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(54) DATA READING DEVICE WITH A SWITCH LOCATABLE ANYWHERE, AND RELATED SYSTEM AND METHOD

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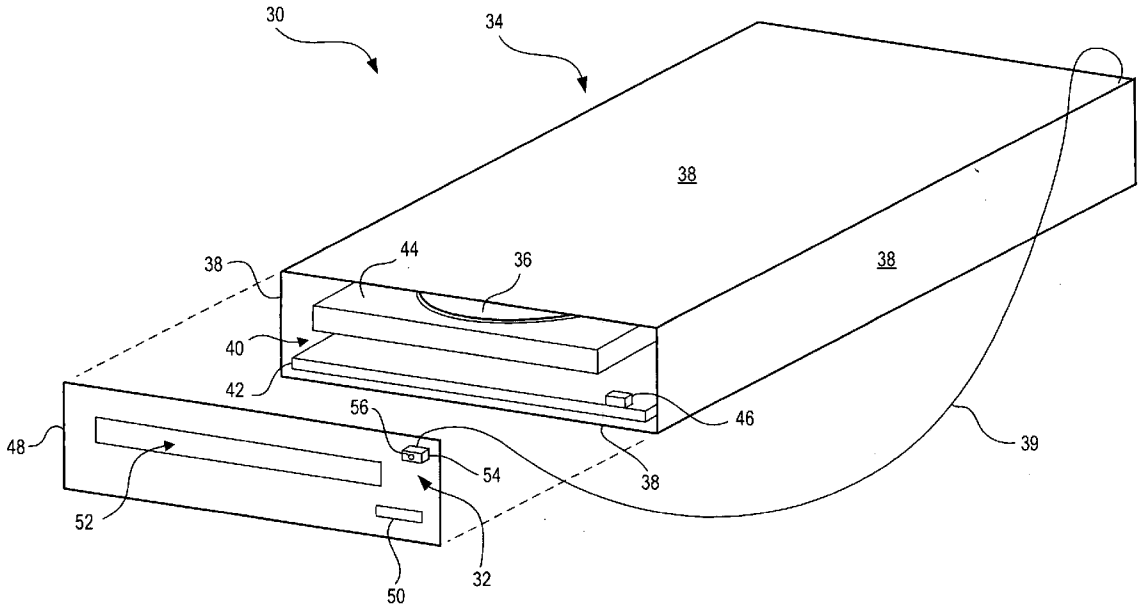
(57) ABSTRACT

An electronic device for reading data from a removable storage medium includes a switch to generate a signal that circuitry of the device receives. The switch is connected to the circuitry and disposed outside a housing of the device. Or, in another embodiment, the switch is connected to a circuit board of the device and disposed in the interior of the device, but not mounted to the circuit board. The circuitry of the device can read data stored on a removable storage medium. The housing protects the circuitry and has a plurality of sides that define an interior in which the circuitry is disposed. With the switch disposed outside the housing, the switch may be located where it will be easier to see and reach. Thus, one can more easily avoid damaging the device when one inserts and removes storage media from the device.



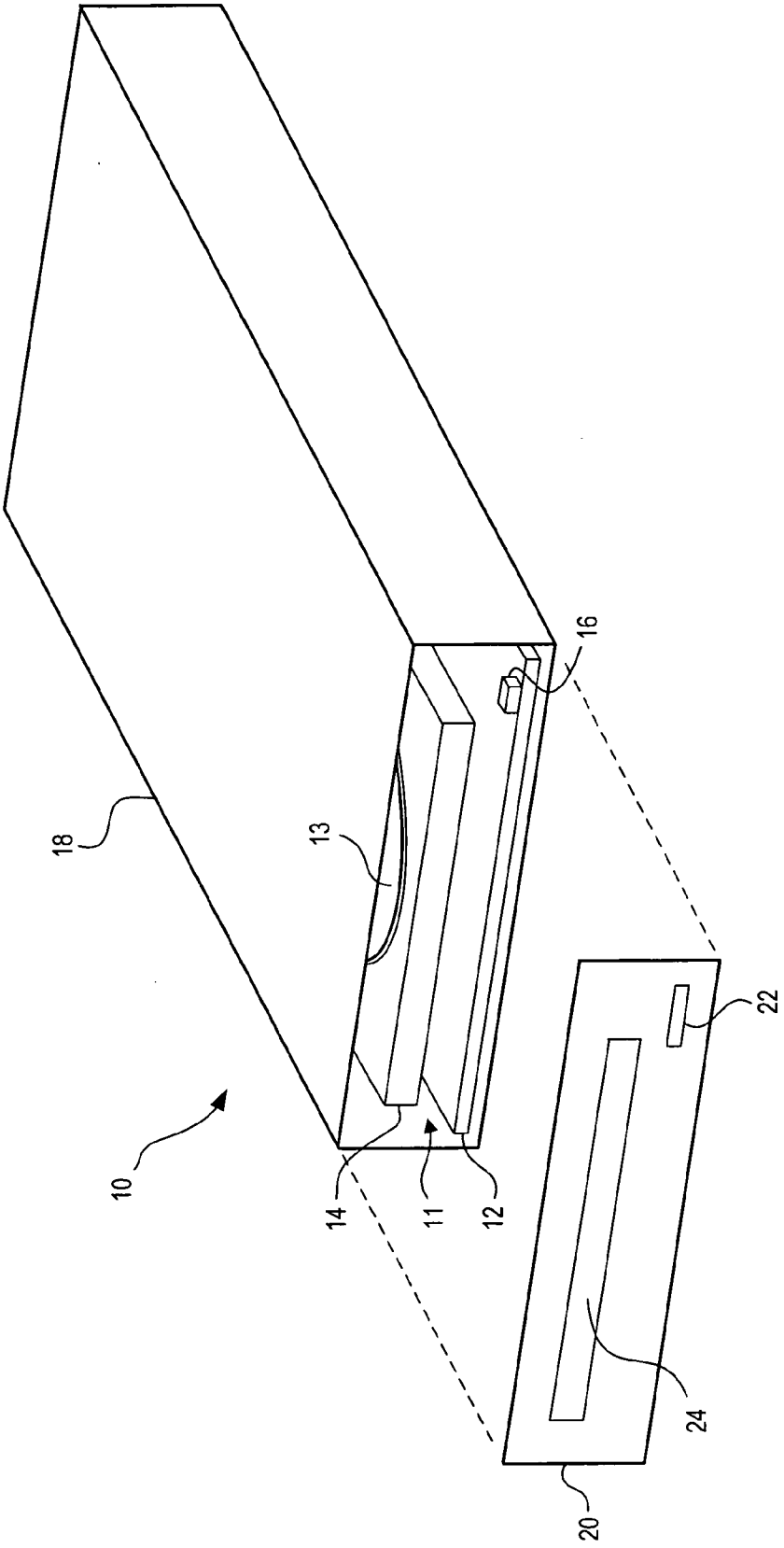


FIG. 1 (Prior Art)

