DEFENDANTS' INVALIDITY CONTENTIONS FOR U.S. PAT. 9,483,722

EXHIBIT B:
Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen

As demonstrated in the claim charts below, the claims of U.S. Patent No. 9,483,722 ("the '722 patent") are invalid (a) under 35 U.S.C. § 103 as obvious over each of U.S. Pub. No. 2010/0112941 ("Bangs"), U.S. Pub. No. 2007/0229279 ("Yamazaki-279"), U.S. Pub. No. 2010/0072277 ("Kim-277"), U.S. Pub. No. 2008/0278329 ("Kim-329"), U.S. Pub. No. 2008/0093454 ("Yamazaki-454"), K.R. 2004/0040846 ("Park-846"), K.R. 2007/0002942 ("Park-942"), U.S. Pub. No. 2007/0232232 ("Matsuo"), W.O. 2007/135434 ("Wilson"), U.S. Pub. No. 2005/0161508 ("Akaida"), W.O. 2010/128442 ("Florek-442"), U.S. Pub. No. 2010/0274677 ("Florek-677"), U.S. Pub. No. 2008/0309490 ("Honkanen"), J.P. 2008/008763 ("Hasegawa"), C. Dachs, NFC — the intuitive contactless technology becomes reality, 122 e & i Elektrotechnik und Informationstechnik 466 (2005) ("Dachs"), and U.S. Pub. No. 2008/0150687 ("Claessen") and (b) under 35 U.S.C. § 103(a) as obvious over Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen combined with the knowledge of a person of ordinary skill in the art, Applicant's Admitted Prior Art, and/or the additional prior art references discussed in Exhibits B and Exhibits B1–B5, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '722 patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

Defendants have conducted the invalidity analysis herein based at least in part and in some instance entirely upon Plaintiff's apparent application of the claims of the '722 patent. By charting the prior art against the claims and limitations herein, Defendants are not admitting or agreeing to Plaintiff's application of the claims at issue in this case, and these charts should not be interpreted as an admission or concession by Defendants that any particular construction or application of any claim limitation by Plaintiff is correct or proper. Additionally, these charts provide representative examples of portions of the charted references that disclose the indicated limitations of the claims; additional portions of these references other than the representative examples provided herein may also disclose the indicated limitation(s) and Defendants contend that the asserted claims are invalid in light of the charted reference(s) as a whole in its or their entirety. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well.

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
1[pre]. A mobile device comprising:	Bangs at Figure 1, Figure 6, [0006], [0042], [0046], [0054], [0064], and [0076]. *See also* Bangs at [0033], [0035], [0036], [0038], [0039], [0040], [0041], [0043], claim 29, claim 30, claim 31, claim 32, claim 33, claim 34, claim 35, claim 36, claim 37, claim 38, claim 39, claim 40, claim 41, claim 42, claim 43, claim 44, and claim 45. Yamazaki–279 at [0001], [0002], [0114], [0215], and [0219].

