ELECTRONIC DEVICE HOUSING

TECHNICAL FIELD

The described embodiments relate generally to portable electronic devices. More particularly, the present embodiments relate to an improved housing for portable electronic devices to protect them from shock and other elements.

BACKGROUND

Portable electronic devices such as smartphones, tablets, laptop computers and the like have become ubiquitous in recent years. Users carry these devices while travelling in automobiles, on buses, trains, and on airplanes. Because users have grown accustomed to carrying these devices, many users carry these devices while engaging in strenuous activities such as running, climbing and the like. Because users are in possession of these devices in many environments, they are sometimes dropped or otherwise exposed to shock events involving rapid acceleration or deceleration. In addition, these devices may sometimes be exposed to elements such as water and may even be dropped into water environments such as a lake, ocean, or even a bathtub or sink within the home.

By subjecting the portable electronic devices to shock and environmental conditions such as those described above, users risk damage to the electronics in these devices and/or damage to the housing containing these electronics. Such damage can result in poor or no performance of the portable electronic device and/or diminution of the aesthetic appeal of the exterior of such devices. In a situation where the portable electronic device is dropped into water, the user may face a risk not only of irreparably damaging the device due to water ingress, but also of losing the device altogether as these devices will sink, and, depending upon the depth and clarity of the water, the portable electronic device may become unrecoverable.

Some modern portable electronic devices incorporate an accelerometer into the device for various purposes. An accelerometer is a device that can measure the force of acceleration, whether caused by gravity or by movement. Conceptually, an accelerometer behaves as a damped mass on a spring. When an accelerometer experiences a change in movement, the mass is displaced to the point that the spring is able to accelerate the mass at the same rate as the casing. The displacement is then measured to give the acceleration. An accelerometer can therefore measure the speed of movement of an object it is attached to. Piezoelectric, piezoresistive and capacitive components are commonly used to convert the mechanical motion into an electrical signal.

Because an accelerometer senses acceleration due to movement and gravity, the angle at which a device incorporating an accelerometer can be determined. Accelerometers are increasingly being incorporated into personal electronic devices to detect the orientation of the device, or portions of a device such as, for example, a display screen. The motion and angle of the device is noted by the sensors or a processing unit receiving information from the sensors, so the device can know the orientation of the screen with respect to a gravity vector.

SUMMARY

Embodiments described herein provide an improved housing for portable electronic devices to protect them in the event of an unexpected shock due to having been dropped by a user or in the event of having been dropped into a water environment. The improved housing includes shock absorbers which may be deployed to protect the device and the housing from damage due to an unexpected acceleration such as from having been dropped. In one embodiment, the shock absorbers are deployed from one or more corners of the devices in order to absorb the shock from the fall.

In another embodiment, the shock absorbers may include buoyant material which permits the portable electronic device to float in the event that it is dropped or otherwise exposed to a water environment. By enabling the device to float, this may permit the user time to retrieve the device from the water environment and prevent damage. In addition, by enabling the device to float, it is prevented from sinking to the bottom of a lake, ocean or other turbid waters where retrieval may be problematic.

In one embodiment, the shock absorbers on the portable electronic device are contained within the housing and only deployed when rapid acceleration is detected by an accelerometer within the portable electronic device indicating that the movement being experienced by the device is inadvertent due to a drop or other unforeseen event. The shock absorbers may be retractable such that, after deploying in the event of a drop, they may be retracted by a user into the housing and may be later deployed again if necessary. In another embodiment, the shock absorbers may include replaceable pads if the pads have deteriorated due to age or have become worn and less aesthetically pleasing to the user. In the event of a water landing, the user may decide to replace the pads for hygienic or other reasons.

BRIEF DESCRIPTION OF THE DRAWINGS

The disclosure will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

FIG. **1** shows a front perspective view of a smart phone;

FIG. **2** shows a front perspective view of a smart phone in accordance with one embodiment, including shock absorbers in a retracted position;

FIG. **3** shows a front perspective view of a smart phone in accordance with one embodiment, including shock absorbers in a deployed position;

FIG. **4** shows a perspective view of a corner of a smartphone with a shock absorber in a deployed position;

FIG. **5** shows a perspective view of a corner of a smartphone with a shock absorber in a deployed position and the pads extended;

FIG. **6** shows a side view of a smartphone with shock absorbers extended and pads deployed;

FIG. **7** shows a user holding a smartphone in accordance with one embodiment;

FIG. **8** shows a user dropping a smartphone and shock absorbers deployed with bumper cushions extended, with an expanded view of the smartphone that is not to scale;

FIG. **9** shows a smartphone floating on water through operation of an embodiment described herein; and

FIG. **10** is a flow chart of a method for protecting a portable electronic device.

DETAILED DESCRIPTION

Reference will now be made in detail to representative embodiments illustrated in the accompanying drawings. It should be understood that the following descriptions are not intended to limit the embodiments to one preferred embodi-