Bare Speaker-Driver Assembly

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ABSTRACT

Consumer electronics devices such as laptops, smartphones, etc., typically include speaker modules inside the device. These usually come as an integrated module, e.g., with the speaker and the amplifier driver fully enclosed in a plastic sub-assembly, which in turn is assembled into the main device enclosure. This plastic speaker housing takes up valuable space in all dimensions, limiting how small or slim the main device can be.

This disclosure describes techniques to use a frame mounted on the coverglass of the main device to serve the same purposes as that of the speaker housing. The bare speaker-driver is mounted and sealed directly onto the coverglass and is constrained from moving by the plastic frame that is on the coverglass. In this manner, the space originally occupied by dedicated plastic housing of the speaker is released, enabling slimmer mobile devices or the mounting of additional componentry.

KEYWORDS

- speaker module
- speaker driver
- device housing
- coverglass
- smartphone speaker
- tablet speaker
- integrated speaker
- thin device
Fig. 1 is an example illustration of an opened-up mobile device (100). Various components, e.g., speaker (102), battery (104), and coverglass screen (106) are shown. As is typical, the speaker is an enclosed and integrated module of the device, e.g., coupled with amplifier driver. The plastic housing that encloses the speaker-driver serves the following purposes:

1. It provides structure for mounting the speaker to the device.
2. It provides back (also known as back-chamber) volume for the driver. Back volume is a space that the speaker is able to push against and project sound.
3. It provides a sealing surface for the front-port to the device-port opening.
However, the speaker housing takes up valuable space in all dimensions, limiting how slim or small the mobile device can be, as well as the number of components that can fit into the mobile device.

**DESCRIPTION**

![Image of a mobile device with a bare speaker mounted on the coverglass](image)

**Fig. 2: Mounting a bare speaker on the coverglass of the mobile device**

Fig. 2 illustrates mounting a bare speaker or other component on the coverglass of the mobile device, per techniques of this disclosure. The speaker housing sub-assembly is removed. Instead, a plastic frame mounted on the coverglass of the main device serves as the enclosure for the bare speaker and driver. The plastic frame on the coverglass can be molded or machined as a unibody part of the main device housing. In this manner, the bare speaker-driver is mounted and
sealed directly to the coverglass, and is constrained from moving by the plastic frame that is on the coverglass. The plastic frame seals to the rear enclosure of the device when assembled, providing a larger back volume for the speaker-driver.

The plastic frame can also be used for other functions, e.g., attaching the coverglass to the rear enclosure, holding other components, flex cables, etc. The techniques of this disclosure can be applied in reverse such that the plastic frame is made part of the rear enclosure of the device and seals to the coverglass instead. This reduces the part count further, since the plastic frame is molded or machined into the rear housing as a unibody piece to which the bare speaker-driver gets directly installed.

CONCLUSION

Consumer electronics devices such as laptops, smartphones, etc., typically include speaker modules inside the device. These usually come as an integrated module, e.g., with the speaker and the amplifier driver fully enclosed in a plastic sub-assembly, which in turn is assembled into the main device enclosure. This plastic speaker housing takes up valuable space in all dimensions, limiting how small or slim the main device can be.

This disclosure describes techniques to use a frame mounted on the coverglass of the main device to serve the same purposes as that of the speaker housing. The bare speaker-driver is mounted and sealed directly onto the coverglass and is constrained from moving by the plastic frame that is on the coverglass. In this manner, the space originally occupied by dedicated plastic housing of the speaker is released, enabling slimmer mobile devices or the mounting of additional componentry.