Patent Owner's Ex. 2017
Samsung v. iCashe (IPR2025-00640)
Page 001

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Kim–277 at Abstract, Figure 1, Figure 2, Figure 7, [0003], [0005], [0010], [0012], [0020], [0031], [0033], [0034], [0035], [0043], [0056], [0084], [0087], [0133], and [0137]. *See also* Kim–277 at [0004], [0009], [0015], [0016], [0017], [0024], [0032], [0036], [0037], [0038], [0052], [0057], [0066], [0067], [0083], [0089], [0093], [0094], [0103], [0117], [0118], [0132], [0136], [0138], and [0139]. Yamazaki–454 at Abstract, Figure 2, Figure 6, Figure 10, Figure 13, Figure 26B, Figure 26C, Figure 26D, Figure 27A, Figure 27B, Figure 27C, Figure 27D, Figure 27E, [0012], [0033], [0065], [0067], [0069], [0117], [0140], [0275], [0276], [0277], [0278], [0279], [0280], [0281], [0282], and [0283]. *See also* Yamazaki–454 at [0056], [0057], [0071], [0105], [0115], [0119], [0137], and [0273]. Park–846 at Figure 6a, Figure 6b, [0009], [0025], [0039], [0065], [0066], [0067], [0068], and [0069]. Matsuo at Abstract, Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 7, Figure 10, Figure 11, Figure 12, Figure 13, Figure 14, [0005], [0010], [0011], [0012], [0015], [0033], [0034], [0035], [0036], [0037], [0038], [0039], [0040], [0041], [0042], [0047], [0049], [0051], [0053], [0055], [0057], [0058], [0062], [0063], [0064], [0066], [0067], [0068], [0069], [0070], [0075], [0077], [0078], [0081], [0082], [0083], [0086], [0087], [0088], and [0089]. Park–589 at [0036]. *See also* Park–589 at [0008] and [0087]. Wilson at 1:6–13, 3:5–23, 9:26–10:19, 17:23–18:1, 18:9–19, 19:3–16, 20:27–21:8, 22:1–9, Figure 1, and Figure 3. Akaida at Figure 9, [0014], [0018], [0029], [0030], [0050], [0051], and [0052]. Florek–442 at Abstract, 1:7–15, 2:18–24, 3:10–19, 4:21–31, 4:32–5:6, 5:7–15, 5:16–28, 5:29–6:4, 6:11–22, 8:4–12, 9:1–16, 10:15–20, 10:29–11:6, 11:21–24, 12:24–13:2, 13:15–14:4, 14:16–29, 16:1–16, 16:17–22, 16:31–17:4, 18:22–28, 18:29–34, 19:21–20:9, 20:10–29, 22:9–12, 22:20–26, 22:27–23:16, 24:2–11, 24:24–34, 25:14–29, 27:10–12, 27:13–17, Figure 2, Figure 5, Figure 6, Figure 7, Figure 8, Figure 10, Figure 11, and Figure 14. Honkanen at Figure 1, Figure 2b, Figure 3c, [0005], [0009], [0012], [0018], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], [0041], [0044], [0045], [0047], [0051], [0052], [0056], [0057], and [0118].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Hasegawa at Abstract, [0001], [0003], [0005], [0006], [0008], [0010], [0013], [0045], [0051], [0053], [0092], [0113], [0128], [0129], [0146], [0148], [0159], [0163], [0165], [0168], [0186], [0197], [0200], [0220], [0223], [0238], [0244], and [0261]. Park–942 at Abstract, Figure 17, 3–4, 4–5, 8–9, 9–10, 10–11, 12, 12–13, 13–14, 14, and 15. Dachs at Abstract, Figure 1, Figure 2, 467, 468, 468–469, 469, Figure 5, 470, 470–471, and Figure 7. Kim–329 at Figure 2, Figure 3, [0008], [0037], [0040], [0043], [0045], and [0046]. Florek–677 at Abstract, Figure 1, Figure 2, [0001], [0003], [0004], [0006], [0008], [0010], [0012], [0020], [0023], [0024], [0025], and [0027]. Claessen at [0002], [0013], [0026], and [0041].
