September 2020

# Computing Devices with Concealed Barometric Ports

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# Computing Devices with Concealed Barometric Ports

**Abstract:**

This publication describes techniques and apparatuses directed to providing computing devices with concealed barometric ports and barometric meshes. In aspects, a computing device includes two or more device elements adhered together using an adhesive, defining a sealed internal cavity that houses the electrical components of the computing device. A passageway (air channel) is defined through the adhesive, extending from an assembly gap located between the device elements and a concealed barometric port. The barometric port is interrupted by a barometric mesh (*e.g.*, air-permeable membrane) through which air flows into or out of the internal cavity, regulating the internal air pressure while restricting the ingress of contaminants (*e.g.*, liquid, dust, debris).

**Keywords:**

Barometric sensor, barometric port, barometric vent, barometric mesh, air-permeable membrane, airflow, waterproof phones, water resistance, internal air pressure, atmospheric pressure, adhesive, seal

**Background:**

The device elements of a computing device define the shape and size of the device and enclose internal electrical components (*e.g.*, circuit boards, sensors). To achieve a satisfactory level of protection for these electrical components against the incursion of outside contaminants (*e.g.*, liquid, dust, debris), the device elements are adhered together with an adhesive (*e.g.*, glue,

epoxy). The assembled device elements define an air-tight (sealed) internal cavity that houses electrical components of the computing device. The internal cavity may have a nominal internal air pressure that differs from an external environment. If the internal air pressure cannot be equalized with the external air pressure, the device may warp, crack, or break due to the pressure differential. As a result, many computing devices integrate a barometric port with a barometric mesh (*e.g.*, air-permeable membrane) to regulate the internal air pressure of the device and restrict the ingress of contaminants into the internal cavity.

A user may notice such a barometric port as a visible hole defined in the exterior housing of the device. For aesthetic reasons, users may prefer exterior housing designs that include few, if any, visible holes. Therefore, it is desirable to provide device housing designs without visible barometric ports.

**Description:**

This publication describes techniques and apparatuses directed to providing computing devices with concealed barometric ports and barometric meshes. In aspects, a computing device includes multiple device elements adhered together using an adhesive. The assembled device elements define a sealed internal cavity that houses the electrical components of the computing device. A passageway (air channel) is defined through the adhesive, extending from an assembly gap located between the device elements and a concealed barometric port. A barometric mesh, through which air flows into or out of the internal cavity, interrupts the barometric port. The barometric mesh regulates the internal air pressure while restricting the ingress of contaminants.

Figure 1, below, illustrates an example computing device (*e.g.*, a smartphone) having two device elements (a display panel module and an assembly body (enclosure)) adhered together

utilizing an adhesive (*e.g.*, glue, epoxy). While the Figures illustrate a computing device with two device elements, in aspects, computing devices that include more than two device elements can also utilize the disclosed techniques and apparatuses. For example, a computing device may include a display panel module, an assembly body, and a back cover as device elements.

