ABSTRACT

Protective cases and related components for cellular phones or other such portable electronic devices are disclosed. The cases may be used to encompass and protect the portable electronic device, while at the same time allowing a user to store, carry, and more effectively utilize discrete tools or sets of tools and accessories. In particular, protective cases for portable electronic devices are provided that include a shell, storage compartments, tools, and an integrated bracing member. Other protective cases for portable electronic devices are provided that include a shell and a swappable tool package. Various swappable tool packages are also provided that are designed to be housed in and fully removable from a protective case for portable electronic devices.
PROTECTIVE CASE WITH TOOLS FOR PORTABLE ELECTRONIC DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS


INTRODUCTION

[0002] Aspects of this disclosure relate generally to protective cases, and more particularly to protective cases for portable electronic devices and the like.

[0003] Cell phones and other mobile devices have become a ubiquitous form of communication and data access. Many individuals carry their portable cellular telephones frequently. Additionally, many of these individuals often carry other tools on a regular basis that are useful when they are not at home. These items and tools include knives, pliers, combs, pens, wrenches, small cosmetics or other such items, which are frequently used daily. Carrying all of these items individually can be quite bulky and difficult to manage, however, and often requires additional handbags or carrying implements in order to maintain access to all of these items on the go. Additionally, when an individual is participating in a sporting past-time, for example, they may also require some of these items but not have the capability to carry different bags and holders with them during the sporting activity.

[0004] Accordingly, there remains a need for improved devices to facilitate carrying and managing the many items that an individual may desire to keep with them.

SUMMARY

[0005] The present disclosure provides protective cases and related components for cellular phones or other such portable electronic devices according to various embodiments. The cases may be used to encompass and protect the portable electronic device. They may also include one or a combination of features that allow the protective case to store, carry, and more effectively utilize discrete tools or sets of tools and accessories.

[0006] As an example, a protective case for a portable electronic device is provided that includes a shell, one or more storage compartments, one or more tools, and an integrated bracing member. The shell may be shaped to define a cavity to receive and hold a portable electronic device in a form fitting relationship. More specifically, the shell may be shaped to protect the portable electronic device and to provide an opening for user interface access to the portable electronic device. The one or more storage compartments may be formed in the shell and have openings to an exterior of the shell. The one or more storage compartments may be movable through the openings to deploy positions extending to the exterior of the shell. The tool may include, in particular, at least one integrated tool coupled to the shell and configured to remain coupled to the shell in a corresponding deployed position. The integrated bracing member may be formed in the shell to mechanically reinforce the protective case during integrated tool use.

[0007] As another example, a protective case for a portable electronic device is provided that includes a shell and a swap-pable tool package. The shell may be shaped to define a cavity to receive and hold a portable electronic device in a form fitting relationship. More specifically, the shell may be shaped to protect the portable electronic device and to provide an opening for user interface access to the portable electronic device. The swappable tool package may be housed in and fully removable from the shell. The swappable tool package may include one or more storage compartments and one or more tools. The one or more tools may have stored positions within the storage compartments and deployed positions outside of the storage compartments.

[0008] As another example, a swappable tool package is provided that is designed to be housed in and fully removable from a protective case for a portable electronic device. The swappable tool package may include one or more storage compartments and one or more tools. The one or more tools may have stored positions within the storage compartments and deployed positions outside of the storage compartments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The accompanying drawings are presented to aid in the description of various aspects of the disclosure and are provided solely for illustration of the aspects and not limitation thereof.

[0010] FIGS. 1A-1B illustrate an example protective case for a portable electronic device.

[0011] FIG. 2 illustrates an example integrated bracing member according to one design.

[0012] FIG. 3 illustrates an example screwdriver tool design in more detail.

[0013] FIG. 4 illustrates an example pliers tool design in more detail.

[0014] FIG. 5 illustrates an example dismountable tool in more detail.

[0015] FIG. 6 illustrates several example spring and detent mechanisms in more detail.

[0016] FIG. 7 illustrates an example protective case with a swappable tool package.

[0017] FIG. 8 illustrates a protective case with an example swappable tool package.

[0018] FIG. 9 illustrates a protective case with another example swappable tool package.

[0019] FIG. 10 illustrates another example swappable tool package.

DETAILED DESCRIPTION

[0020] Various aspects of the present invention are disclosed in the following description and related drawings directed to specific embodiments of the invention. The term “embodiments of the invention” does not require that all embodiments of the invention include the discussed feature, advantage, process, or mode of operation, and alternate embodiments may be devised without departing from the scope of the invention. Additionally, well-known elements of the invention may not be described in detail or may be omitted so as not to obscure other, more relevant details.

