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Shostak

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(54) **COMPUTING DEVICE HAVING MULTIPLE CO-LOCATED ANTENNAS**

(71) Applicant: **GOOGLE TECHNOLOGY HOLDINGS LLC**, Mountain View, CA (US)

(72) Inventor: **Pavel A Shostak**, Evanston, IL (US)

(73) Assignee: **Google Technology Holdings LLC**, Mountain View, CA (US)

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(51) **Int. Cl.**

H01J 7/02 (2006.01)
H01Q 1/24 (2006.01)
H01Q 1/22 (2006.01)
H01Q 7/06 (2006.01)
H04B 5/00 (2006.01)
H02J 7/02 (2006.01)

(52) **U.S. Cl.**

CPC **H04B 5/0037** (2013.01); **H01Q 1/2266** (2013.01); **H01Q 1/243** (2013.01); **H01Q 7/06** (2013.01); **H02J 7/025** (2013.01); **H04B 5/0081** (2013.01)

(58) **Field of Classification Search**

CPC H01F 38/14; H01F 41/00; H02J 5/005; H02J 7/025; H02J 17/00; H01Q 1/362; A61F 2250/0002; A61N 1/37229
See application file for complete search history.

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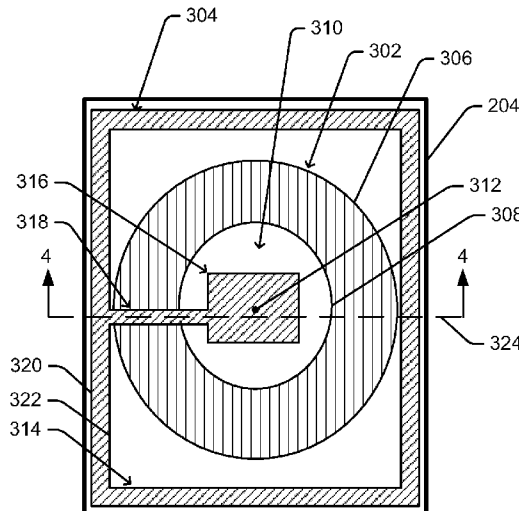
Primary Examiner — Sujatha Sharma

(74) *Attorney, Agent, or Firm* — Faegre Baker Daniels LLP

(57) **ABSTRACT**

A computing device (102) includes multiple antennas, one antenna for wireless communication and another antenna for wireless charging. Each antenna is one of multiple coils that are co-located at a particular area of a housing of the computing device. These multiple coils can be configured in various different manners, and are configured such that a first of the multiple coils has an outer periphery and an inner boundary. A second of the multiple coils includes a first portion, a second portion, and a third portion. The first portion of the second coil is positioned about the outer periphery of the first coil, the second portion of the second coil is positioned within the inner boundary of the first coil, and the third portion of the second coil traverses the first coil and interconnects the first and second portions of the second coil.