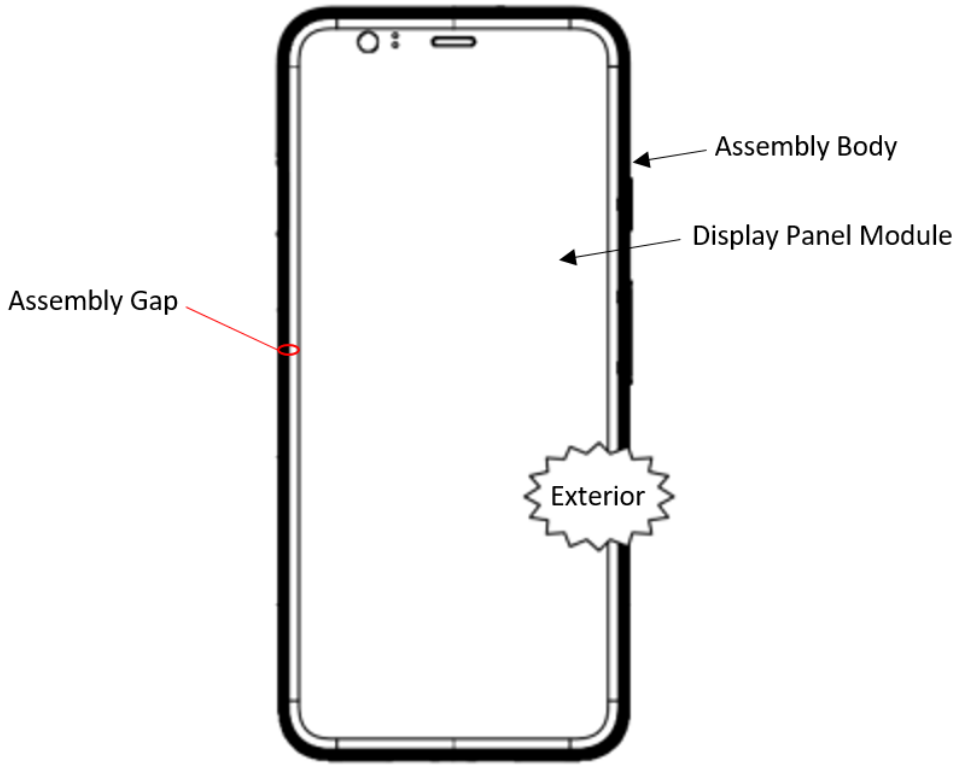


**Figure 1**

During assembly, joining device elements together results in the formation of an assembly gap tens to hundreds of micrometers wide. The smartphone illustrated in Figure 1 includes an assembly gap present next to a perimeter of the device, where the assembly body and an edge of the display panel module abut.

To regulate the internal air pressure of the device, a passageway (air channel) is defined through the adhesive, extending from the assembly gap located between the device elements and

the barometric port. A barometric mesh interrupts the barometric port and is configured to allow air to pass into and out of the internal cavity of the device. Figure 2, below, is a cross-sectional perspective of the smartphone, illustrating the air channel defined through the adhesive leading from the assembly gap to the barometric port.

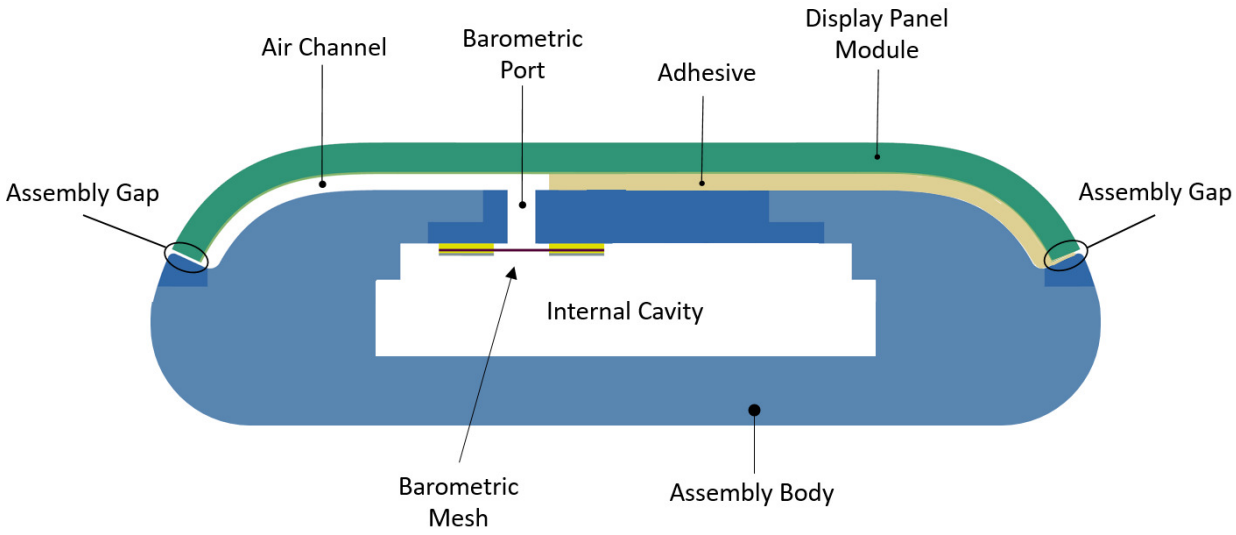


**Figure 2**

As illustrated in Figure 2, the display panel module is adhered to the assembly body. An air channel is defined through the adhesive, extending from the assembly gap to a concealed barometric port. The air channel may be micrometers to millimeters in width and height. Following the barometric port, a barometric mesh inhibits the ingress of contaminants from entering the internal cavity.

