mechanism is disposed at a corner of the case, there arises another problem in that the lock mechanism is likely to be damaged due to drop impact and so forth.

SUMMARY OF THE INVENTION

[0005] In view of the foregoing, it is a primary object of the present invention to provide a lid opening and closing device having a break-proof structure for impact to be applied due to a drop and so forth.

[0006] In order to achieve the above and other objects, the lid opening and closing device according to the present invention comprises a lock mechanism, a retainer portion and a rotation mechanism. The lock mechanism inhibits the lid from rotating to an open position, where a mouth formed in one surface of a case is exposed, when the lid is kept in a lock position. The retainer portion slidably retains the lid between the lock position and a lock release position. The lid is close to an inner side of a lateral surface adjacent to the surface, in which the mouth is formed, when kept in the lock position. The lid is away from the inner side of the lateral surface when kept in the lock release position. The rotation mechanism allows the lid rotating to the open position around an end portion of the lid positioned in a slide direction thereof when the lid is kept in the lock release position.

[0007] In a preferred embodiment, the end portion of the lid is an anterior end defined at a time when the lid is slide from the lock position to the lock release position. The rotation mechanism comprises a shaft and a couple of elongate holes. The shaft is disposed on either one of the anterior end of the lid and the case so as to be perpendicular to the slide direction of the lid. The elongate holes are formed in the other of the anterior end of the lid and the case so as to extend in the slide direction. Both ends of the shaft fit into the elongate holes.

[0008] It is preferable that the lid opening and closing device further comprises an engagement claw and an elastic member. The engagement claw is disposed at a position adjacent to the mouth and at a side of the shaft to retain an object loaded inside the mouth. The elastic member holds the engagement claw and is bendable in a direction evacuating from the mouth toward the shaft.

[0009] It is preferable that the lid opening and closing device further comprises a torsion spring and a slide surface. The torsion spring into which the shaft is inserted biases the lid toward the open position. One end of the torsion spring comes into contact with an inner surface of the lid and the other end thereof comes into contact with the case. On the slide surface, the end of the torsion spring slides when the lid moves between the lock position and the lock release position. The slide surface slopes so as to widen an interval of the lid and the retainer portion toward the shaft.

[0010] It is preferable that the lock mechanism comprises a protrusion, an engagement projection and contact surfaces. The protrusion is formed on an inner side of the lid. The engagement projection is formed on the case and retains the protrusion when the lid is kept in the lock position. The engagement projection disengages from the protrusion when the lid is moved to the lock release position. The contact surfaces are formed on the protrusion and the engagement projection. The contact surfaces come into contact with each other when the lid is moved from the open position to the lock release position, where the mouth is covered, in a state that the lid is situated nearer the lock position rather than the lock release position. The contact surfaces slope so as to recede from the lid toward the shaft.

[0011] It is preferable that the lid opening and closing device further comprises a click protrusion and a clicking member. The click protrusion is formed on one of an inner side of the lid and the case. The clicking member is disposed at the other of the inner side of the lid and the case. The clicking member retains the click protrusion to apply resistance to a slide operation of the lid when the lid is kept in the lock position. The clicking member disengages the click protrusion and biases the lid toward the open position upon performing the slide operation overcoming the resistance.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a perspective view showing a front side of an electronic camera;

[0013] FIG. 2 is a plan view showing a bottom side of the electronic camera;

[0014] FIG. 3 is a perspective view showing a structure of a container unit;
FIGS. 4A and 4B are plan views showing a bottom side of the container unit, wherein a lid is slid to a lock position and a release position;

FIGS. 5A, 5B and 5C are section views showing a structure of the container unit and showing a structure and an operation of a protrusion and an engagement projection acting as a lock mechanism;

FIGS. 6A, 6B and 6C are section views showing the structure of the container unit and showing a structure and an operation of a torsion spring; and

FIGS. 7A, 7B and 7C are section views showing the structure of the container unit and showing a structure and an operation of a click mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An electronic camera 10 shown in FIG. 1 comprises various imaging mechanisms built in a camera body 11 of a parallelepiped case. The camera body 11 is composed of a front cover 11a and a rear cover 11b.

