June 2020

Adhesiveless Display Panel Attachment

Daniel Dondzik

Adhesiveless Display Panel Attachment

Abstract:

This publication describes techniques and apparatuses for the adhesiveless fastening of a display panel onto an electronic device. The techniques and apparatuses utilize an internal slide mechanism accessible through the SIM door opening on the device. The slide mechanism engages the trim of the display panel to fasten the display panel to the enclosure of the device. A mechanical sealing means (*e.g.*, gasket, O-ring) between the display panel and the enclosure provides water and dust resistance.

Keywords:

display panel, gasket, attachment, replacement, repair, adhesive, adhesiveless, enclosure, mobile device, mechanical seal, O-ring, water-resistant, dust-resistant

Background:

Many electronic devices (*e.g.*, mobile computing devices, smartphones) include display panels upon which the user interacts, giving the user the ability to perform tasks on the device. The display panel attaches to the device at an enclosure of the device. In aspects, to create a water-resistant and/or dust-resistant seal between the display panel and the enclosure, a combination of adhesives (*e.g.*, adhesive tape, sealant) and mechanical fasteners (*e.g.*, snaps, clips) are utilized. While the utilization of adhesives results in the formation of a water-resistant and/or dust-resistant seal between the display panel and the enclosure, the adhesive seals present challenges when a person performs maintenance on the device (*e.g.*, when a person replaces a broken display panel).

For example, to replace a broken display panel, a person repairing the device may need to apply a heat source to the display panel of the device to soften the adhesive utilized to seal the display panel to the enclosure. After the softening of the adhesive, suction cups and other prying tools may then be utilized to partially separate the display panel from the enclosure. Upon the separation of the display panel from the enclosure, the adhesive seal can be broken through the use of a tool, for example, a pick or a spudger tool. Breaking the adhesive seal enables the broken display panel to be detached from the enclosure. After the removal of the display panel from the enclosure, the enclosure may need to be meticulously cleaned to remove all traces of the old adhesive before new adhesive can be applied and the new display panel attached. If any of the adhesive residue remains, the display panel may not adhere properly to the enclosure using the new adhesive, potentially compromising the water/dust- resistance of the device. As a result, an adhesiveless display panel attachment technique is desirable.

Description:

This publication describes techniques and apparatuses for forming a seal (*e.g.*, water-resistant seal, dust-resistant seal) between a display panel and an enclosure of an electronic device without requiring the use of adhesives. The term "electronic device," as used in this publication, refers to a device that includes a display (*e.g.*, portable telecommunication device, wireless-communication device, mobile phone, smartphone, computing device, camera, tablet computer, laptop computer, convertibles, displays, smartwatches, intelligent glasses, and so forth).

The Figures illustrate an example electronic device as a mobile device (*e.g.*, smartphone) and elements of the mobile device that support the adhesiveless attachment and detachment of a display panel to an enclosure. While the mobile device is illustrated in these Figures as a

smartphone, other types of electronic devices can also support the techniques and apparatuses described in this publication.

The techniques and apparatuses utilize an internal slide mechanism of the enclosure to securely lock the display panel to the enclosure of the mobile device. The slide mechanism can be accessed through a subscriber identity module (SIM) door opening or recess defined in the enclosure of the mobile device. Through this access, the slide mechanism of the enclosure can be manipulated to engage and disengage the display trim of the display panel. When engaged, utilizing a mechanical sealing means, a sealed connection between the display panel and the enclosure is formed.

Figure 1 illustrates a mobile device (100) that includes an enclosure (10) and a display panel. While the enclosure may house various internal components associated with the mobile device (*e.g.*, battery, processor, memory, transceivers, sensors, antenna), those components are not illustrated in the Figures. In Figure 1, only the display panel trim (30) of the display panel is illustrated, colored in a lime green color. The display panel trim is sealingly attached to a display panel and a cover glass.

