

"THIN BATTERY-CONTAINING STRUCTURE"

Heretofore, small-sized electronic apparatuses, such as pocket radio receivers, have made use of a thin battery, such as a button type battery. Fig. 1 shows a structure for such a button-type battery. When battery holder 4, for holding button-type battery 3, is inserted in battery container 2 of case 1, pawls 4a, 4b formed at the end of battery holder 4 are engaged with engaging claws 2a, in battery container 2. In this way, battery holder 4 is engaged with battery container 2. When battery holder 4 is removed, pawls 4a, are formed with slopes of approx. 45° with respect to the attaching or detaching direction of battery holder 4, and battery holder 4 is pulled beforehand to disengage pawls 4a, from engaging claws 2a, thereby removing battery holder 4 due to the deflections of pawls 4a, to the side of battery 3.

However, when the elasticity of pawls 4a, is excessively strong with respect to the removing force of battery holder 4 in this structure, battery holder 4 can be hardly removed, while when they are excessively weak, its impact resistance decreases so that battery holder 4 might be detached. Thus, the structure of this type has disadvantages that the elasticity of pawls 4a, are hardly regulated.

Accordingly, an object of the present invention is to provide a thin battery-containing structure in which

a battery holder is not unintentionally removed and a battery can be readily replaced by a simple operation.

According to the present invention, there is provided a thin battery-containing structure for an electronic apparatus comprising a case, a battery holder detachably contained in a battery container in the case, electrode plates provided in the battery container in contact with electrodes of thin battery contained in the battery holder, a lock pin provided at the battery holder and having a flexible arm, a guide lock provided at the ^{case}~~battery holder~~ for guiding to engage the lock pin at a predetermined position when pressing to set the battery holder in the battery container and disengaging the engagement of the lock pin when further pressing the battery holder in the battery container to set the holder to the detachable state, and a spring member for pressing out the battery holder contained in the battery container.

In the battery-containing structure of this invention, when the battery holder is pressed to be set in the battery container of the case, the lock pin provided through the arm having a flexibility in the battery holder is guided to be engaged by the guide lock in the case. When the battery holder is further pressed, the lock pin is disengaged by the guide lock to press out the battery holder by the spring member in the case from the battery container. Therefore, the

battery-containing structure of this invention has the advantages in that the battery holder can not be removed unintentionally at containing time and the battery itself can be readily replaced by means of a simple operation.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a view showing a battery holder of a conventional thin electronic apparatus;

Fig. 2 is a view showing a thin electronic apparatus in which a battery is contained according to the present invention;

Fig. 3 is a view showing a thin electronic apparatus in which a battery holder is removed according to the present invention;

Fig. 4 is a sectional view taken along the line IV-IV in Fig. 2;

Fig. 5 is a side view of a battery holder of a thin electronic apparatus according to the present invention;

Fig. 6 is a bottom view of a guide lock groove of a thin electronic apparatus according to the present invention;

Fig. 7 is a sectional view taken along the line VII-VII in Fig. 6; and

Fig. 8 is a sectional view taken along the line VIII-VIII in Fig. 6.

Preferred embodiments of the present invention applied to a thin radio receiver will now be described in detail with reference to Figs. 2 to 8.

Figs. 2 to 4 show a thin radio receiver. A thin battery containing structure of the present invention comprises case 10. Case 10 is formed in a thin flat plate shape opened at the lower side. Case 10 detachably contains battery holder 11 therein. Circuit substrate 12 is attached by screws to the bottom of container 10. Front and back sheets are respectively bonded to the upper and lower surfaces of case 10. On circuit substrate 12 are placed components necessary for radio receiving function, such as power switch 12, tuning switch 14, variable resistor switch 15, earphone socket 16, an antenna, not shown, and an LSI, etc.

Battery container 10a for containing battery 11 is provided in case 10. Battery container 10a has, as shown in Figs. 3 and 4, guide walls 10b and 10c for guiding both sides of battery holder 11, and electrode plates 17 and 18 provided on the bottom (lower portion) thereof. Circuit substrate 12 is cut out at a portion corresponding to battery container 10a, and one electrode plate 17 is disposed over the cut-out portion. Electrode plate 17 is contacted with the lower surface (negative electrode) of battery 19, and made of a metal plate, such as a stainless steel plate. Cut and erected contactors 17a are formed at predetermined

positions on electrode plate 17. Other electrode plate 18 is formed of a leaf spring contacted with the side (positive electrode) of battery 19 and formed by bending a slender metal plate in "L" shape. Electrode plate 18 is disposed in the depth side of battery container 10a, is soldered at one end thereof to circuit substrate 12, and is elastically contacted at the other end thereof with the side of battery 19 to always press battery holder 11 contained in battery container 10a. Auxiliary coiled spring 18a is formed at the bent portion of electrode plate 18. This auxiliary coiled spring 18a contained in battery holder 11 is compressed in battery holder 11 to press battery holder 11.