20 Claims, 11 Drawing Sheets



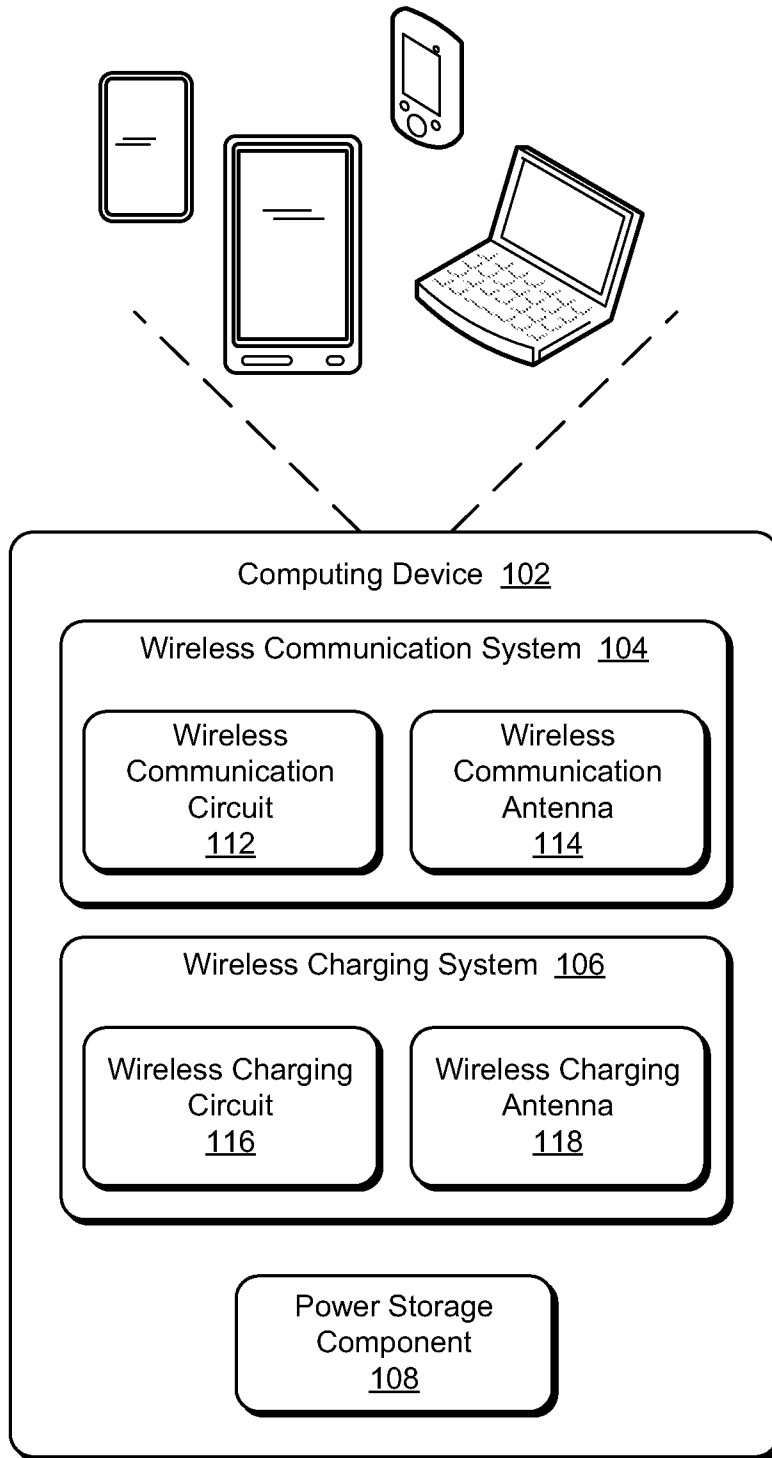


FIG. 1

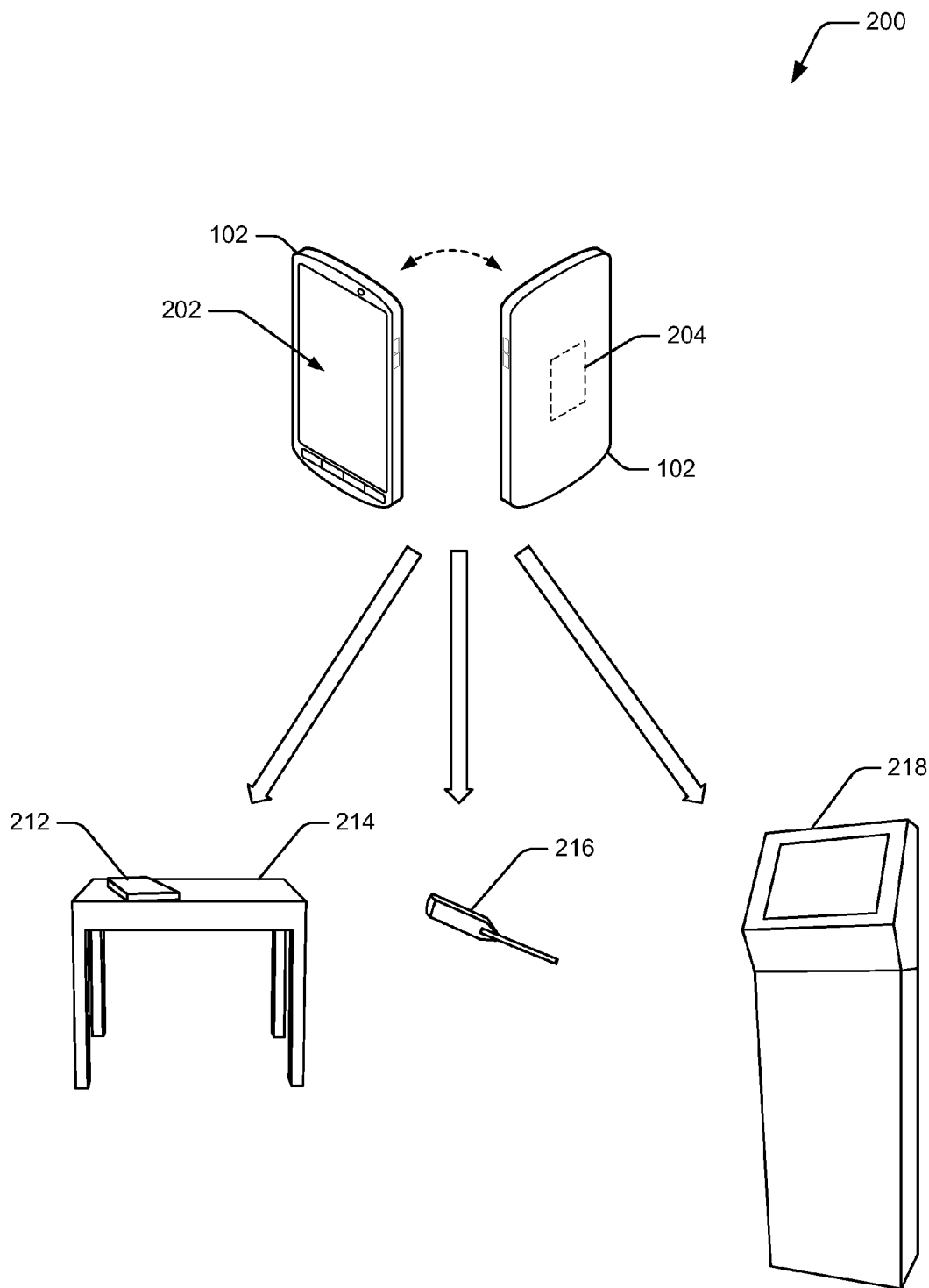