[0021] FIGS. 1A-1B illustrate an example protective case for a portable electronic device. Portable electronic devices with which the protective case may be used include but are not limited to cellular phones, personal digital assistants (PDAs), tablet computers, portable music devices, portable television devices, portable movie player devices, portable Internet devices, and so on.
As shown and described in more detail below, the protective case 100 generally includes a shell 102 shaped to define a cavity to receive and hold a portable electronic device (not shown) in a form fitting relationship. In particular, the shell 102 is shaped to protect the portable electronic device (e.g., against mechanical shock) while at the same time providing an opening for user interface access to the portable electronic device, including any internal (e.g., software) or external (e.g., hardware) controls. Within the shell 102 are formed various storage compartments 104 having openings to an exterior of the shell 102. Several example storage compartments 104A-104D are highlighted for illustration purposes. Various corresponding tools 106 are provided that have stored positions within the storage compartments, and which are movable through the openings to deployed positions extending to the exterior of the shell 102. Several example tools 106A-106C are highlighted for illustration purposes.

In the design of FIGS. 1A-IB, the protective case 100 is illustrated as being shaped for use with a cell phone or PDA-style portable electronic device. Accordingly, the shell 102 in this design is formed as a sleeve that is arranged to be mounted around the rear surface, sides, and lower end of the portable electronic device. In particular, the shell 102 includes a rear wall 108 covering a rear portion of the portable electronic device when the device is positioned in the cavity of the shell 102. Left and right side walls 110 extend from the rear wall 108 for covering left and right side portions of the portable electronic device, respectively. Top and bottom end walls 112 are connected to the rear wall 108 and the left and right side walls 110 for covering top and bottom end portions of the portable electronic device, respectively. Various user controls and ports along the sides and ends of the portable electronic device may also be exposed by cutouts or access ports 114 in the protective case 100.

It will be appreciated that in different design variations, the rear wall 108, side walls 110, and end walls 112 may be connected to each other in different ways, including being made of a single piece of material, being formed as separate pieces bonded together, being formed as separate pieces mated together via a screw or other mating feature, and so on. It will also be appreciated that one or more such wall may be omitted in certain designs. For example, the side walls 110 may be sufficient to receive and hold the portable electronic device and the end walls 112 may be omitted.

Contact between the protective case and the portable electronic device can be maintained by a friction fit, for example, although a fastener or adhesive can also be used. Additionally, contact may be maintained by components that wrap around the surface or edges of the portable electronic device, effectively holding it against the back wall. In the design of FIGS. 1A-1B, the protective case 100 is shown as being held in place by an edge band 116. The edge band 116 includes two constituent pieces (e.g., two halves) that are attached to each other via fasteners to form a roughly continuous band. The pieces of the edge band 116 may include two complementary halves, a horseshoe or “U” shaped design with asymmetric pieces, and so on. A cutout feature in the edge band 116 may interface with a protrusion on the edge of the rear wall 108 to fix the rear wall 108 in a position that is flush with the back surface of the edge band 116.

In some designs, the shell may be made of a rigid material such as metal, plastic, polymer, ceramic, or carbon fiber. In other designs, the shell may be made of a soft pliable material such as rubber, soft plastic, or polymer, with a more rigid core structure made of a stiff and strong material such as metal, plastic, alloy, polymer, ceramic, or carbon fiber. A plastic or other soft film may be affixed to the shell to provide protection against scratches or other damages to the portable electronic device to which it attaches.

The tools may include, for example, one or a combination of any of the following non-limiting examples: knives, pliers, screwdrivers, wrenches, wire cutters, rulers, kickstands, card holders, cosmetic holders, combs, pens, stylus, bicycle repair tools, bicycle patch kits, golf tools, photography tools, memory cards, lights, or batteries. The tools may be made of a hard and resilient material such as metal, hard plastic, alloy, polymer, ceramic, or carbon fiber. The tools may also be made from softer materials when desired, such as soft plastics or rubbers. The tools may also be electronic in nature, made from typical electronic components and circuit boards, and containing power sources.

In the example of FIGS. 1A-IB, there is shown multiple built-in tools including a knife 106A, pliers 106B (having integrated wire cutters), and a screwdriver 106C, among others. Special features, such as the ruler engraving 118, may also be engraved onto any of the exposed surfaces of the protective case 100 to incorporate additional features. Additionally, FIGS. 1A-IB show slider buttons 120 that allow access to stored tools when the protective case 100 is installed on a portable electronic device. Several example sliders 120A-120B are highlighted for illustration purposes.