[1a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Bangs at Figure 2, [0002], [0007], [0009], [0014], [0046], [0049], [0050], [0051], [0052], [0053], [0054], [0055], [0067], and [0074]. *See also* Bangs at Figure 5, Figure 6, [0018], [0065], [0068], [0070], [0073], and [0086]. Yamazaki–279 at Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, Figure 32, [0005], [0006], [0020], [0059], [0070], [0076], [0077], [0080], [0081], [0091], and [0108]. *See also* Yamazaki–279 at [0010], [0011], [0012], [0013], [0014], [0015], [0016], [0017], [0018], and [0078]. Kim–277 at Abstract, Figure 1, Figure 2, Figure 3, Figure 5, [0005], [0010], [0012], [0016], [0033], [0036], [0037], [0038], [0041], [0046], [0049], [0050], [0051], [0052], [0053], [0054], [0055], [0056], [0057], [0058], [0059], [0060], [0061], [0062], [0063], [0064], [0067], [0079], [0080], [0084], [0089], [0137], and [0139]. *See also* Kim–277 at [0040] and [0082]. Yamazaki–454 at Figure 1, Figure 2, Figure 4, Figure 5, Figure 6, Figure 7A, Figure 7B, Figure 8, Figure 9, Figure 10, [0028], [0033], [0034], [0036], [0037], [0038], [0044], [0045], [0053], [0054], [0055], [0056], [0057], [0060], [0061], [0062], [0064], [0065], [0067], [0068], [0069], [0070], [0071], [0074], [0077], [0078], [0079], [0095], [0110], [0112], [0114], [0115], [0119], [0120], [0121], [0122], [0150], [0273], [0275], [0279], [0281], and [0282]. *See also* Yamazaki–454 at [0018], [0023], [0024], [0029], [0030], [0031], [0032], [0035], [0066], [0073], [0075], [0090], [0094], [0102], [0105], [0118], [0137], [0268], [0269], and [0280].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Park–846 at Abstract, Figure 2, Figure 3a, Figure 3b, Figure 4a, Figure 4b, Figure 5a, Figure 5b, Figure 6a, Figure 6b, [0020], [0031], [0032], [0036], [0037], [0038], [0049], [0050], [0058], [0060], [0065], [0066], [0067], [0069], and [0071]. Matsuo at Figure 2, Figure 6, [0007], [0008], [0009], [0010], [0015], [0034], [0035], [0048], [0056], [0057], [0058], [0059], [0060], [0062], [0064], [0067], [0068], and [0070]. Park–589 at Abstract, Figure 1, Figure 3, Figure 4, Figure 6, Figure 7, [0016], [0017], [0019], [0020], [0021], [0032], [0033], [0035], [0040], [0042], [0043], [0045], [0046], [0047], [0048], [0049], [0051], [0052], [0055], [0058], [0062], [0063], [0064], [0068], [0069], [0070], [0071], [0073], [0074], [0076], [0080], [0081], [0085], [0092], claim 1, claim 2, claim 3, claim 4, claim 6, claim 8, claim 9, claim 11, claim 15, claim 16, claim 17, and claim 18. *See also* Park–589 at Figure 2, [0018], [0041], [0054], [0056], [0082], [0084], [0086], [0090], [0091], claim 7, and claim 10. Wilson at 1:28–2:14, 3:24–4:3, 4:4–15, 6:16–7:2, 8:28–9:3, 10:20–29, 11:1–24, 12:3–24, 13:14–27, 14:12–21, 15:20–16:3, 16:25–30, 17:23–18:1, 19:21–28, 19:29–20:18, 20:19–26, 20:27–21:8, Figure 1, Figure 2, and Figure 3. *See also* Wilson at 14:12–21, 14:22–27. Akaida at Abstract, Figure 3, Figure 4, Figure 8, Figure 9, [0003], [0008], [0012], [0016], [0017], [0018], [0029], [0030], [0036], [0038], [0042], [0043], [0045], [0046], [0050], and [0051]. *See also* Akaida at [0014]. Florek–442 at 1:33–2:12, 4:21–31, 6:11–22, 7:22–33, 8:4–12, 8:17–32, 9:1–16, 10:9–14, 11:7–20, 16:31–17:4, 19:21–20:9, 21:5–11, 21:26–32, 22:20–26, 22:27–23:16, Figure 1, Figure 3, Figure 4, Figure 12, and Figure 13. Honkanen at Figure 2b, [0006], [0012], [0032], [0034], [0035], [0037], [0045], [0052], [0057], [0142], [0144], and [0151]. Hasegawa at Abstract, [0003], [0005], [0006], [0013], [0045], [0051], [0053], [0057], [0092], [0113], [0128], [0129], [0148], [0163], [0165], and [0168]. Park–942 at 5, 5–6, 6–7, 7, 8–9, 9–10, 10–11, 12, and 12–13.

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Dachs at Figure 2, 467, Figure 3, 468, 469, Figure 5, 470–471, and Figure 7. *See also* Dachs at Abstract, Figure 1, and 467. Kim–329 at Abstract, Figure 3, Figure 6, [0008], [0043], [0044], and [0045]. Florek–677 at Figure 1, Figure 2, [0020], and [0024]. Claessen at [0002], [0003], [0005], [0013], and [0026].