FIG. 2

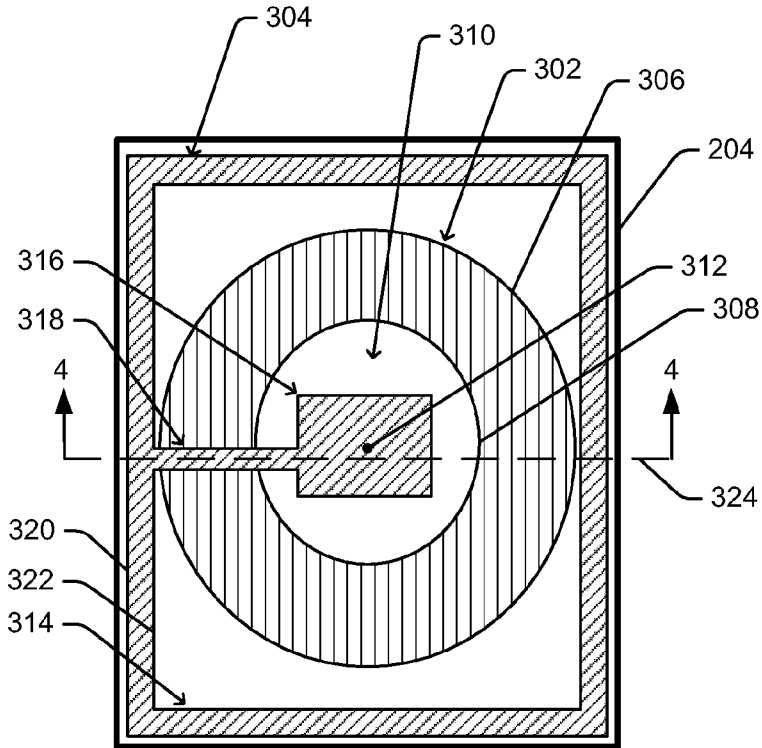


FIG. 3

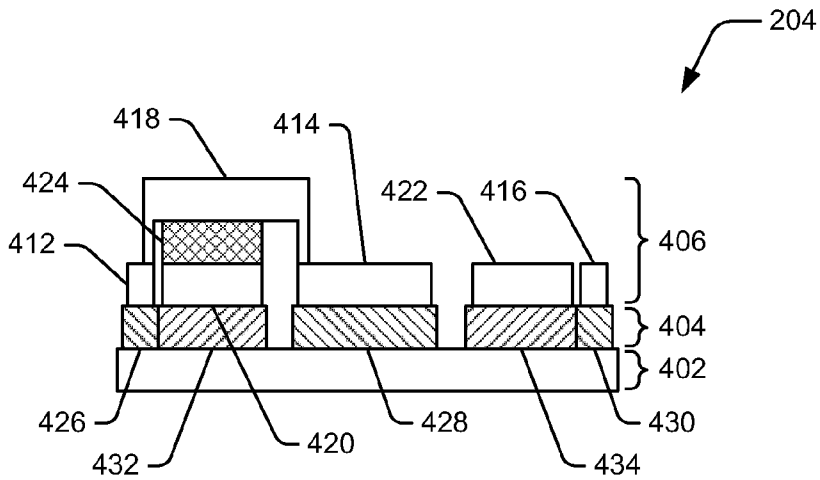