In general, two types of tools may be employed: (1) removable tools that are detachable from the shelf in a corresponding deployed position; and (2) integrated tools that are coupled to the shelf and configured to remain coupled to the shelf in a corresponding deployed position. Removable tools can include tools that are contained in slots within the protective case and can be removed completely from the protective case to be used independently of the protective case. Integrated tools may include tools that are contained in slots within the protective case and can protrude from the edges of the protective case for use. Integrated tools may also include tools that are exposed on the outside of the protective case and can be hinged so they can swivel or rotate into a position at which they can be used. Integrated tools can also include tools located at fixed locations on the outside of the protective case and can be used in-situ. Integrated tools may also include tools that are concealed and stored in the case, and removed from the storage slots and placed in an auxiliary slot in the case for use.

To mechanically reinforce the protective case and thereby better protect the portable electronic device during integrated tool use, the protective case may further include an integrated bracing member formed in the shell.

FIG. 2 illustrates an example integrated bracing member according to one design. In this design, the shell 200 is formed as a substantially unitary structure with various storage compartments 202 being formed as part of an integrated bracing member 204. The integrated bracing member provides rigidity and strength for integrated tool use by transferring the associated forces to the protective case, such that the load is distributed to the user’s hand and the portable electronic device over a larger area. This allows the portable electronic device to be more reliably used as a handle for knives, pliers, screwdrivers, etc., without damaging it.

In other designs, the shell may be split into a composite structure that includes the integrated bracing member and a separate tool storage member shaped to define the
storage compartments. For example, in such designs, the integrated bracing member may be formed as a backplate abutting the separate tool storage member (e.g., a softer outer layer). As another example, the integrated bracing member may be disposed as a protective band around the edges of the shell (e.g., surrounding the separate tool storage member) to further distribute loading around the portable electronic device and to the user’s hand. As another example, the integrated bracing member may be an internal stiff structure surrounded by the tool storage member, thereby adding strength and rigidity to the tool storage member.

The integrated bracing member may be formed from one or a combination of aluminum, titanium, zinc, steel, glass-filled nylon, a carbon-fiber mold, a Kevlar mold, or other stiff (e.g., reinforced) variants of polycarbonate or ceramic materials, to name a few example materials. The integrated bracing member may also be one of the above materials surrounded by a softer or less rigid material which makes up a separate tool storage member.

Returning to FIG. 2, the integrated bracing member may include a pass-through 206 (e.g., one or more non-conductive windows) arranged to allow electromagnetic signals to pass therethrough, to and from the portable electronic device. Several example non-conductive windows 206A-206D are highlighted for illustration purposes. This may help to improve wireless communication functions of the portable electronic device in certain designs that use metal or other conductive materials as the integrated bracing member, since these materials may degrade the reception or transmission wireless signals.

Returning to FIGS. 1A-1B, some tools may be specially designed to better fit and operate in conjunction with certain dimension or other constraints necessitated by protective case designs.

FIG. 3 illustrates an example screwdriver tool design in more detail. In this design, the screwdriver 300 includes a thin hex or “Allen” wrench head portion 302 having exactly two tangs 304 disposed opposite one another in the respective head portion. The design of the screwdriver 300 is such that it maintains a very thin profile in order to fit inside a relatively slim protective case (e.g., for a smartphone) while still providing sufficient torque transfer to a screw of mating design. By removing portions of the standard Allen wrench profile (which is typically hexagonal in shape) and reducing the profile to only the widest section of the hexagon, spanning from one intersection point to the intersection point directly opposite, the Allen wrench profile can be flattened for more seamless integration.

Other screwdriver heads, such as a similar thin Phillips head screwdriver head portion, for example, may be provided in other designs. Further, as shown in FIG. 3, multiple such heads may be integrated into the same screwdriver tool. This may provide different sizing options for the user or other features.

FIG. 4 illustrates an example pliers tool design in more detail. In this design, the pliers 400 are formed as a pair of thin pliers from first and second independently-moved levers 402A, 402B. The design of the pliers’ pivot allows for a reduction in the thickness and bulk of the protective case. The pliers’ joint is not overlapping as is the case with traditional pliers, but rather, each half of the pliers is fully constrained at the locations indicated by the A-B arrows when extended, so as to function as a standard pivot but with reduced thickness. This design also allows both halves of the pliers to be designed at a maximum thickness for the available space. In a conventional, overlapping arrangement, each of the left and right component thickness at the point of overlap would have to be reduced by one-half the total enclosure thickness, reducing the pliers’ strength.