15 Battery holder 11 for containing battery 19 is set in battery container 10a of case 10, is formed in a square flat plate shape, and formed at the center with battery containing hole 11a for containing button-type battery 19. Battery holder 11 is projected at its one end with arm 11b from side toward depth side, and lock pin 11c is erected at the end of projected arm 11b. Arm 11b has a flexibility to be flexible in upward or downward, or rightward or leftward direction when lock pin 11c moves. Lock pin 11c moves along guide lock groove 20 to be described later, serves to lock battery holder 11 to be engaged with a predetermined position when battery holder 11 is set in battery container 10a,

and is engaged with guide lock groove 20 so that battery holder 11 may not be removed from battery container 10a when lock pin is released to be removed from battery container 10a. Battery containing hole 11a penetrates battery holder 11 elevationally as shown in Fig. 4 to project at the lower portion (negative electrode portion) of battery 19. Thus, contactors 17a, 17a of electrode plate 17 are elastically contacted with the projected portion of battery 17. The depth side of battery containing hole 11a is opened as shown in Fig. 2. The side (positive electrode portion) of battery 19 is projected from the opened portion, and leaf spring-like electrode plate 18 is elastically contacted with the projected portion of battery 19.

Guide lock groove 20 engaged under the guidance of lock pin 11c of battery holder 11 is provided on the inner surface of case 10, and formed, as shown in Figs. 6 to 8, of a linear portion 20a, and an annular portion 20b. More specifically, linear portion 20a serves to move lock pin 11c in a direction of an arrow Z when pressing and removing battery holder 11 so that lock pin 11c contacts with beforehand end (lower end) so as not to remove when battery holder 11 is most pulled out. Annular portion 20b serves to move in a direction of an arrow X by inserting lock pin 11c from linear portion 20a when setting battery holder 11 to a predetermined position, and to move in a direction of

an arrow Y at detaching time to be again fed to linear portion 20a. Annular portion 20b is formed at the center in a raised portion (a) of "heart" shape and is partitioned sequentially at the groove of periphery thereof in partitions (b) to (g). In a range of partitions (b) to (e) of annular portion 20b, lock pin 11c moves in a direction of an arrow X when battery holder 11 is set, and in a range of partitions (e) to (g) of annular portion 20b, lock pin moves in a direction of an arrow Y. More specifically, partition (b) combines with linear portion 20a to be deepest in the groove. Partition (c) is inclined to increase the pressing force of battery holder 11 so that the groove is gradually shallowed. Partition (d) is flat to provide click feeling when battery holder 11c is set to be most shallow in the groove. Partition (c) sets battery holder 11 to a predetermined position by engaging lock pin 11c with circular-arc-shaped recess of the outer periphery of raised portion (a) to be deeper in the groove with a step than partition (d) and more shallow than partition (b). Partition (f) overrides lock pin 11 when set battery holder 11 is further pressed to remove its lock to be more shallow than partition (e) with a step and to be inclined to form a large step at beforehand side and a small step at the depth side so that lock pin 11c can readily overrides when battery holder 11 is pressed. In a range of

partition (g), lock pin 11c serves to move when battery holder 11 is pressed by leaf spring-shaped electrode plate 18 and auxiliary coiled spring 18a to be deeper than partition (e) and more shallow than partition (b) in the groove. Therefore, lock pin 11c always move sequentially in partitions (b) to (g), but does not move reversely.

The operation of battery holder 11 when replacing battery of the thin radio receiver constructed as described above will be described.

As shown in Fig. 3, battery holder 11 is first removed from battery container 10a of case 10. Then, since battery containing hole 11a formed at battery holder 11 is exposed out of case 10, button-shaped battery 19 can be inserted to be set in battery containing hole 11a thus exposed. When battery holder 11 for containing battery 19 is pressed into battery container 10a, lock pin 11c provided through arm 11b at battery holder 11 moves from beforehand along linear portion 20a of guide lock groove 20 formed on the inner surface of case 10. Then, contactors 17a, 17a of electrode plate 17 formed on the bottom of battery container 10a are elastically contacted with the lower surface (negative electrode) of battery 17, and electrode plate 18 and auxiliary coiled spring 18a are elastically contacted with the depth wall of battery holder 11. In this state, battery holder 11 is not