A front surface of the camera body 11 is provided with a lens barrel 13 containing a taking lens 12, a flash emitter 14 for emitting flash light toward a subject, and a grip portion 15. A top surface of the camera body 11 is provided with a shutter button 16 to be depressed for shooting, a mode dial 17 to be rotated for changing a mode, and a power button 18 to be pressed for turning on and off a power source. A rear surface of the camera body 11 is provided with an LCD (not shown) for displaying an image and various setting pictures, and an operating portion 19 (see FIG. 2) composed of a plurality of buttons.

Besides the various shooting mechanisms, a container unit 30 (see FIG. 3) described later is built in the camera body 11. The container unit 30 is held by the front cover 11a and the rear cover 11b. As shown in FIG. 2, a lower surface of the camera body 11 is provided with a lid 31 composing the container unit 30. The lid 31 is opened and closed at a time when a battery and a memory card are inserted into and removed from the camera body 11.

The lid opening and closing mechanism of the present invention is composed of the lid 31 and a holder 32 for rotatably and slidably holding the lid 31. As shown in FIG. 3, the container unit 30 comprises a unit body 40 of a parallelepiped case and the lid 31. The unit body 40 contains the battery 41 and the memory card 44 (see FIG. 3). The battery 41 is a power source for driving the respective parts of the camera body 11. The memory card 44 is a recording medium for storing image data.

The above-mentioned holder 32 is a concave portion formed at the bottom of the unit body 40. As shown in FIGS. 4A and 4B, a space having a size larger than a contour of the lid 31 is formed so that the lid 31 is adapted to be slid inside the holder 32 in a direction shown by an arrow A. The lid 31 is slidly retained by the holder 32 between a lock position (shown in FIG. 4A) and a release position (shown in FIG. 4B). In the lock position, the lid 31 is adjacent to an inner wall 32a and rotation of the lid 31 is inhibited by a lock mechanism described later. In the release position, the lid 31 is adjacent to an inner wall 32b and lock of the lock mechanism is released. The lid 31 is slid inside the surfaces which are adjacent to the lower surface of the camera body 11.

When the lid 31 has been slid from the lock position to the release position, the lid 31 is rotated by a rotation mechanism around an end portion of the lid 31 located in a slide direction thereof. As described later, the rotation mechanism is composed of a rotary shaft 51 and elongate holes 52. Hereinafter, the rotation mechanism is described.

One end of the lid 31 is provided with the rotary shaft 51. Moreover, the holder 32 is provided with two elongate holes 52, which are formed in side walls adjacent to the inner wall 32b and extend in the slide direction (represented by the arrow A) of the lid 31. Both ends of the rotary shaft 51 engage with the two elongate holes 52. The lid 31 is retained by the holder 32 so as to be slideable in the direction of the arrow A and so as to be rotatable in a direction of an arrow B.

A battery slot 43 and a card slot 45 are formed at a surface 32c of the holder 32 which confronts an inner surface 31a of the lid 31 when the lid 31 is closed. The battery slot 43 is a mouth for inserting the battery 41 into a battery chamber 42 of the unit body 40. The card slot 45 is a mouth for inserting the memory card 44. Meanwhile, an engagement claw 46 is disposed at a side of the rotary shaft 51 so as to be adjacent to the battery slot 43 for the purpose of preventing the battery 41 from dropping out of the battery chamber. The engagement claw 46 is fixed to a head of a leaf spring 47 and is movable in the slide direction (represented by the arrow A) of the lid 31.

When the lid 31 is kept in the lock position (shown in FIG. 4A), the rotation thereof is inhibited by the lock mechanism. As described later, the lock mechanism comprises a protrusion, an engagement projection and an engagement opening for retaining the protrusion. Hereinafter, the lock mechanism is described.