[1b] an antenna tuned to operate at 13.56 MHz; and	Bangs at Abstract, Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, [0002], [0016], [0021], [0023], [0029], [0030], [0031], [0032], [0039], [0052], [0056], [0057], [0058], [0063], [0070], [0076], [0078], [0081], [0099], and claim 44. *See also* Bangs at [0001], [0005], [0010], [0017], [0018], [0019], [0020], [0022], [0024], [0025], [0046], [0049], [0050], [0053], [0059], [0061], [0062], [0064], [0065], [0066], [0067], [0068], [0069], [0071], [0072], [0073], [0074], [0075], [0077], [0079], [0080], [0082], [0083], [0084], [0085], [0086], [0087], [0088], [0089], [0090], [0091], [0092], [0093], [0094], [0096], [0097], [0098], claim 29, claim 30, claim 31, claim 32, claim 33, claim 34, claim 35, claim 36, claim 37, claim 38, claim 39, claim 40, claim 41, claim 42, claim 43, claim 45, claim 46, claim 47, and claim 48. Yamazaki–279 at Abstract, Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, [0001], [0005], [0006], [0008], [0010], [0011], [0012], [0020], [0059], [0060], [0061], [0062], [0068], [0069], [0070], [0076], [0077], [0081], [0082], [0086], [0089], [0091], [0092], [0094], [0096], [0103], and [0104]. *See also* Yamazaki–279 at [0013], [0014], [0015], [0016], [0017], [0018], [0023], [0072], [0108], [0114], and [0201]. Kim–277 at Figure 1, Figure 2, Figure 3, Figure 4, Figure 6, [0024], [0034], [0036], [0040], [0045], [0063], [0065], [0066], [0069], [0076], [0083], [0084], and [0088]. *See also* Kim–277 at [0060] and [0067]. Yamazaki–454 at Figure 5, [0008], [0009], [0013], [0020], [0025], [0026], [0055], [0061], [0064], [0070], [0071], [0074], [0111], [0114], [0121], [0137], [0167], [0271], and [0273]. *See also* Yamazaki–454 at Abstract, Figure 1, Figure 9, [0065], [0112], [0255], [0256], [0257], [0258], [0259], [0260], [0263], and [0279].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Park–846 at Abstract, Figure 2, Figure 3a, Figure 3b, [0022], [0031], [0032], [0034], [0035], [0036], [0040], [0050], [0056], [0058], [0060], [0067], [0069], and [0071]. Matsuo at Figure 2, Figure 6, [0003], [0008], [0015], [0047], [0048], [0049], [0051], [0053], [0054], [0055], [0056], [0057], [0059], [0060], [0061], [0063], [0066], [0067], [0068], [0069], [0070], [0077], [0078], [0083], [0086], [0087], [0088], and [0089]. *See also* Matsuo at Abstract, [0005], [0034], [0037], [0038], and [0042]. Park–589 at Abstract, Figure 1, Figure 5, Figure 6, Figure 7, [0006]–[0007], [0019], [0020], [0027], [0032], [0034], [0047], [0052], [0054], [0055], [0056], [0058], [0059], [0060], [0073], [0075], [0081], claim 1, claim 6, claim 8, claim 11, claim 13, claim 14, claim 15, and claim 17. *See also* Park–589 at [0012], [0017], [0048], and [0049]. Wilson at 1:6–13, 3:24–4:3, 5:19–24, 6:16–7:2, 7:3–12, 8:17–27, 8:28–9:3, 12:3–24, 13:14–27, 14:12–21, 15:20–16:3, 16:15–24, 16:25–30, 19:21–28, 19:29–20:18, 22:1–9, Figure 1, Figure 2, and Figure 3. Akaida at Figure 1, Figure 3, Figure 4, Figure 5, Figure 8, Figure 9, [0008], [0010], [0012], [0016], [0017], [0018], [0029], [0030], [0031], [0036], [0038], [0039], [0045], [0046], and [0056]. Florek–442 at 9:1–16, 13:15–14:4, 14:16–29, 18:11–15, 18:29–34, 19:21–20:9, 22:9–12, 24:24–34, 25:1–5, 27:13–17, Figure 2, Figure 3, Figure 6, Figure 8, Figure 