Knowles MEMS Microphones in Apple iPhone 7 Plus: Patent-to-Product Mapping

What are the main patented features of Knowles’ MEMS Microphones in the iPhone 7 Plus?

REPORT OUTLINE

- Knowles MEMS Microphones in Apple iPhone 7 Plus: Patent-to-Product Mapping
- April 2017
- PDF (100+ slides)
- €3,990 (corporate license)

KEY FEATURES OF THE REPORT

- Essential IP analysis of Knowles’ patent portfolio related to the MEMS Microphones of Apple iPhone 7 Plus including:
  - Time evolution of patent publications and countries of patent filings
  - Current legal status of patents
  - Citation network and competitive IP networks
  - Inventor identification

- Analysis of main patent lawsuits filed by Knowles

- Deep insight on technology data, including teardown analysis, of the Knowles MEMS Microphones in the Apple iPhone 7 Plus

OBJECTIVE OF THE REPORT

- Understand Knowles’ IP strategy

- Identify key patents held by Knowles, and related to product features

- Find the link between patented technological solutions and the marketed product.

RELATED REPORTS

- Yole Développement: Acoustic MEMS and Audio Solutions 2017

KNOWLES: WORLD-LEADER IN MEMS MICROPHONES

Founded in 1946, Knowles offers a growing range of micro-acoustic, electro-mechanical, and related technology platforms to support its customers. Knowles was the first to introduce MEMS microphones to the market in 2003 and is now the world-leader in MEMS microphones, with its SiSonic technology. Knowles is Apple’s main MEMS microphone supplier. Yole Développement estimates the sales of Knowles’ MEMS microphones at $360M in 2016, giving the company over 40% of the market. That year, Knowles shipped over 1.55 billion MEMS microphones. Moreover, Knowles has filed several patent lawsuits in the last ten years against rival manufacturers. In this context, it is important to understand the links between Knowles’ MEMS microphones and their related patents.

Our partner, System Plus Consulting, analyzed the MEMS microphone components included in the iPhone 7 Plus, which was launched by Apple in September 2016. The smartphone contains four MEMS microphones: one front-facing top microphone, two front-facing bottom microphones and one rear-facing top microphone. Two different MEMS microphones from Knowles have been found in the iPhone 7 Plus, the KSM microphones, KSM1 or KSM2, and the KMM microphone, KMM1. The models are very similar and the study focuses mainly on the KSM format. Based on the features revealed by the microphone teardowns, we have identified the closest Knowles patents to these technologies, and describe the main claimed features. This helps understand the core technologies developed by Knowles in their MEMS microphones.

Time evolution of patent publications

Knowles microphones in the iPhone 7 Plus include technologies claimed in patents published in the early 2000s and in the mid-2010s. We have also observed new IP activity linked to these microphones. The technologies currently being developed could represent a new angle of attack for infringement litigation from Knowles after the wave of suits the company initiated over the last decade.

Combining the data obtained by System Plus Consulting’s teardown of Knowles microphones in the Apple iPhone 7 Plus with Knowmade’s IP analysis, this report highlights IP related to these MEMS microphones. Moreover, it analyzes Knowles’ related patent portfolio in order to understand the company’s IP strategy and to identify main IP competitors.

Benefit from KnowMade and System Plus Consulting’s combined added value, highlighting product features and related patents
**PATENT-TO-PRODUCT MAPPING**

System Plus Consulting tore down the MEMS microphones of Knowles included in Apple’s iPhone 7 Plus, launched in September 2016. Knowmade then compared the features revealed to Knowles’ IP portfolio. The selected features are mainly related to the microphone package, diaphragm and backplate, which uses Knowles’ free-floating technology. The report identifies key patents held by Knowles related to these technology features. For each product feature, we have established links between patented technologies, including legal status.

**Infringement lawsuits**

Knowles has filed patent infringement litigations related to only two patent families of its portfolio. Both families are related to MEMS microphones and to features identified in this patent-to-product mapping report. Knowles has filed complaints against six different defendants, including its main IP competitors. The technologies claimed in these patents are key for Knowles.

**PATENT LITIGATIONS**

**PATENT ANALYSIS AND IP COMPETITIVE ENVIRONMENT**

We have analyzed Knowles’ patents related to MEMS microphones found in the Apple iPhone 7 Plus, including publication trends, country of publication, main inventors, and identified IP competitors. The analysis of forward and backward citations shows that Knowles’ portfolio is cited by many patent applicants. Combining the citation network with analysis of the content of citing/cited patents, we have ranked Knowles’ IP competitors to establish a general view of the IP competitive environment.

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