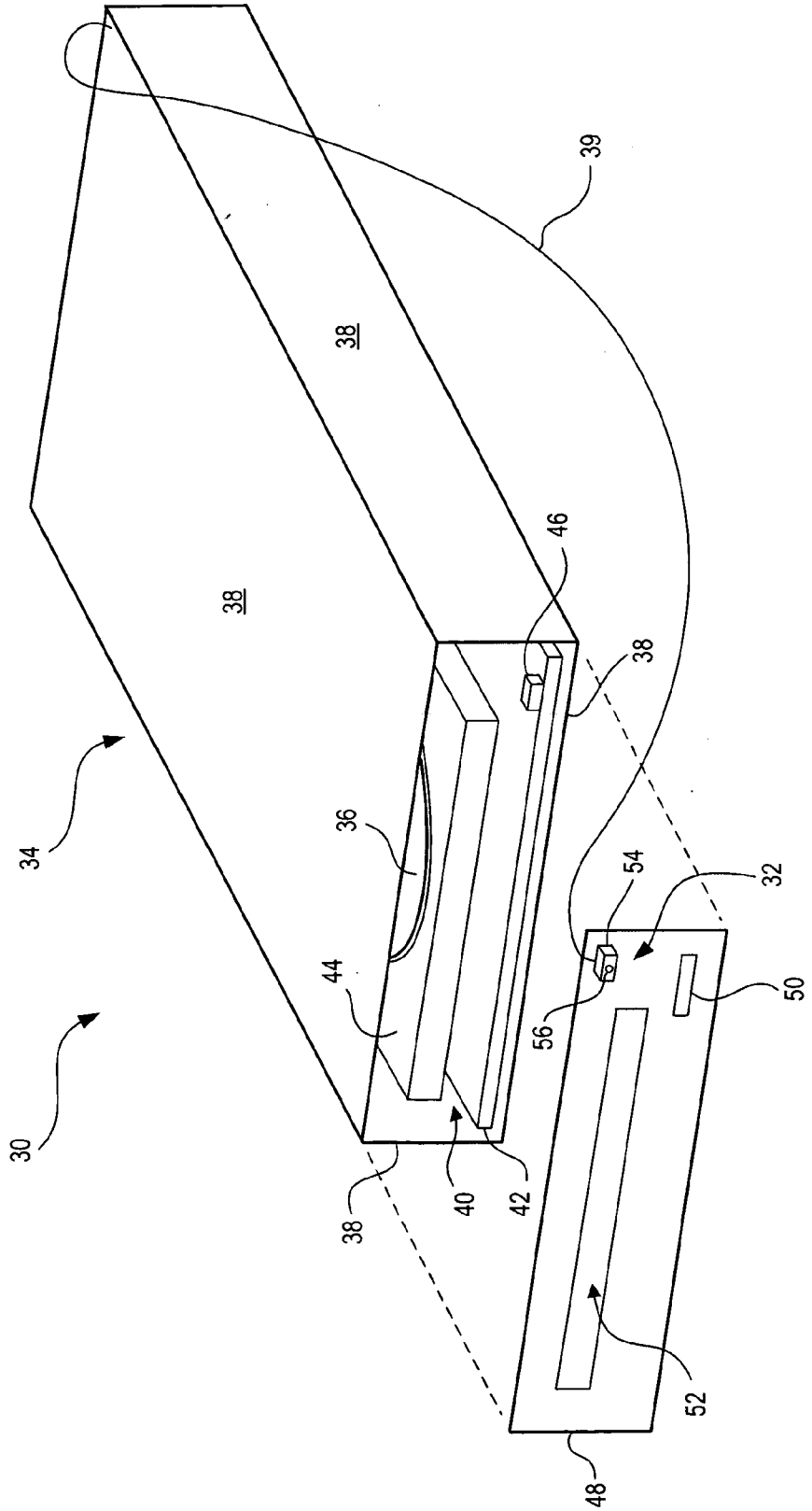


FIG. 2

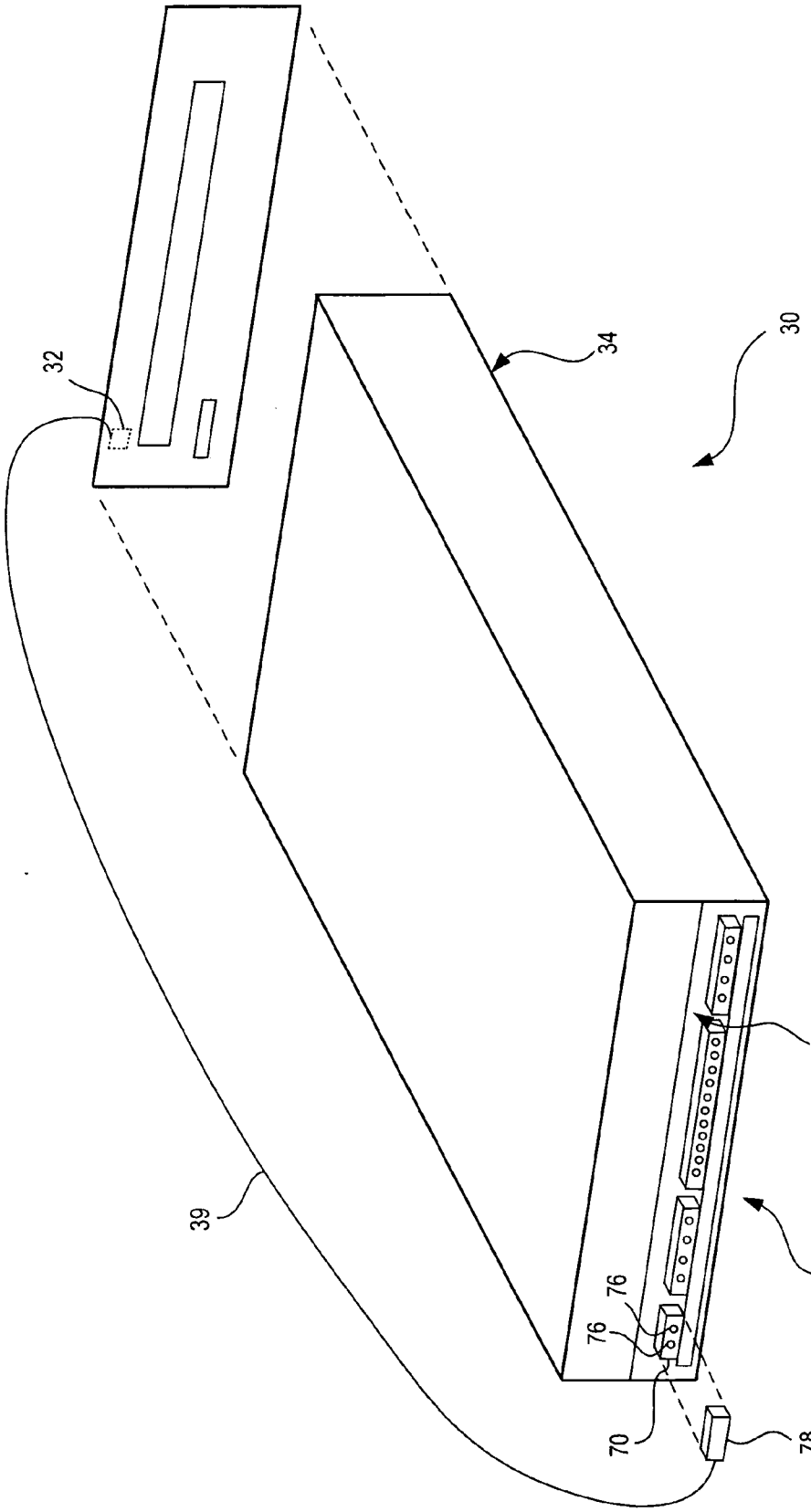


FIG. 3

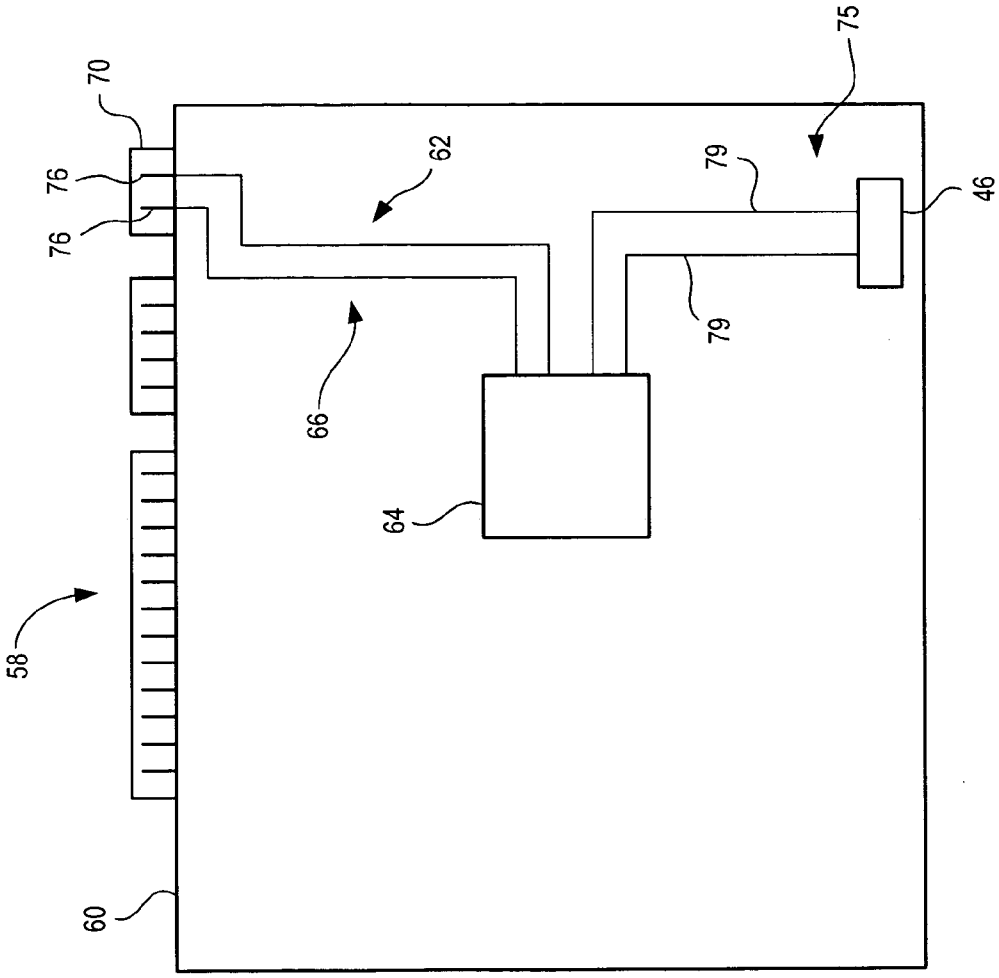


FIG. 4

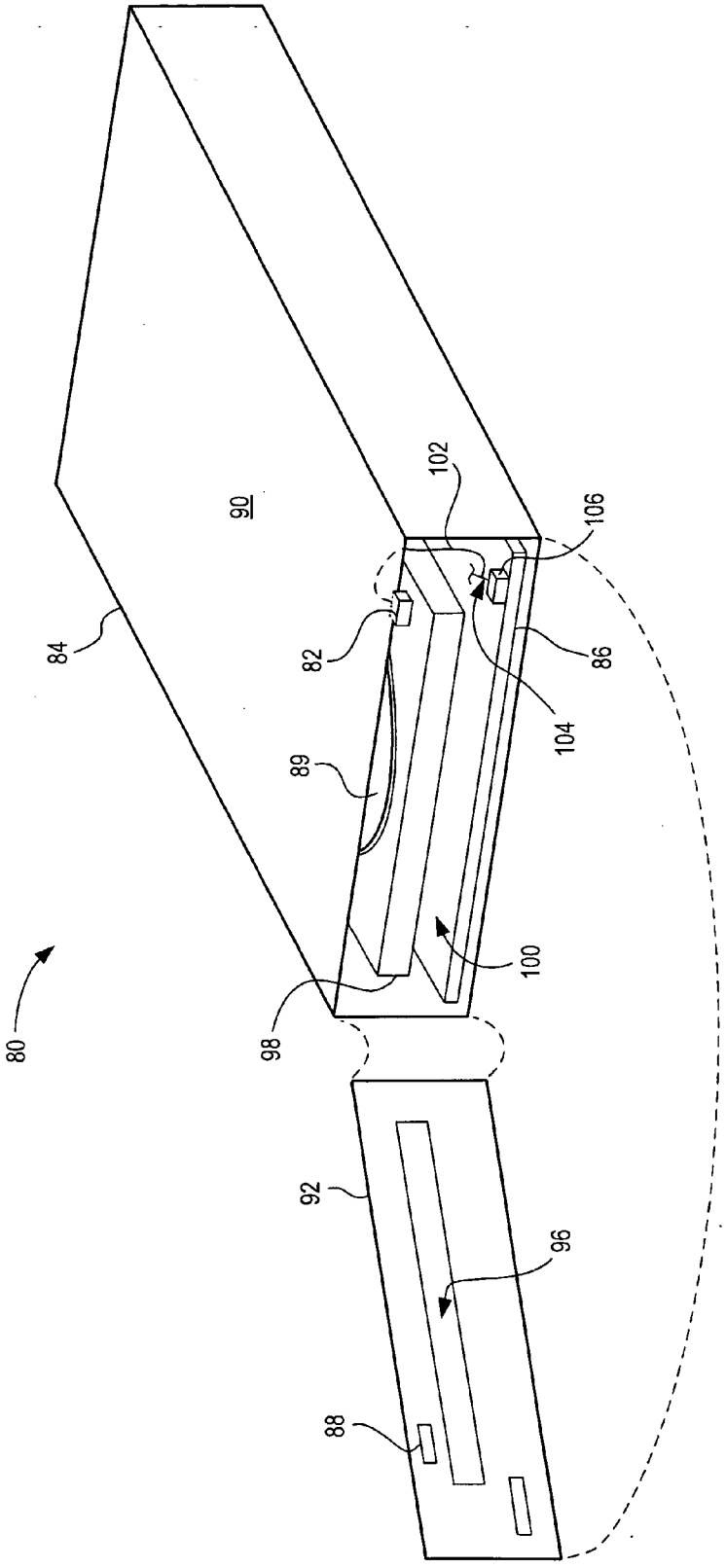


FIG. 5

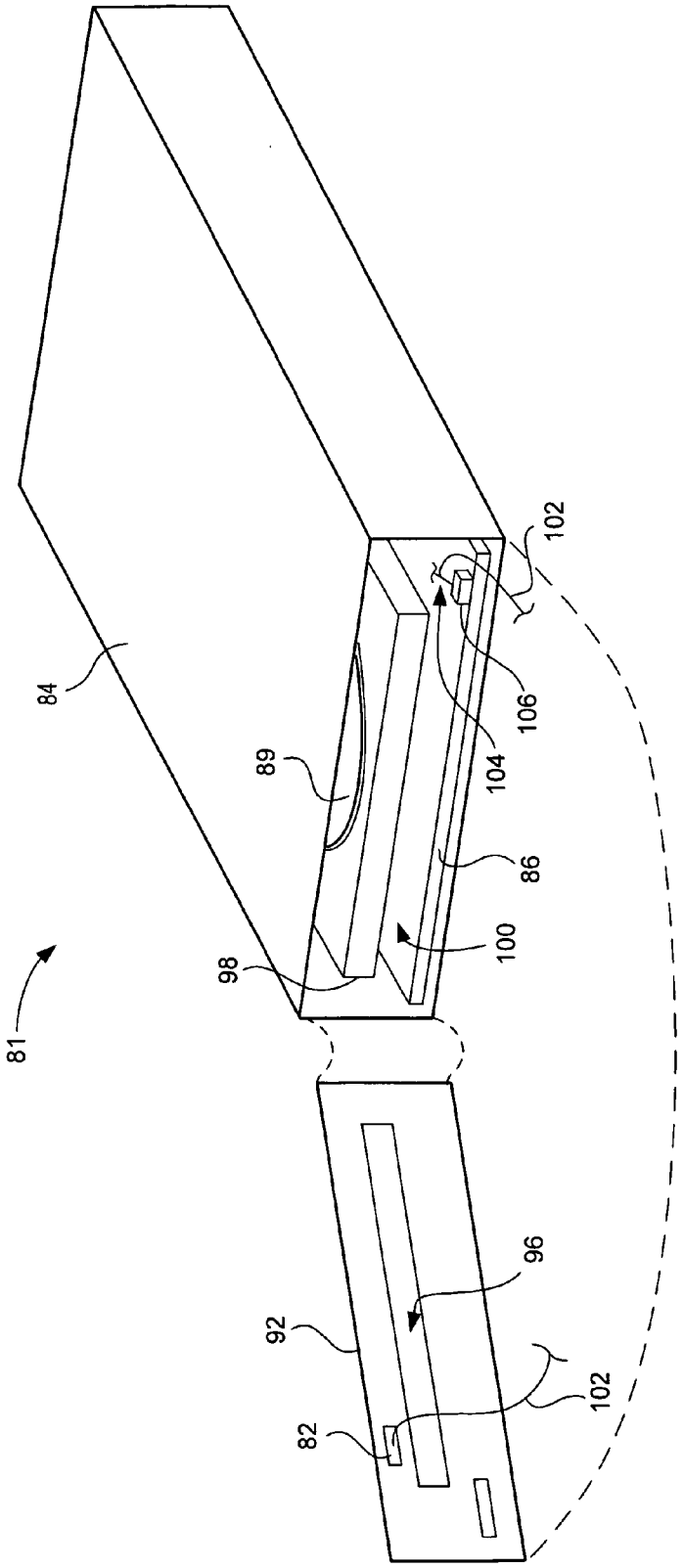


FIG. 6

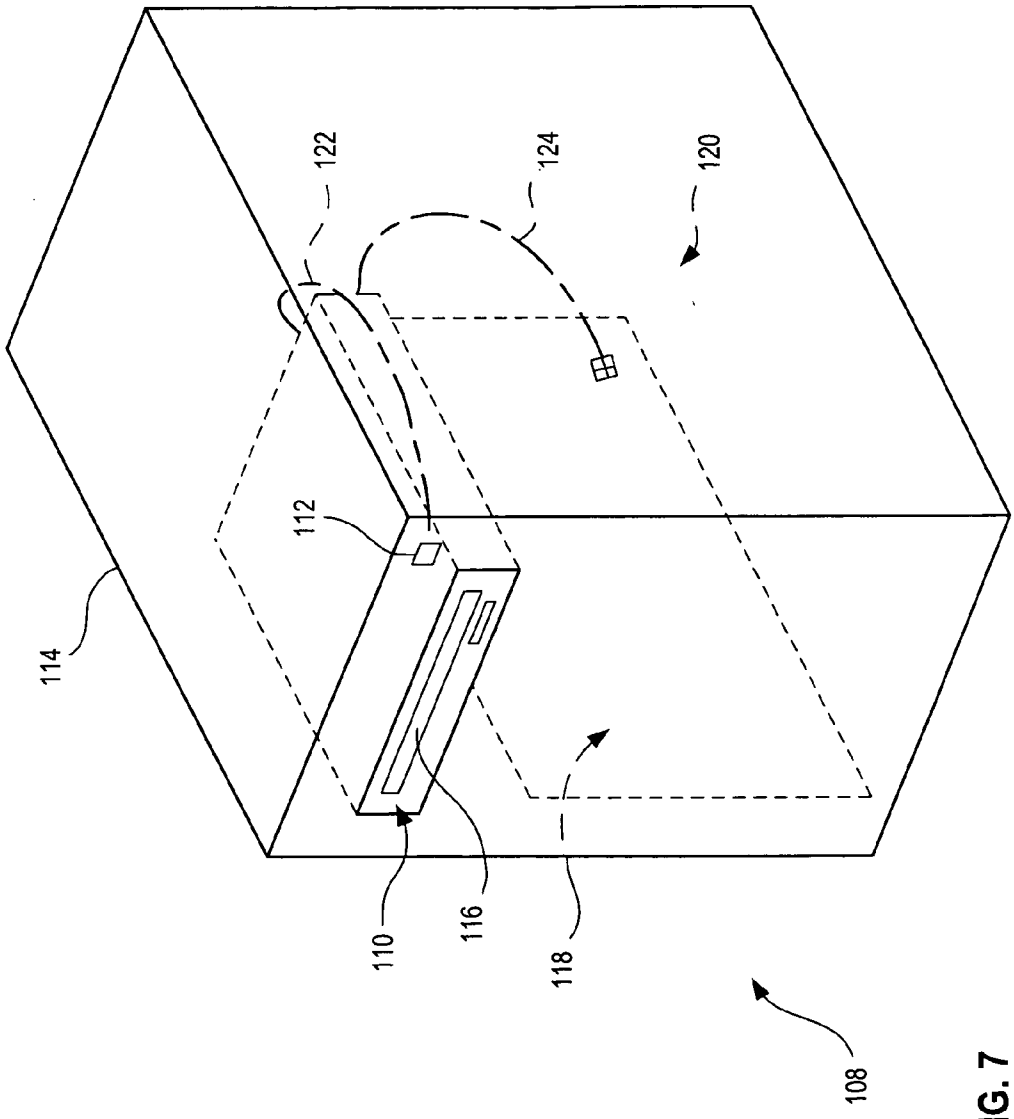


FIG. 7

DATA READING DEVICE WITH A SWITCH LOCATABLE ANYWHERE, AND RELATED SYSTEM AND METHOD

BACKGROUND

[0001] Computer systems typically have a processor that receives and generates data and executes instructions, and have one or more storage devices that are coupled to the processor. The processor typically includes circuitry, such as a central processing unit, for performing various computing functions, such as executing programs to perform specific tasks. The one or more storage devices read data stored on a storage medium to provide the processor data that it needs to execute programs, and may write data to the medium to allow data generated by the processor to be stored for future use. The storage medium