10, Figure 13, and Figure 14. *See also* Florek–442 at 1:7–15. Honkanen at Figure 1, Figure 2b, Figure 3c, [0005], [0006], [0031], [0032], [0033], [0034], [0037], [0044], [0057], [0061], and [0144]. Hasegawa at Abstract, [0003], [0004], [0005], [0051], [0094], and [0186]. Park–942 at Abstract, 2, 3–4, 4–5, 5, 5–6, 7, 9–10, 10–11, 11–12, 12, and 12–13. Dachs at Abstract, Figure 2, 467, Figure 3, 468, 469, Figure 5, and Figure 7. *See also* Dachs at Figure 1, 468, 468–469, and 470. Kim–329 at Abstract, Figure 2, Figure 3, [0008], [0042], [0043], and [0044]. Florek–677 at Figure 2, [0010], [0023], [0024], and [0025].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
[1c] at least one active circuit coupled between the smartcard controller and the antenna, wherein the at least one active circuit includes an amplifier coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller, and the at least one active circuit further includes a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna.	Bangs at Abstract, Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, [0002], [0004], [0007], [0009], [0014], [0015], [0016], [0021], [0023], [0029], [0030], [0031], [0032], [0036], [0041], [0046], [0047], [0049], [0050], [0052], [0053], [0056], [0057], [0058], [0059], [0070], [0071], [0074], [0075], [0076], [0078], [0079], and [0081]. *See also* Bangs at [0001], [0010], [0017], [0018], [0019], [0020], [0022], [0024], [0025], [0033], [0038], [0039], [0061], [0062], [0063], [0064], [0065], [0067], [0068], [0069], [0072], [0073], [0077], [0080], [0082], [0083], [0084], [0085], [0086], [0087], [0088], [0089], [0090], [0091], [0092], [0093], [0094], [0096], [0097], claim 29, claim 30, claim 31, claim 32, claim 33, claim 34, claim 35, claim 36, claim 37, claim 38, claim 39, claim 40, claim 41, claim 42, claim 43, claim 44, claim 46, claim 47, and claim 48. Yamazaki–279 at Abstract, Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, [0001], [0004], [0005], [0006], [0008], [0010], [0011], [0012], [0013], [0014], [0015], [0016], [0017], [0018], [0019], [0020], [0023], [0059], [0060], [0061], [0062], [0068], [0069], [0070], [0072], [0073], [0075], [0076], [0077], [0080], [0081], [0082], [0086], [0089], [0091], [0092], [0094], [0096], [0103], [0104], and [0108]. *See also* Yamazaki–279 at [0114] and [0201]. Kim–277 at Abstract, Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, [0005], [0010], [0012], [0015], [0024], [0033], [0035], [0036], [0037], [0040], [0041], [0043], [0045], [0046], [0048], [0049], [0050], [0051], [0052], [0053], [0054], [0055], [0056], [0059], [0060], [0061], [0062], [0063], [0064], [0065], [0066], [0067], [0069], [0071], [0072], [0073], [0076], [0079], [0080], [0082], [0083], [0084], [0089], [0136], [0137], and [0139]. *See also* Kim–277 at [0088]. Yamazaki–454 at Figure 1, Figure 5, Figure 9, [0008], [0009], [0013], [0019], [0020], [0025], [0026], [0055], [0060], [0061], [0062], [0064], [0070], [0071], [0074], [0110], [0111], [0112], [0114], [0115], [0118], [0119], [0120], [0121], [0137], [0150], [0167], [0269], [0271], [0273], and [0275]. *See also* Yamazaki–454 at Abstract, [0065], [0255], [0256], [0257], [0258], [0259], [0260], [0263], and [0279]. Park–846 at Abstract, Figure 2, Figure 3a, Figure 3b, Figure 4a, Figure 4b, Figure 5a, Figure 5b, Figure 6a, Figure 6b, [0018], [0022], [0031], [0032], [0034], [0035], [0036], [0037], [0039], [0040], [0049], [0050], [0056], [0058], [0060], [0065], [0066], [0067], [0069], and [0071].