Three protrusions 54 to 56 are formed at the periphery of the lid 31. When the lid 31 is kept in the lock position (shown in FIG. 4A), the protrusion 54 is inserted into an engagement opening 61 formed in the inner wall 32a of the holder 32, and is retained thereby to inhibit the rotation of the lid 31. When the lid 31 is moved to the release position (shown in FIG. 4B), the protrusion 54 is evacuated from the engagement opening 61 and is disengaged therefrom so that the lid 31 becomes rotatable.

When the lid 31 is kept in the lock position (shown in FIG. 4A), the protrusion 55 is retained by an engagement projection, which is formed on an inner wall 32a of the holder, to inhibit the rotation of the lid 31. When the lid 31 is moved to the release position (shown in FIG. 4B), the protrusion 55 is evacuated from the engagement projection and is disengaged therefrom so that the lid 31 becomes rotatable.

As shown in FIGS. 5A to 5C, the opposite surface 32c of the holder 32 is provided with an engagement projection 62 and an opening 63 formed at a position corresponding to the protrusion 56. When the lid 31 is kept in the lock position (shown in FIG. 4A), the protrusion 56 is retained by the engagement projection 62 such as shown in FIG. 5A to inhibit the rotation of the lid 31. When the lid 31 is moved to the release position (shown in FIG. 4B), the protrusion 56 is evacuated to a side of the opening 63 and is disengaged from the engagement projection 62 such as shown in FIG. 5B so that the lid 31 becomes rotatable.

As shown in FIG. 3, the protrusion 56 is disposed at a nearer position to the fulcrum (rotary shaft 51) in comparison with the protrusions 54 and 55. When the rotary shaft 51 is kept in a position nearer to the lock position rather
than the release position (such as shown in FIG. 5C) within the elongate hole 52, the protrusion 56 comes into contact with the engagement projection 62 at the outset upon rotating the lid 31 in a closed direction.

[0032] Contact surfaces 56a and 62a for contacting with each other are formed so as to slope, and thus a force acts relative to the lid 31 in a direction of an arrow C when the lid 31 is forced in the closed direction. In other words, the contact surface 62a of the engagement projection 62 slopes so as to recede from the lid 31 toward the rotary shaft 51, and the contact surface 56a of the protrusion 56 slopes so as to be parallel to the contact surface 62a while coming into contact therewith. Thus, when the lid 31 is closed in the state shown in FIG. 5C, the force acts in the direction of the arrow C to move the lid 31 to the release position shown in FIG. 5B.

[0033] The above-mentioned rotary shaft 51 is inserted into a torsion spring 53. One end 53a of the torsion spring 53 abuts on the inner surface 31a of the lid 31, and the other end 53b thereof abuts on the opposite surface 32c. By means of the torsion spring 53, the lid 31 is biased toward the open position shown in FIG. 3.

[0034] In virtue of this, upon sliding the lid 31 from the lock position (shown in FIG. 4A) to the release position (shown in FIG. 4B), the lid 31 is moved from a position shown in FIG. 6A to a position shown in FIG. 6B. And then, the lid 31 is rotated by the biasing force of the torsion spring 53 to a position shown in FIG. 6C.

[0035] In the meantime, while the rotary shaft 51 is moved relative to the elongate hole 52 between the positions shown in FIGS. 6A and 6B, the other end 53c of the torsion spring 53 is slid on the opposite surface 32c. An area of the opposite surface 32c on which the other end 53b is slid is formed as a slope 32c, which is inclined so as to recede from the lid 31 toward the inner wall 32b. The top of the other end 53b is curved in an arc shape such as shown in FIG. 3 for the purpose of preventing the other end 53b from being caught by the slope 32e at the time when the other end 53b slides on the slope 32c.