may be removable from the storage device to allow one to provide the processor a large amount of data, and thus the one or more storage devices typically include a mechanism for inserting and removing the storage medium.

[0002] For example, FIG. **1** shows a storage device **10** that can read data stored on a removable compact disc **13**. The device **10** includes a laser (not shown) disposed in the interior **11** that generates and directs light toward the compact disc **13**, and a circuit board **12** that has circuitry (not shown) for converting the light reflected from the compact disc **13** into an electrical signal corresponding to the data stored on the compact disc. The device **10** also includes a tray **14** for carrying the compact disc **13** into and out of the interior **11**, and a motor (not shown) that moves the tray **14** into and out of the interior **11**. The circuitry includes a switch **16** mounted to the circuit board for generating a signal for the motor to move the tray **14**. The device **10** also includes a housing **18** and a cover plate **20** to protect the laser, circuitry (including the switch **16**), tray **14**, and motor. The cover plate **20** is mounted to the housing **18** and includes a button **22** to allow one to operate the switch **16** when the cover plate **20** is mounted to the housing **18**. The cover plate **20** also includes an opening **24** that the tray **14** extends through when the motor moves the tray **14** into and out of the interior **11** of the device **10**.

[0003] To insert the compact disc **13** into the device **10**, one pushes the button **22** to close the switch **16**. When closed, the switch **16** generates a signal in the circuitry that causes the motor to extend the tray **14** through the opening **24**. One then places the compact disc **13** on the tray **14**. One then pushes the button **22**, again, to cause the switch **16** to generate another signal in the circuitry that causes the motor to retract the tray **14**. With the compact disc **13** in the interior **11**, the device **10** can read the data stored on the compact disc **13**. To remove the compact disc **13** from the device **10**, one pushes the button **22** again to cause the motor to extend the tray **14** through the opening **24**.

[0004] Unfortunately, the location of the switch **16**, and thus button **22**, makes one's use of the button **22** awkward. The tray **14** is typically located above the switch **16** and button **22**. When the tray **14** is extended through the opening **24**, the tray **14** typically extends about 5 inches (approximately the diameter of a compact disc). Thus, one typically cannot see the button **22** to push it to retract the tray **14** back through the opening **24**. And thus, one has to reach around the tray **14** and feel for the button **22** to retract the tray **14**. This can cause one to inadvertently knock the tray **14** and damage it or the motor that moves the tray **14**.