Returning again to FIGS. 1A-1B, some tools may be provided with special access or retention mechanisms to better fit and operate in conjunction with certain dimension or other constraints necessitated by protective case designs.

FIG. 5 illustrates an example disconnectable slider in more detail. In this design, the disconnectable slider 502 protrudes from the shell for user access to a given removable tool and decouples from the removable tool in the corresponding deployed position. Sliders embedded in the backside of the protective case may be used to provide easier gloved access to stored tools, for example. The sliders may be directly connected to the tools or to ejectors that allow tool access. For example, the slider may slide up a small “ramp” and be captured by the shell to disengage from the tool (e.g., the knife 106A in FIGS. 1A-1B), allowing it to be removed.

FIG. 6 illustrates several example spring and detent mechanisms in more detail. In each of the illustrated designs, the spring or detent mechanism couples at least one of the storage compartments to a given tool (e.g., by being formed in the storage compartment or in the tool) to retain and lock the tool into the corresponding deployed position. As shown, multiple spring and detent designs can be used to secure integrated and removable tools inside the storage compartments. In a first example design 602, a circular coil spring design is shown that functions as a detent for the tool, holding it temporarily in-place during storage or use. The spring mates with a similar cutout in the associated tool, applying sufficient force to hold the tool in-place during use or storage, but also allowing the tool to be removed when additional force is applied. In a second example design 604, another spring detent design is shown that uses a bendable arm to apply force to a small cutout in the mating tool, allowing the tool to be held in-place during storage or use, but also to be removed when additional force is applied. In a third example design 606, a spring-based locking mechanism is shown that positively engages with a mating cutout in the tool to hold the tool in-place during storage and/or during use of the integrated tool. The tool is prevented (or locked) from being deployed until the locking mechanism is physically moved out from the mating cutout.

In some designs, the storage compartments may be formed into or otherwise include a swappable tool package that is fully removable from the shell. As such, the case may be configured to mate with any one of a plurality of swappable tool packages (sub-assemblies) that holds the tools. The swappable tool packages may each have their own specific sets of tools adapted for different user activities interest (e.g., daily life, business, biking, golf, make-up, photography, travel, adventure, etc.). For example, one such package may include a small knife, pliers, wrenches, and screwdrivers. Another such package may include a pen, stylus, comb, and reservoir of lip balm. Yet another such package may include bicycle repair tools. Yet another such package may include a nail file, emery board, lip balm, tweezers, and blotting paper. Yet another such package may include a USB drive, lighting devices, scissors, and screwdrivers. Yet another such package may include battery back-up power. Yet another such package may include storage space for specific items such as electronic cigarettes or memory cards. Any of these packages may
be attached to the main protective case via a universal fastening feature to securely hold the tool package in place and facilitate interchangeability.

[0043] FIG. 7 illustrates an example protective case with a swappable tool package. As shown, the protective case includes a base shell 702 and a tool package sub-assembly 704 that is designed to hold multiple tools, which may be arranged in sets and tailored as per the preference of the user. The sets of tools can be exchanged for other tools while the protective case is installed on a portable electronic device. Thus, multiple different tool package sub-assemblies can be installed in the base shell of the protective case, and as discussed above, each tool package sub-assembly can have different uses, such as bicycle repair tools, men’s or women’s grooming tools, and so on.

[0044] FIG. 8 illustrates a protective case with an example swappable tool package. In this example, the tool package sub-assembly 704 includes five example tools as shown, including a combination bottle-opener/tire iron, Allen wrench tools, a combination hex wrench and tire iron, and two screwdrivers. Each tool may be fixed into the tool package sub-assembly by a snapping mechanism, for example, although other attachment mechanisms may be used.

[0045] FIG. 9 illustrates a protective case with another example swappable tool package. In this example, the tool package sub-assembly 704 includes a different set of tools than the one shown in FIG. 8. This tool package sub-assembly similarly attaches onto the base shell 702 of the protective case and uses a similar snapping feature. This example assembly includes a mirror, a pen and stylus combination, a combination bottle opener and knife, and a comb.

[0046] FIG. 10 illustrates another example swappable tool package. In this example, the tool package sub-assembly 704 includes yet another different set of tools than the ones shown in FIGS. 8-9. This example assembly includes a mirror, a pen and stylus combination, a combination bottle opener, Phillips head screwdriver, flathead screwdriver and nail file, a USB solid-state storage device, tweezers, a personal LED light, scissors, and small flathead and Phillips head screwdrivers.