A computing device may contain multiple air channels, barometric ports, and barometric meshes. For example, if a computing device has multiple, partitioned internal cavities, the device may utilize multiple air channels, barometric ports, and barometric meshes to allow air flow into each internal cavity. In addition, an air channel may extend from any location along the assembly gap. Moreover, a barometric port and barometric mesh may be concealed anywhere underneath a

device element. For example, Figure 3 illustrates a smartphone with an air channel, barometric port, and barometric mesh located near the charging port of the device.

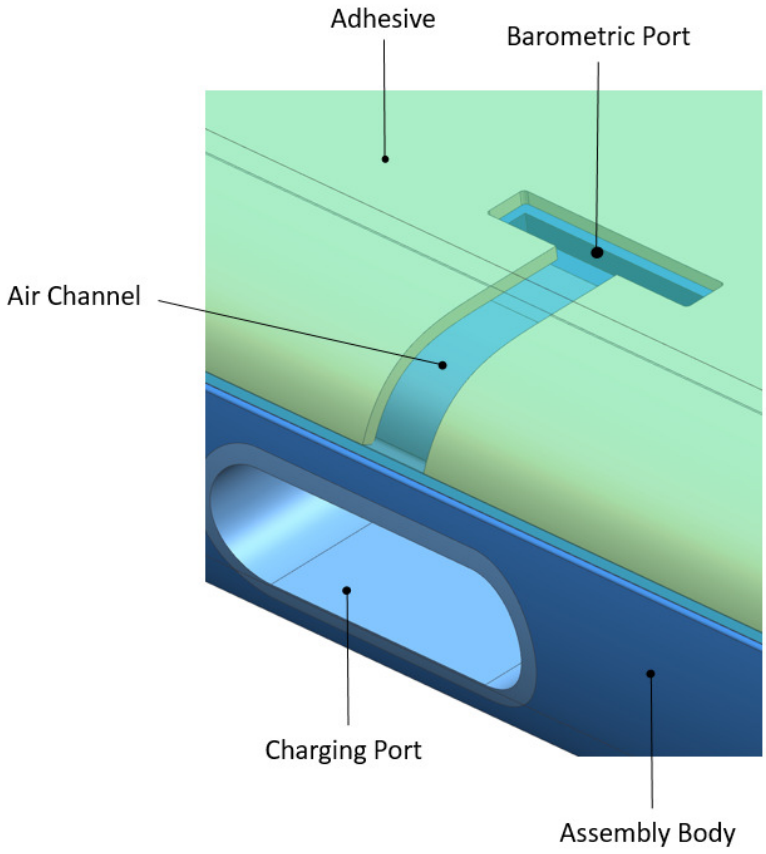


**Figure 3**

In Figure 3, for illustrative purposes, the display panel module is not illustrated. The air channel extends to a concealed barometric port followed by a barometric mesh. In this configuration, air passes through the air channel, barometric port, and barometric mesh into an internal cavity near the device charging port. Again, the air channel, barometric port, and barometric mesh may be implemented in other locations in the device.

Using the disclosed techniques and apparatuses, computing devices may be configured with concealed barometric ports located underneath device elements, minimizing the number of visible holes defined in the exterior housing of the device. Moreover, utilizing such a configuration

allows for design flexibility, since the opening into the air channel can start from any location along an assembly gap. In addition, computing devices can house barometric ports anywhere underneath a device element. The increased design flexibility affords internal, electrical component placement optimization and enables the utilization of larger, lower-cost barometric mesh; while still affording air pressure equalization and inhibiting the ingress of contaminants into the device.

**References:**

[1] Patent Publication: US 20190082547 A1. Concealed barometric vent for an electronic device. Priority Date: September 11, 2017.

[2] Patent Publication: US 20170089698 A1. Barometric sensor integration in a water-resistant electronic device. Priority Date: September 30, 2015.