[0005] A common way to avoid having to reach around the tray **14** and blindly feel for the button **22** is to have the processor of the computer system that is coupled to the device **10** generate a signal to retract or extend the tray **14**. But this presents some problems too. For example, because the processor requires a software operating system to function as desired, and the storage device requires a software driver accessible by the operating system, one's ability to extend or retract the tray **14** depends on the operating system and driver functioning properly. If the operating system crashes, the processor would not be able to generate a signal to extend or retract the tray **14** in response to one's input. Also, if the operating system is busy it may take a relatively long time for the processor to generate a signal to extend or retract the tray **14** in response to one's input.

[0006] Another common way to avoid having to reach around the tray **14** and blindly feel for the button **22** is to locate the button **22** above the opening **24**. But this also presents some problems. Because the switch **16** is mounted to the circuit board **12** and located below the tray **14** when the tray is disposed in the interior **11**, a mechanical coupler (not shown) is mounted to the cover plate **20**. The coupler mechanically transfers the movement of a button located above the tray **14** to the switch **16** that is located below the tray **14**. Unfortunately, the coupler is more apt to bind or wear out because of the additional moving parts. Also, the coupler alters the tactile feel of the switch **16** and thus removes some certainty about closing the switch **16** before the tray **14** moves.

SUMMARY

[0007] In one aspect of the invention, an electronic device for reading data from a removable storage medium includes a switch to generate a signal that circuitry of the device receives. The switch is connected to the circuitry and disposed outside a housing of the device. The circuitry of the device can read data stored on a removable storage medium. The housing protects the circuitry and has a plurality of sides that define an interior in which the circuitry is disposed. With the switch disposed outside the housing, the switch may be located where it will be easier to see and reach. Thus, one can more easily avoid damaging the device when one inserts and removes storage media from the device.

[0008] In another aspect of the invention, an electronic device for reading data from a removable storage medium includes a switch to generate a signal that circuitry of the device receives. The switch is connected to a circuit board of the device and disposed in the interior of the device, but not mounted to the circuit board. The circuitry of the device can read data stored on a removable storage medium. The housing protects the circuitry and has a plurality of sides that define an interior in which the circuitry is disposed. With the switch disposed in the interior of the housing but not mounted to the circuit board, the switch may be located where it can be easily contacted by a button mounted on the housing and located where it will be easier to see and reach. Thus, one can more easily avoid damaging the device when one inserts and removes storage media from the device.

BRIEF DESCRIPTION OF THE FIGURES

[0009] FIG. **1** is a perspective view of a conventional storage device.

[0010] FIG. **2** is a perspective view of a storage device that includes a switch, according to an embodiment of the invention.

[0011] FIG. **3** is a perspective view of the storage device in FIG. **2** that includes a connector for connecting the switch to an interface of the device, according to an embodiment of the invention.

[0012] FIG. **4** is a schematic diagram of circuitry included in the device in FIG. **2**, according to an embodiment of the invention.

[0013] FIG. **5** is a perspective view of a storage device that includes a switch, according to another embodiment of the invention.

[0014] FIG. **6** is a perspective view of a storage device that includes a switch, according to yet another embodiment of the invention.

[0015] FIG. **7** is a perspective view of a system that includes a storage device, according to an embodiment of the invention.

DETAILED DESCRIPTION

[0016] The following discussion is presented to enable one skilled in the art to make and use the invention. Various modifications to the disclosed embodiments will be readily apparent to those skilled in the art, and the generic principles herein may be applied to other embodiments and applications without departing from the spirit and scope of the present invention as defined by the appended claims. Thus, the present invention is not intended to be limited to the embodiments shown, but is to be accorded the widest scope consistent with the principles and features disclosed herein.

[0017] FIG. **2** is a perspective view of a storage device **30** that includes a switch **32** disposed outside a housing **34** of the device **30**, according to an embodiment of the invention. The device **30** reads data stored on a removable storage medium, such as a compact disc **36** or a magnetic disc, and may write data onto the medium to store the data for future use. The housing **34** includes walls **38** that define an interior **40**. When one exerts pressure on the switch **32**, circuitry (not shown) within the device **30** instructs the device to move the compact disc **36** into or out of the interior **40** to allow one to insert or remove the disc **36** from the device **30**. The switch **32** may also be used to have the device **30** perform other functions, such as instructing the device **30** to read data stored on the disc **36** when the disc **36** is disposed in the interior **40**. With the switch **32** disposed outside the housing **36**, the switch **32** may be located where it will be easier to see and reach after the device **30** has moved the compact disc **36** out of the interior **40** of the device **30**. Thus, one can more easily avoid damaging the device **30** when one inserts and removes the compact disc **36** from the device **30**.

[0018] The storage device **30** may be any type of storage device that reads data from a removable storage medium. For example, in one embodiment the device **30** is an optical disc drive that includes a laser (not shown) and a circuit board **42**, each disposed in the interior **40**. The laser generates and directs light toward the compact disc **36**, and the circuit board **42** includes circuitry (not shown) for converting the light reflected from the compact disc **36** into an electrical signal. The device **30** also includes a cable **39** that connects the switch **32** to the circuitry, a tray **44** to carry the compact disc **36** into and out of the interior **40**, and a motor (not shown) that moves the tray **44** into and out of the interior **40**.

[0019] Other embodiments of the device are contemplated. For example, the storage device **30** may be a floppy disk drive that reads data stored on a magnetic disk that is removable from the device **30**.

[0020] Still referring to FIG. **2**, the circuitry of the circuit board **42** includes a controller (not shown in FIG. **3**, but shown in FIG. **4** and discussed in greater detail in conjunction with FIG. **4**) to execute programming instructions, and an input circuit (also not shown in FIG. **3** but shown in FIG. **4** and discussed in greater detail in conjunction with FIG. **4**) to provide a signal to the controller that has been generated by the switch **32**. The circuitry also includes a second switch **46** that instructs the motor to move the compact disc **36** into or out of the interior **40** when one exerts pressure on the switch **46**. The second switch **46** is mounted to the circuit board **42** and is similar to the switch **16** (FIG. **1**) in the conventional storage device **10** (FIG. **1**). Thus, the switch **46** also may be used to insert the compact disc **36** from the device **30**. In conventional storage devices that have the switch **32** added to them, the switch **46** could continue to provide its designed function. In storage devices that are designed and made to include the switch **32**, the switch **46** may or may not be included in the devices.