completely contained in battery container 10a, but is projected externally in some degree. When battery holder 11 is further pressed against elastic forces of electrode plate 18 and auxiliary coiled spring 18a, lock pin 11c of battery holder 11 moves from linear portion 20a of guide lock groove 20 into annular portion 20b to move annular portion 20b in a direction of an arrow X. More specifically, lock pin 11c is moved upward on the slope of partition (c) from partition (b) of annular portion 20b to override partition (d) to eventually fall in clock feeling in partition (e). When a hand is removed from battery holder in this state, battery holder 11 is pressed elastically by electrode plate 18 and auxiliary coiled spring 18a. Thus, lock pin 11c is intruded into the recess of the outer periphery of raised portion (a) in partition (e) to be securely engaged. Thus, battery holder 11 is completely contained in battery container 10a as shown in Fig. 1 so as not to be unintentionally removed but to be securely set preferably in battery container 10a. When battery holder 11 is thus contained, contactors 17a, 17a of electrode plate 17 are elastically contacted directly with the lower surface (negative electrode) of battery 19, and electrode plate 18 is elastically contacted with the side (positive electrode) of battery 19 projected from the depth wall of battery holder 11. Therefore, battery 19 is electrically connected to circuit

substrate 12. When battery 19 is thus contained, contactors 17a, 17a of electrode plate 17 formed on the bottom of battery container 10 are elastically contacted directly with the lower surface of battery 19 to lift
5 battery 19. Thus, even if battery 19 contained in battery containing hole 11a of battery holder 11 is slightly fluctuated, battery 19 contained in battery container 10a does not fluctuate but is securely and preferably contained in battery container 10a.

10 When battery 19 thus contained is removed, battery holder 11 is further pressed. In other words, when battery holder 11 is further pressed against the elastic forces of electrode plate 18 and auxiliary coiled spring 18a, lock pin 11c is contacted with the outer wall of
15 partition (e) to forcibly override partition (f) along the outer wall to be fed to next partition (g). When a hand is released from battery holder 11 in this state, battery holder 11 is pressed out in some degree by electrode plate 18 and auxiliary coiled spring 18a.

20 Then, lock pin 11c is again fed from partition (g) of annular portion 20b to linear portion 20a. When the pressed portion of battery holder 11 is pulled by hand, battery holder 11 is pulled out from battery container 10a as shown in Fig. 3, and battery 19 contained in
25 battery holder 11 can be replaced. Even if battery holder 11 is pulled out, lock pin 11c is contacted with the end of linear portion 20a of guide lock groove 20.

Thus, battery holder 11 is not completely removed out of battery container 10. Therefore, battery holder 11 is not lost.

5 However, according to the battery containing structure thus constructed, battery 19 can be readily replaced by a simple operation of merely pressing battery holder 11, and battery holder 11 is not unintentionally removed out at containing time but can be preferably used.

10 In the embodiment described above, auxiliary coiled spring 18a has been provided at the bent portion of leaf spring-like electrode plate 18. However, when electrode plate 18 has sufficient elastic force (flexible force), auxiliary coiled spring 18a may not always be provided.

15 In the embodiment described above, the case that the battery containing structure is applied to a thin radio receiver has been described. However, the present invention is not limited to the particular embodiment. For example, the present invention may be applied widely
20 to other pocket television, or other small-sized electronic apparatuses.



Claims:

1. A thin battery-containing structure for an electronic apparatus, comprising:

a case,

5 a battery holder detachably housed in a battery container within the case,

electrode plates incorporated in the battery container, in contact with electrodes of a thin battery held in the battery holder,

10 a lock pin provided at the battery holder and having a flexible arm,

a guide lock member provided at the case for guiding to engage the lock pin at a predetermined position when pressing to set the battery holder in the battery container and disengaging the lock pin when further pressing the battery holder in the battery container to set the holder to the detachable state, and

15 a spring member for pressing out the battery holder housed in the battery container.

20 2. A thin battery-containing structure for an electronic apparatus according to claim 1, wherein said spring member is one of the electrode plates in contact with the battery in said battery holder.

25 3. A thin battery-containing structure for an electronic apparatus according to claim 1, further comprising: an auxiliary spring member for acting to press out the battery holder.



4. A thin battery-containing structure for an electronic apparatus according to claim 1, wherein said guide lock has a linear portion for linearly moving the lock pin and an annular portion for circulating the lock pin at said holder removing and pressing time.

5. A thin battery-containing structure for an electronic apparatus according to claim 4, wherein said lock pin is in contact with the end of the linear portion of said guide lock when removing said holder to prevent said holder from being removed.

6. A thin battery-containing structure for an electronic apparatus according to claim 4, wherein the center of the annular portion of said guide lock is formed in a raised portion of heart shape having a recess to be engaged with said lock pin when said holder is pressed.

7. A thin battery-containing structure for an electronic apparatus according to claim 4, wherein the annular portion of said guide lock is partitioned into a plurality of partitions, and said partitions are different in the depth of the groove thereof from the other adjacent partition.

8. A thin battery-containing structure for an electronic apparatus according to claim 1, wherein said electronic apparatus is a receiver.

9. A thin battery-containing structure for an electronic apparatus according to claim 8, wherein said



receiver is a radio receiver.

10. A thin battery-containing structure,
substantially as hereinbefore described with reference
to the accompanying drawings.