[0036] If the surface on which the other end 53b of the torsion spring 53 slides is flat, a force acts so as to move the lid 31 to the lock position (shown in FIG. 4A) when the lid 31 is rotated in the closed direction. In this case, a user needs to perform two operations, one of which is performed for closing the lid 31 and the other of which is performed for moving the lid 31 to the release position (shown in FIG. 4B). However, in the case the area on which the other end 53b slides is formed as the slope 32c as described above, when the lid 31 is rotated in the closed direction, the slope 32c prevents the force from acting in the direction, wherein the lid 31 is moved to the lock position (shown in FIG. 4A), such as shown in FIG. 6C. Thus, the lid 31 is moved to the position shown in FIG. 6B without the force by which the lid 31 is moved toward the lock position.

[0037] Successively, a click mechanism is described below. As described later, the click mechanism is composed of a click protrusion 57 and a click plate 66 regarded as a clicking member.

[0038] An opening 65 is formed in the opposite surface 32c. The click plate 66 is disposed so as to project through the opening 65 to the side of the opposite surface 32c. The click plate 66 is a leaf spring. A curvature portion 66a curved in an arc shape toward the lid side is formed at an anterior end of the click plate 66 such as shown in FIGS. 7A to 7C. Further, a posterior end of the click plate 66 is flexed and is fixed to the back of the opposite surface 32c at a position nearer to the rotary shaft 51 than the opening 65. Furthermore, the click protrusion 57 is formed on the inner surface 31a of the lid 31.

[0039] When the lid 31 is kept in the lock position (shown in FIG. 4A), the click protrusion 57 is located so as to be adjacent to the anterior end of the curvature portion 66a such as shown in FIG. 7A. At this time, the click protrusion 57 is retained by the curvature portion 66a. By virtue of this, resistance is caused in sliding the lid 31 toward the release position (shown in FIG. 4B). Upon a slide operation overcoming the resistance, the click plate 66 is elastically deformed and the curvature portion 66a is moved upward (toward the opening 65) to release the retention. And then, as shown in FIG. 7B, the curvature portion 66a comes into contact with an upper portion of the click protrusion 57 (positioned at a side of the opening 65). At this moment, the lid 31 is urged and rotated toward the open position shown in FIG. 7C by a restoring force of the click plate 66.

[0040] Next, an operation of the container unit 30 having the above structure is described below. When a user tries to load the battery 41 and the memory card 44 into the camera body 11, the lid 31 of the container unit 30 is opened. Also, when the user tries to remove the battery 41 and the memory card 44 from the camera body 11, the lid 31 is opened.

[0041] When the lid 31 is kept in the lock position (shown in FIG. 4A), the above-described lock mechanism inhibits the lid 31 from rotating. Therefore, the lid 31 is slid from the lock position (shown in FIG. 4A) to the release position (shown in FIG. 4B).

[0042] Moreover, when the lid 31 is kept in the lock position (shown in FIG. 4A), the click protrusion 57 is retained by the curvature portion 66a of the click plate 66 such as shown in FIG. 7A. The lid 31 is slid by overcoming the resistance of the click plate 66. Upon moving the lid 31 to the release position (shown in FIG. 4B), the click plate 66 is elastically deformed and the curvature portion 66a is moved upward (toward the opening 65) by the click protrusion 57 such as shown in FIG. 7B.

[0043] When the curvature portion 66a is moved upward, the restoring force of the click plate 66 urges the lid 31 toward the open position (shown in FIG. 7C). At this time, the lid 31 is urged by the torsion spring 53 as wall toward the open position. The lid 31 is rotated to the open position shown in FIG. 3 by the urging forces of the click plate 66 and the torsion spring 53 to expose the battery slot 43 and the card slot 45.

[0044] After that, the battery 41 and the memory card 44 are loaded or removed. By the way, in loading the battery 41, the engagement claw 46 is moved to the outside of the battery slot 43. Similarly, in removing the battery 41, the engagement claw 46 is moved to the outside of the battery slot 43. Incidentally, the engagement claw 46 is disposed at a side (of the rotary shaft 51) to which the lid 31 is moved when opened. Since the operating direction is common, good operability is achieved.