[0021] Still referring to FIG. **2**, the switch **32** is mounted to the housing **34** outside the interior **40** using conventional techniques. For example, in one embodiment the switch **32** is mounted to a cover plate **48** of the housing **34**. The cover plate **48** is conventionally mounted to one or more walls **38** of the housing **34** to cover an opening of the housing **34** and protect the laser, circuit board **42**, circuitry, tray **44**, motor and other components of the device **30** disposed in the interior **40**. The cover plate **48** includes a button **50** to allow one to exert pressure on the switch **46**, and an opening **52** that the tray **44** extends through when the motor moves the tray **44** into and out of the interior **40**. To allow one to easily see and reach the switch **32** when the tray **44** is extended through the opening **52**, the switch **32** is mounted above the opening **52**. Thus, one can more easily avoid damaging the device **30** when one inserts the compact disc **36** into the interior **40**.

[0022] Still referring to FIG. **2**, the switch **32** may be any conventional switch that generates a signal when a component (not shown) of the switch **32** is moved. For example, in one embodiment the switch **32** generates an electrical signal by completing and electrical circuit. The switch **32** includes a body **54** and a component **56** that extends away from the body **54**. Pushing the component **56** toward the body **54** closes the switch **32**, thus allowing an electrical signal to travel through the switch and through an input circuit of the circuitry. The controller then receives the signal and executes one or more instructions that are associated with the signal, which include generating a signal that directs the motor to move the tray **44** into or out of the interior **40**.

[0023] FIG. **3** is a perspective view of the storage device **30** in FIG. **2** showing an interface **58** of the circuitry. The interface **58** is disposed in a second opening **59** of the housing **34** and allows one to connect a component disposed outside the housing **34** to the circuitry (not shown in FIG. **3**)

of the device **30** disposed in the interior **40** (FIG. **2**). FIG. **4** is a schematic diagram of the circuitry **60** in the device **30** in FIG. **2** that includes an input circuit **62**, according to an embodiment of the invention. The input circuit **62** connects the interface **58** to the controller **64** to allow the controller **64** to receive a signal generated by a component disposed outside the device's housing **34**.

[**0024**] For example, in one embodiment the input circuit **62** includes a circuit **66** that typically exists on conventional storage devices and includes a connector **70** in the interface **58**. The circuit **66** is typically designed to provide a signal that is generated by the controller **64** to a component that is connected to the connector **70**. However, the controller **64** may be programmed to receive a signal through the circuit **66**. For example, the switch **32** may be connected to the connector **70** and the circuit **66** may provide the controller **64** the signal generated by the switch **32**. The connector **70** is a conventional connector that includes two pins **76**. The cable **39** includes a conventional connector **78** that has two receptacles (not shown) each sized to receive a respective one of the pins **76**. When the pins **76** are inserted into the receptacles, cable **39** is connected to the input circuit **62** and the controller **64** can receive a signal generated by the switch **32**. Thus, the switch **32** may be easily added to a conventional storage device that was originally designed to include only the second switch **46**.

[**0025**] Other embodiments are contemplated. For example, the input circuit **62** may include another circuit **75** that connects the second switch **46** to the controller **64** (see FIGS. **5** and **6** and their related discussions). To connect the cable **39** (FIG. **3**) to the circuit **75**, the cable **39** may be soldered directly to the leads **79** or connected directly to leads **79** using any conventional technique. For another example, the input circuit **62** may include another connector (not shown) that is typically included in the interface **58** and that is connected to the controller **64**. Or, the input circuit **62** may include another connector (not shown) that is solely dedicated to the input circuit **62** and separate from the circuit **66**. Or, the input circuit **62** may be an additional circuit (not shown) in the device **30** that is solely dedicated to connecting a connector (not shown) of the interface **58** to the controller **64**.

[**0026**] FIGS. **5** and **6** are perspective views of a storage device **80** (FIG. **5**) and **81** (FIG. **6**) that includes a switch **82** disposed inside the housing **84**, according to other embodiments of the invention. Although the switch **82** is disposed inside the housing **84**, the switch **82** is not mounted to a circuit board **86** of the devices **80** and **81**. Thus, the switch **82** may be located where it can be easily contacted by a button **88** (FIG. **5**) that is mounted on the housing **84** and that is located where it will be easier to see and reach. Thus, one can more easily avoid damaging the devices **80** and **81** when one inserts and removes a compact disc **89** from the devices **80** and **81**.

[**0027**] For example, in one embodiment of the device **80** that is shown in FIG. **5**, the switch **82** is located above the tray **88** and mounted to the wall **90** of the housing **84** using conventional techniques. The housing **84** includes a cover plate **92** that has a button **88** to allow one to exert pressure on the switch **82**, and an opening **96** that the tray **98** extends through when the motor moves the tray **98** into and out of the interior **100**. The cable **102** is soldered to the input circuit **104** that connects the second switch **106** to the controller (not shown) to connect the switch **82** to the controller. By mounting the switch **82** above the tray **98**, one can easily see and reach the corresponding button **88** when the tray **98** is extended through the opening **96**. Thus, one can more easily avoid damaging the device **80** when one inserts the compact disc **89** into the interior **100**.

[**0028**] For another example, in one embodiment that is shown in FIG. **6**, the switch **82** is located above the tray **98** and mounted to the cover plate **92** using conventional techniques. The cable **102** is soldered to the input circuit **104** of the second switch **106** that connects the second switch **106** to the controller (not shown) to connect the switch **82** to the controller.

[**0029**] FIG. **7** is a perspective view of a system **108**, for example a personal computer, that includes a storage device **110**, according to an embodiment of the invention. The storage device **110** is similar to the storage device **30** of FIG. **2** except the switch **112** is mounted to the casing **114** of the system **108** using conventional techniques; not the housing **34** (FIG. **2**) of the device **30** (FIG. **2**). With the switch **112** mounted to the casing **114**, the switch **112** may be located where it will be easy to see and reach when the tray **116** is moved out of the interior (not shown) of the device **110**. Thus, one can more easily avoid damaging the device **110** when one inserts and removes compact discs (**36** in FIG. **2**) from the device **110**.