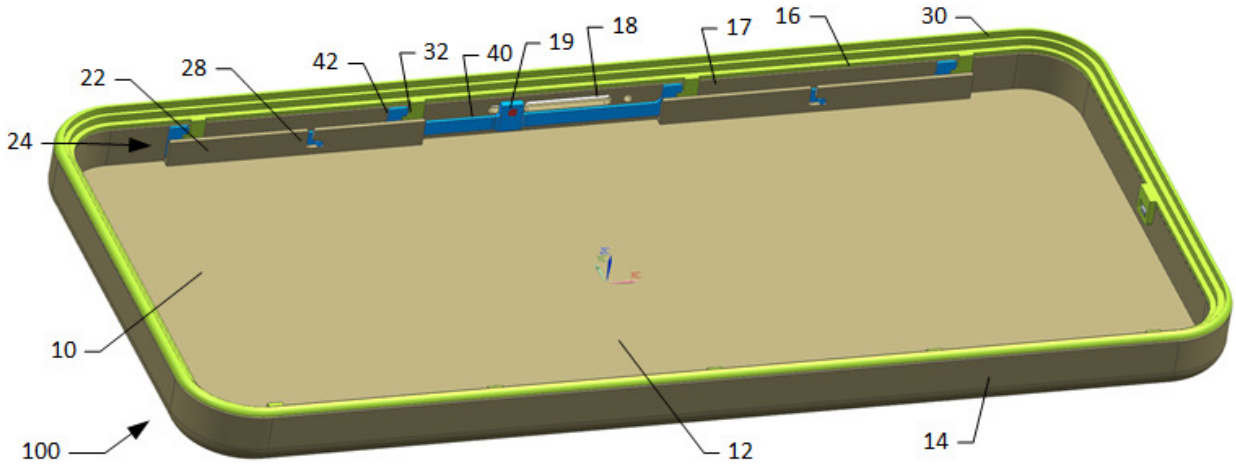

Figure 1

The enclosure includes a back cover (12) and a sidewall (14) that wraps around the enclosure to define an enclosure space. The sidewall includes a long sidewall (16) through which a SIM card tray opening (18) is defined. The SIM card tray opening is configured for receiving a tray (not illustrated) supporting a SIM card (not illustrated). The long sidewall includes an inner surface (17) that faces into the enclosure space.

A guide wall (22) extends from the inside surface of the back cover, generally parallel to the sidewall. An inside surface of the guide wall faces the long sidewall. A channel (24) is defined between the inside surface of the sidewall and the inside surface of the guide wall. The channel is configured to receive a slide mechanism (40). The guide wall defines two L-shaped slots (28) configured to receive two pins (44) protruding from the slide mechanism. The L-shaped slots and pins are configured for locking the slide mechanism onto the enclosure, as illustrated in Figure 2.