FIG. 4

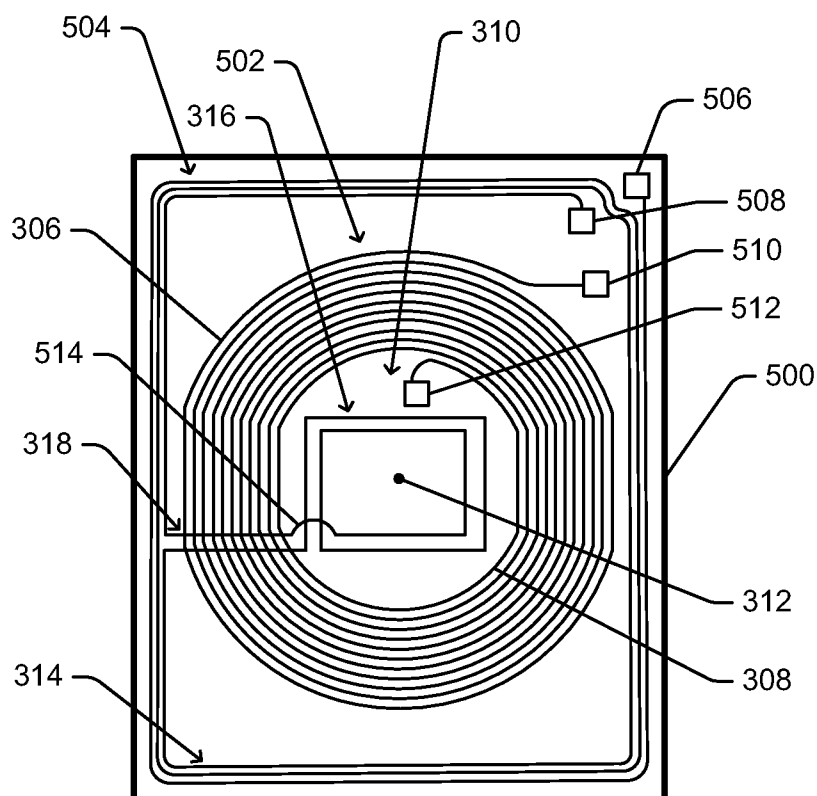


FIG. 5

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