[**0030**] For example, in one embodiment the system **108** includes a processing unit **118** for processing data read by the device **110**. The system **108** also includes a casing **114** that defines an interior **120** in which the device **110** and the processing unit **118** are disposed, and that protects the device **110** and processing unit **118**. The cable **122** connects the switch **112** to the circuitry (not shown) of the device **110** via an interface (not shown) of the device **110**, and is also disposed in the interior **120**. The cable **124** connects the device **110** to the processing unit **118** to allow the processing unit **118** to receive signals generated by the device **110**.

[**0031**] Many of the specific details of certain embodiments of the invention are set forth in the above description and accompanying figures to provide a thorough understanding of such embodiments. One skilled in the art will understand, however, that the present invention may be practiced without some of the details described with regard to these embodiments. Moreover, one skilled in the art will understand that the figures related to the various embodiments are not to be interpreted as conveying any specific or relative physical dimensions, and that specific or relative physical dimensions, if stated, are not to be considered limiting unless the claims expressly state otherwise. Further, illustrations of the various embodiments when presented by way of illustrative examples are intended only to further illustrate certain details of the various embodiments, and shall not be interpreted as limiting the scope of the invention.

What is claimed is:

1. An electronic device for reading data from a removable storage medium, the device comprising:

circuitry operable to read data from a removable storage medium;

a housing operable to protect the circuitry and having a plurality of sides that define an interior in which the circuitry is disposed; and

a switch connected to the circuitry and disposed outside the housing, the switch being operable to generate a signal that the circuitry receives.

2. The device of claim 1 wherein the device includes an optical disk drive.

3. The device of claim 1 wherein the signal generated by the switch includes an electronic signal.

4. The device of claim 1 wherein the switch is operable to insert a storage medium into the interior of the housing.

5. The device of claim 1 wherein:

the housing includes a cover panel operable to cover an opening through which the interior is accessible, and

the switch is mounted to the cover panel.

6. The device of claim 1:

wherein the housing includes a cover panel operable to cover an opening in the housing;

further comprising a tray operable to move the storage medium through the opening; and

wherein the switch is mounted to the cover panel above the tray.

7. The device of claim 1:

further comprising a cable connected to the switch and including a first connector;

wherein the housing includes a second opening; and

wherein the circuitry includes an interface disposed in the second opening and having a second connector operable to receive the first connector to connect the cable to the circuitry.

8. The device of claim 1:

wherein the circuitry includes a controller operable to execute instructions and an input circuit operable to carry a signal toward the controller; and

further comprising a second switch connected to the input circuit and disposed in the interior of the housing, the second switch being operable to generate a signal that the circuitry receives.

9. An electronic device for reading data from a removable storage medium, the device comprising:

a circuit board including circuitry operable to read data from a removable storage medium;

a housing operable to protect the circuit board and having a plurality of sides that define an interior in which the circuit board is disposed; and

a switch connected to the circuit board and disposed in the interior but not mounted to the circuit board, the switch being operable to generate a signal that the circuitry receives.

10. The device of claim 9 wherein the switch is operable to insert a storage medium into the interior of the housing.

11. The device of claim 9 wherein the switch is mounted to a side of the plurality of sides.

12. The device of claim 9 wherein:

the housing includes a cover panel operable to cover an opening through which the interior is accessible, and

the switch is mounted to the cover panel.

13. The device of claim 9 wherein:

the circuitry includes a controller operable to execute instructions, an input circuit operable to carry a signal toward the controller, and

the switch is connected to the input circuit.

14. The device of claim 9:

wherein the circuitry includes a controller operable to execute instructions and an input circuit operable to carry a signal toward the controller; and

further comprising a second switch connected to the input circuit and mounted to the circuit board, the second switch being operable to generate a signal that the circuitry receives.

15. An electronic system comprising:

an electronic device for reading data from a removable storage medium, the device comprising:

circuitry operable to read data from a removable storage medium;

a housing operable to protect the circuitry and having a plurality of sides that define an interior in which the circuitry is disposed; and

a switch connected to the circuitry and disposed outside the housing, the switch being operable to generate a signal that the circuitry receives; and

a processing unit coupled to the device and operable to process the data read by the device.

16. The system of claim 15 wherein the system includes a personal computer.

17. The system of claim 15:

further comprising a casing having an interior in which the processing unit is disposed and the electronic device is disposed; and

wherein the switch is mounted to the casing.

18. An electronic system comprising:

an electronic device for reading data from a removable storage medium, the device comprising:

a circuit board including circuitry operable to read data from a removable storage medium;

a housing operable to protect the circuit board and having a plurality of sides that define an interior in which the circuit board is disposed;

a switch coupled to the circuit board and located in the interior but not mounted to the circuit board, the switch being operable to generate a signal that the circuitry receives; and

a processing unit coupled to the device and operable to process the data read by the device.

19. A method for removing a storage medium from an electronic device, the method comprising:

locating a switch outside a housing of the device;

connecting the switch to circuitry disposed inside the housing; and

exerting pressure on the switch to generate a signal.

20. The method of claim 19 wherein locating the switch outside the housing includes mounting the switch to a cover plate of the housing.

21. The method of claim 19:

further comprising moving a tray of the device to carry the storage medium out of the housing; and

wherein locating the switch outside the housing includes mounting the switch to a cover plate of the housing and above the tray.

22. The method of claim 19 wherein connecting the switch to the circuitry includes connecting a cable to an interface of the circuitry.

23. The method of claim 19 wherein exerting pressure on the switch includes pushing a component of the switch to close the switch.

24. A method for removing a storage medium from an electronic device, the method comprising:

locating a switch inside a housing of the device but not mounting the switch to a circuit board disposed inside the housing;

connecting the switch to circuitry of the circuit board;

exerting pressure on the switch to generate a signal.

25. The method of claim 24 wherein locating the switch inside the housing includes mounting the switch to a side of the housing.

26. The method of claim 24 wherein locating the switch inside the housing includes mounting the switch to a cover plate of the housing.

27. The method of claim 24:

further comprising moving a tray of the device to carry the storage medium out of the housing; and

wherein locating the switch inside the housing includes mounting the switch to a cover plate of the housing and above the tray.

* * * * *