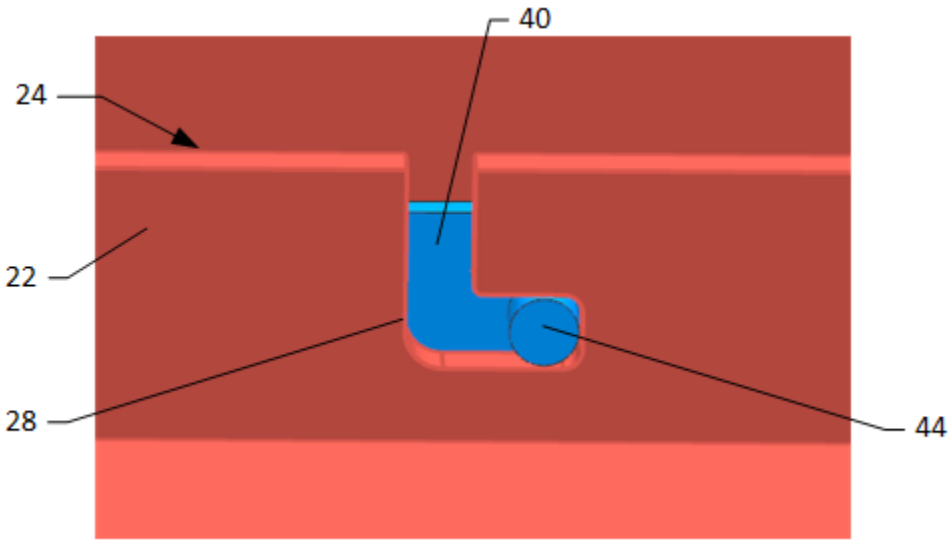

Figure 2

Figure 2 illustrates one of the two L-shaped slots (28) (hereinafter "slot") of the enclosure guide wall (22). The slot is configured as both a securing means and movement means for the slide mechanism (40). The pins (44) extend from the slide mechanism and are configured for

securing the slide mechanism into the L-shaped slot. The guide wall defines the channel (26) in which the slide mechanism resides. Upon assembly of the device, the pins of the slide mechanism drop into the L-shaped slot/groove in the inner wall of the device enclosure. The pins are configured to move laterally within the slot when the screw is loosened and manipulated.

Referring back to Figure 1, the slide mechanism is colored blue. The slide mechanism is anchored to the enclosure in three areas. The first area of connection is between the slide mechanism and a screw (19), as illustrated in Figure 4. The other two anchor points are the pins extending from the slide mechanism that are configured to engage the L-shaped slot on the guide wall of the enclosure.

In the aspect illustrated in the Figures, a latching connection between the enclosure and the display panel takes place through a mating locking means as the flanges of the slide mechanism (42) engage the flanges of the display panel trim (32), drawing the display panel to the enclosure, and compressing a mechanical sealing means (33) located between the display panel and the enclosure. The slide mechanism illustrated in Figure 1 is in a locked position where the display panel is sealingly engaged with the enclosure. The mechanical sealing means (*e.g.,* gasket, silicone gasket, O-ring) resides between the display trim and the edge of the enclosure, as illustrated in Figure 3. In aspects, the mechanical sealing means is reusable and ensures water resistance and dust resistance when the slide mechanism engages the display panel, without needing the use of an adhesive seal.

Referring now to Figure 3, illustrated is a cross-section view of the mobile device (100) with the display panel trim (30) attached, as illustrated in Figure 1. The display panel and the cover glass that would be attached to the display panel trim are not illustrated. The slide mechanism (26) is illustrated in engagement with the display panel trim (30), with the flanges of

the slide mechanism (42) engaging the flanges of the display panel trim (32), drawing the display panel to the enclosure, and compressing a mechanical sealing means (33) located between the display panel and the enclosure.

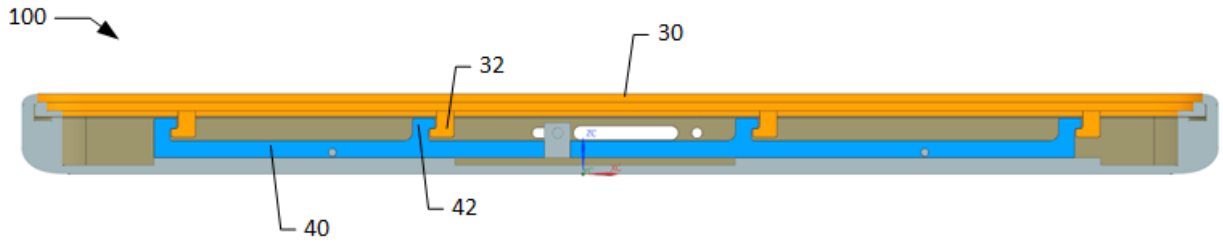

Figure 3

Figure 4 is a partial, side view of the mobile device, showing the SIM card tray opening (18) defined through the long wall (16). The SIM card tray opening is defined within a SIM door recess (15) configured for receiving a door portion of the tray supporting the SIM card (not illustrated). Defined within the SIM door recess (15), adjacent to the SIM card tray opening, is a screw hole configured for receiving a screw (10) therethrough.