[0047] The foregoing description is provided to enable any person skilled in the art to make or use embodiments of the present invention. It will be appreciated, however, that the present invention is not limited to the particular formulations, process steps, and materials disclosed herein, as various modifications to these embodiments will be readily apparent to those skilled in the art. That is, the generic principles defined herein may be applied to other embodiments without departing from the spirit or scope of the invention.

What is claimed is:

1. A protective case for a portable electronic device, the protective case comprising:
   a shell shaped to define a cavity to receive and hold a portable electronic device in a form fitting relationship, the shell being shaped to protect the portable electronic device and to provide an opening for user interface access to the portable electronic device;
   one or more storage compartments formed in the shell and having openings to an exterior of the shell;
   one or more tools having stored positions within the storage compartments and movable through the openings to deployed positions extending to the exterior of the shell, wherein the tools comprise at least one integrated tool coupled to the shell and configured to remain coupled to the shell in a corresponding deployed position; and
   an integrated bracing member formed in the shell to mechanically reinforce the protective case during integrated tool use.
2. The protective case of claim 1, wherein the shell comprises:
   a rear wall covering a rear portion of the portable electronic device when the device is positioned in the cavity of the shell; and
   left and right side walls that extend from the rear wall for covering left and right side portions of the portable electronic device, respectively.
3. The protective case of claim 1, wherein the shell is a unitary structure with the one or more storage compartments being formed as part of the integrated bracing member.
4. The protective case of claim 1, wherein the shell is a composite structure comprising the integrated bracing member and a separate tool storage member shaped to define the one or more storage compartments.
5. The protective case of claim 4, wherein the integrated bracing member is formed as a backplate abutting the separate tool storage member or as a band surrounding the separate tool storage member.
6. The protective case of claim 1, wherein the integrated bracing member is formed from one or a combination of: aluminum, titanium, zinc, steel, glass-filled nylon, or carbon-fiber.
7. The protective case of claim 1, wherein the integrated bracing member comprises one or more non-conductive windows arranged to allow electromagnetic signals to pass therethrough to and from the portable electronic device.
8. The protective case of claim 1, wherein the one or more tools further comprise at least one removable tool that is detachable from the shell in a corresponding deployed position.
9. The protective case of claim 8, wherein the removable tool is accessible via a disconnectable slider that protrudes from the shell for user access and decouples from the removable tool in the corresponding deployed position.
10. The protective case of claim 1, further comprising a spring or detent mechanism coupling at least one of the storage compartments to the integrated tool to retain and lock the integrated tool into the corresponding deployed position.
11. The protective case of claim 1, wherein the at least one integrated tool comprises a pair of thin pliers formed from first and second independently-mounted levers.
12. The protective case of claim 1, wherein the at least one integrated tool comprises a thin Allen wrench head portion or a thin Phillips head screwdriver head portion having exactly two tangs disposed opposite one another in the respective head portion.
13. The protective case of claim 1, wherein the one or more storage compartments form a swappable tool package that is fully removable from the shell.
14. The protective case of claim 13, wherein the swappable tool package comprises a first set of tools adapted for a first user activity and is swappable with a second set of tools adapted for a second user activity.
15. A protective case for a portable electronic device, the protective case comprising:
   a shell shaped to define a cavity to receive and hold a portable electronic device in a form fitting relationship, the shell being shaped to protect the portable electronic device and to provide an opening for user interface access to the portable electronic device; and
a swappable tool package housed in and fully removable from the shell, the swappable tool package comprising:
one or more storage compartments; and
one or more tools having stored positions within the storage compartments and deployed positions outside of the storage compartments.

16. The protective case of claim 15, wherein the swappable tool package comprises a first set of tools adapted for a first user activity and is swappable with a second set of tools adapted for a second user activity.

17. The protective case of claim 15, wherein the shell comprises:
(a) a rear wall covering a rear portion of the portable electronic device when the device is positioned in the cavity of the shell; and
(b) left and right side walls that extend from the rear wall for covering left and right side portions of the portable electronic device, respectively,

wherein the swappable tool package is housed in and fully removable from the rear wall of the shell.

18. A swappable tool package designed to be housed in and fully removable from a protective case for a portable electronic device, the swappable tool package comprising:
one or more storage compartments; and
one or more tools having stored positions within the storage compartments and deployed positions outside of the storage compartments.

19. The swappable tool package of claim 18, wherein the one or more tools comprise a first set of tools adapted for a first user activity.

20. The swappable tool package of claim 19, wherein first set of tools are swappable with a second set of tools adapted for a second user activity.

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