[0045] When the lid 31 is closed, the force acting in the closed direction is applied to the lid 31 kept in the open position (shown in FIGS. 6C and 7C). At this time, the end 53b of the torsion spring 53 comes into contact with the slope 32e to prevent the force from acting toward the lock position (shown in FIG. 4A). Thus, only by applying the force to the lid 31 in the direction of the arrow C, the lid 31
is moved to the release position (shown in FIG. 4B). Consequently, it is unnecessary to apply the force for moving the lid 31 toward the release position so that the lid 31 is moved to the release position in one-step operation.

[0046] When the force of the closed direction is applied to the lid 31 in a state that the rotary shaft 51 is located nearer to the lock position (shown in FIG. 5A) rather than the release position (shown in FIG. 5B), the force of the closed direction is further applied to the lid 31 at the moment when the protrusion 56 and the engagement projection 62 have contacted with each other. Upon this, the force is applied to the lid 31 in the direction of the arrow C to move the lid 31 to the release position. In this way, only by applying the force in the closed direction, it is possible to move the lid 31 to the release position.

[0047] After that, the lid 31 is moved from the release position (shown in FIG. 4B) to the lock position (shown in FIG. 4A). And then, the lock mechanism of the holder 32 retains the lid 31 to inhibit the rotation of the lid 31. As described above, in closing the lid 31, it is possible to move the lid 31 to the release position (shown in FIG. 4B) only by applying the force to the lid 31 in the closed direction. Thus, operability for closing the lid 31 is improved.

[0048] Further, as described above, the lid 31 is moved within the holder 32 disposed inside the lower surface of the camera body 11. Consequently, the lid 31 is moved inside the lateral surfaces, which are adjacent to the lower surface, so that the lock mechanism of the lid 31 is prevented from being disposed at a corner of the camera body 11. In virtue of this, even if impact is caused at the corner of the camera body 11 due to drop and so force, it is prevented that the lock mechanism is damaged.

[0049] Meanwhile, in a case that the lid 31 is slid to the outside of the lateral surface, lid-opening lines are formed on the lower and lateral surfaces. However, in the case the lid 31 moves inside the lateral surfaces adjacent to the lower surface such as described in the present invention, it is sufficient to form the lid-opening line on only the lower surface. Therefore, a cover member for composing the camera body 11 is easily processed and production cost may be reduced. In addition, appearance is improved.

[0050] In the above embodiment, the rotation mechanism is composed of the rotary shaft attached to the lid, and the elongate holder. However, this rotation mechanism is not exclusive. A shaft may be attached to the holder and elongate holes engaging with the shaft may be formed in the lid to compose another rotation mechanism. In this case, the end of the torsion spring slides on the inner surface of the lid when the lid is moved between the lock position and the release position. In view of this, it is preferable that the slide surface is formed as a slope.

[0051] In the above embodiment, the click mechanism is composed of the click plate attached to the holder, and the click protrusion formed on the inner surface of the lid. However, this click mechanism is not exclusive. The click plate may be attached to the inner surface of the lid and the click protrusion may be formed on the holder.

[0052] In the above embodiment, the containing portion of the container unit is disposed at the lower surface of the camera body. However, this is not exclusive. The containing portion may be integrally formed with the lower surface of the camera body.

[0053] In the above embodiment, the lid is disposed at the lower surface of the camera body. However, this is not exclusive. The lid may be disposed at any surface of the upper surface, the lateral surface and so force. Further, the sliding direction and the rotating direction of the lid are not limited to the above embodiment and may be properly changed.

[0054] The foregoing embodiment relates to the electronic camera. However, this is not exclusive. The present invention is available to any device requiring a lid.