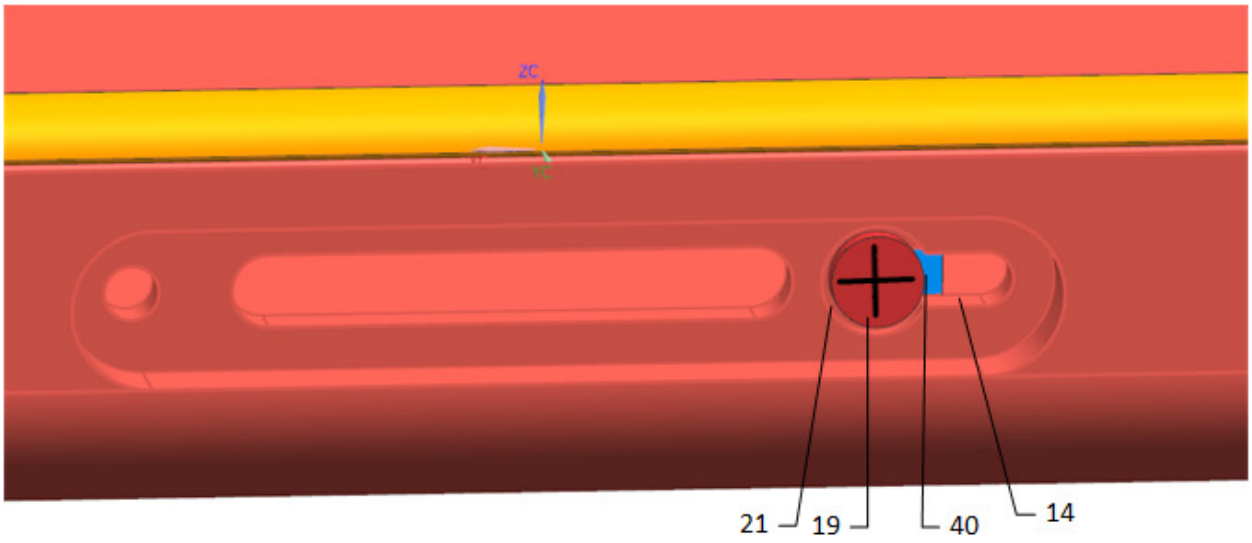

Figure 4

The screw is configured to thread into a threaded orifice defined in the slide mechanism. During an assembly process, the screw can be threaded into the threaded orifice defined in the

slide mechanism to lock the slide mechanism in the channel (24) (illustrated in Figure 1). The screw can be tightened to lock the slide mechanism relative to the channel or loosened to unlock the slide mechanism relative to the channel. In the unlocked position, the screw is configured to operate as a handle for moving the slide mechanism (40) in a first direction and a second direction, allowing the slide mechanism to be manipulated by a user to engage and disengage the display trim of the display panel from the enclosure. In the unlocked position, the screw may slide along an open slot (23) defined in the long wall.

The display panel is secured to the enclosure through the utilization of two securing means. The first securing means includes a series of mechanical fasteners (*e.g.,* clips, snaps, flanges) around the trim of the display panel that mechanically engages fasteners located around the sidewalls of the enclosure (*e.g.,* the clips snap onto flanges). The second securing means for the display panel and enclosure is the mating locking means, for example, the display panel locking flanges (32) engaging the slide mechanism locking flanges (42).

The publication describes techniques and apparatuses for attaching a display panel to the enclosure of an electronic device, utilizing a slide mechanism that is secured in a channel within the enclosure. The slide mechanism contains flanges that interact with corresponding flanges on the trim of the display panel. When the slide mechanism slides into a locked position, the flanges connect, and the display panel engages the enclosure of the device. A mechanical seal (*e.g.,* gasket) resides in between the display panel trim and the edge of the device enclosure. This gasket forms a water and dust resistant seal between the display panel and the device enclosure.