[0055] Although the present invention has been fully described by way of the preferred embodiments thereof with reference to the accompanying drawings, various changes and modifications will be apparent to those having skill in this field. Therefore, unless otherwise these changes and modifications depart from the scope of the present invention, they should be construed as included therein.

What is claimed is:

1. An opening and closing device of a lid for covering a mouth formed in one surface of a case, comprising:
   a lock mechanism for inhibiting said lid from rotating to an open position, where said mouth is exposed, when said lid is kept in a lock position;
   a retainer portion for slidably retaining said lid between said lock position and a lock release position, said lid being close to an inner side of a lateral surface adjacent to said one surface when kept in said lock position, and said lid being away from the inner side of said lateral surface when kept in said lock release position; and
   a rotation mechanism for allowing said lid rotating to said open position around an end portion of said lid positioned in a slide direction thereof when said lid is kept in the lock release position.

2. The opening and closing device according to claim 1, wherein said end portion is an anterior end defined at a time when said lid is slid from said lock position to said lock release position.

3. The opening and closing device according to claim 2, wherein said rotation mechanism comprises:
   a shaft disposed on either one of said anterior end of the lid and said case so as to be perpendicular to said slide direction of the lid; and
   a couple of elongate holes formed in the other of said anterior end of the lid and said case so as to extend in said slide direction, said elongate holes fitting with both ends of said shaft.

4. The opening and closing device according to claim 3, further comprising:
   an engagement claw disposed at a position adjacent to said mouth and at a side of said shaft to retain an object loaded inside said mouth; and
   an elastic member for holding said engagement claw, said elastic member being bendable in a direction evacuating from said mouth toward said shaft.

5. The opening and closing device according to claim 4, wherein the loaded object is a battery for driving each part contained in said case, and said engagement claw evacuates from said mouth in loading and removing said battery.

6. The opening and closing device according to claim 3, further comprising:
   a torsion spring into which said shaft is inserted to bias said lid toward said open position, one end of said torsion spring coming into contact with an inner surface of said lid and the other end thereof coming into contact with said case; and
a slide surface on which either end of said torsion spring slides when said lid moves between said lock position and said lock release position, said slide surface sloping so as to widen an interval of said lid and said retainer portion toward said shaft.

7. The opening and closing device according to claim 6, wherein the end of said torsion spring sliding on said slide surface is curved in an arc shape to prevent the end of said torsion spring from being caught by said slide surface.

8. The opening and closing device according to claim 3, wherein said lock mechanism comprises:

a protrusion formed on an inner side of said lid;
an engagement projection formed on said case, said engagement projection retaining said protrusion when said lid is kept in said lock position, and said engagement projection disengaging from said protrusion when said lid is moved to said lock release position; and

contact surfaces formed on said protrusion and said engagement projection, said contact surfaces coming into contact with each other when said lid is moved from said open position to said lock release position, where said mouth is covered, in a state that said lid is situated nearer said lock position rather than said lock release position, said contact surfaces sloping so as to recede from said lid toward said shaft.

9. The opening and closing device according to claim 1, further comprising:

a click protrusion formed on one of an inner side of said lid and said case; and

a clicking member disposed at the other of the inner side of said lid and said case, said clicking member retaining said click protrusion to apply resistance to a slide operation of said lid when said lid is kept in said lock position, and said clicking member disengaging said click protrusion and biasing said lid toward said open position upon performing the slide operation overcoming said resistance.

10. The opening and closing device according to claim 9, wherein said clicking member is a leaf spring and is disengaged from said click protrusion by elastic deformation of said leaf spring.

11. The opening and closing device according to claim 10, wherein a top portion of said leaf spring is convexly curved relative to said click protrusion, and the curved top portion comes into contact with said click protrusion to apply said resistance.

12. The opening and closing device according to claim 1, wherein said mouth is formed at a bottom surface of said case, and said lid covering said mouth is rotated downward by said rotation mechanism after sliding.

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