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Matsuo at Figure 6, [0008], [0015], [0047], [0048], [0049], [0053], [0054], [0055], [0056], [0057], [0058], [0059], [0060], [0061], [0063], [0066], [0067], [0068], [0069], and [0070]. *See also* Matsuo at Figure 2 and [0007]. Park–589 at Abstract, Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, Figure 7, [0019], [0020], [0025], [0027], [0032], [0034], [0047], [0048], [0050], [0051], [0052], [0054], [0055], [0056], [0058], [0059], [0060], [0073], [0075], [0081], claim 1, claim 6, claim 8, claim 9, claim 11, claim 13, claim 14, claim 15, and claim 17. *See also* Park–589 at [0017] and [0049]. Wilson at 1:28–2:14, 6:16–7:2, 7:3–12, 9:11–14, 11:1–24, 12:3–24, 13:14–27, 14:12–21, 17:23–18:1, 19:3–16, 19:21–28, 19:29–20:18, Figure 1, Figure 2, and Figure 3. Akaida at Abstract, Figure 1, Figure 3, Figure 4, Figure 5, Figure 8, Figure 9, [0008], [0010], [0012], [0016], [0017], [0018], [0029], [0030], [0031], [0036], [0038], [0039], [0042], [0043], [0045], [0046], [0048], [0052], and [0056]. Florek–442 at 5:29–6:4, 9:1–16, 18:11–15, 19:21–20:9, 22:9–12, 24:24–34, Figure 2, Figure 3, Figure 5, Figure 6, Figure 8, Figure 10, Figure 13, and Figure 14. Honkanen at Figure 1, Figure 2b, Figure 3c, [0005], [0031], [0032], [0034], [0035], [0037], [0044], [0057], [0061], [0144], [0155], [0158], [0159], and [0176]. Hasegawa at Abstract, [0003], [0005], [0013], [0021], [0045], [0053], [0057], [0059], [0092], [0094], [0113], [0128], [0129], [0163], [0165], [0168], [0186], and [0200]. Park–942 at Abstract, 2, 3–4, 4–5, 5, 5–6, 6–7, 7, 7–8, 9–10, 10, 10–11, 11–12, 12, 12–13, 13–14, and 14. Dachs at Figure 2, 467, Figure 3, 468, 469, Figure 5, and Figure 7. Kim–329 at Abstract, Figure 2, Figure 3, Figure 6, [0008], [0022], [0042], [0043], [0044], [0045], and [0046]. *See also* Kim–329 at [0041]. Florek–677 at Figure 2, [0010], and [0023]. Claessen at [0005], [0013], and [0026].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
2. The mobile device of claim 1 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Bangs at Abstract, Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, [0002], [0008], [0010], [0011], [0012], [0016], [0020], [0021], [0023], [0029], [0030], [0031], [0032], [0039], [0056], [0057], [0058], [0061], [0063], [0072], [0073], [0076], [0077], [0078], [0081], [0087], [0088], [0089], and [0094]. *See also* Bangs at [0001], [0007], [0009], [0017], [0018], [0019], [0022], [0024], [0025], [0046], [0049], [0050], [0053], [0059], [0062], [0064], [0065], [0067], [0068], [0069], [0070], [0071], [0074], [0075], [0079], [0080], [0082], [0083], [0084], [0085], [0086], [0090], [0091], [0092], [0093], [0095], [0096], [0097], claim 29, claim 30, claim 31, claim 32, claim 33, claim 34, claim 35, claim 36, claim 37, claim 38, claim 39, claim 40, claim 41, claim 42, claim 43, claim 44, claim 46, claim 47, and claim 48. Yamazaki–279 at Abstract, Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, [0001], [0005], [0006], [0008], [0010], [0011], [0012], [0020], [0059], [0060], [0061], [0062], [0068], [0069], [0070], [0072], [0076], [0077], [0081], [0082], [0086], [0089], [0091], [0092], [0094], [0096], [0103], [0104], and [0108]. *See also* Yamazaki–279 at [0013], [0014], [0015], [0016], [0017], [0018], [0023], [0114], and [0201]. Kim–277 at Figure 1, Figure 2, Figure 3, Figure 4, Figure 6, [0024], [0036], [0040], [0045], [0063], [0065], [0066], [0069], [0076], [0083], [0084], [0118], and [0137]. *See also* Kim–277 at [0017], [0060], [0067], [0088], and [0138]. Yamazaki–454 at Figure 5, [0008], [0009], [0013], [0020], [0025], [0026], [0055], [0061], [0064], [0065], [0070], [0071], [0073], [0074], [0111], [0114], [0121], [0137], [0167], [0259], [0269], [0271], and [0273]. *See also* Yamazaki–454 at Abstract, Figure 1, Figure 9, [0112], [0255], [0256], [0257], [0258], [0260], [0263], and [0279]. Park–846 at Abstract, Figure 2, Figure 3a, Figure 3b, [0022], [0031], [0032], [0034], [0035], [0036], [0040], [0056], [0058], [0060], [0067], [0069], and [0071]. Matsuo at Figure 6, [0008], [0015], [0047], [0048], [0049], [0053], [0054], [0055], [0056], [0059], [0060], [0061], [0063], [0066], [0067], [0068], [0069], and [0070]. *See also* Matsuo at Figure 2. Park–589 at Abstract, Figure 1, Figure 5, Figure 6, Figure 7, [0006]–[0007], [0019], [0020], [0027], [0032], [0034], [0047], [0052], [0054], [0055], [0056], [0058], [0059], [0060], [0073], [0075], [0081], claim 1, claim 6, claim 8, claim 11, claim 13, claim 14, claim 15, and claim 17.

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	See also Park–589 at [0017]. Wilson at 4:4–21, 15:20–16:3. Akaida at Figure 1, Figure 3, Figure 4, Figure 5, Figure 8, Figure 9, [0008], [0010], [0012], [0016], [0017], [0018], [0029], [0030], [0031], [0036], [0038], [0039], [0045], [0046], and [0056]. Florek–442 at 9:1–16, 18:11–15, 19:21–20:9, 22:9–12, 24:24–34, Figure 2, Figure 3, Figure 6, Figure 8, Figure 10, Figure 13, and Figure 14. Honkanen at Figure 1, Figure 2b, Figure 3c, [0005], [0031], [0032], [0034], [0037], [0044], [0057], [0061], and [0144]. Hasegawa at [0005], [0094], and [0186]. Park–942 at Abstract, 2, 3–4, 4–5, 5, 5–6, 9–10, 10–11, 11–12, 12, and 12–13. Dachs at 468, 469, Figure 5, and Figure 7. Kim–329 at Abstract, Figure 2, Figure 3, [0008], [0042], [0043], and [0044]. Florek–677 at Figure 2, [0010], and [0023]. *See also* claim 1 above.
3. The mobile device of claim 1 wherein the smartcard controller is coupled to be powered by the mobile device.	Bangs at Figure 2, [0004], [0015], [0036], [0041], [0046], and [0047]. *See also* Bangs at Figure 1 and [0038]. Yamazaki–279 at Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, [0004], [0005], [0010], [0019], [0023], [0060], [0072], [0075], [0082], and [0091]. *See also* Yamazaki–279 at Abstract. Kim–277 at Figure 1, Figure 2, [0005], [0015], [0033], [0035], [0037], [0041], [0055], [0056], [0058], [0064], [0089], and [0136]. Yamazaki–454 at [0061]. Park–846 at Abstract, Figure 2, Figure 3a, Figure 3b, Figure 4a, Figure 4b, Figure 5a, Figure 5b, Figure 6a, Figure 6b, [0018], [0031], [0032], [0034], [0039], [0056], [0065], [0066], [0067], [0069], and [0071].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Matsuo at Figure 6, [0049], [0063], and [0066]. *See also* Matsuo at [0048] and [0068]. Wilson at 1:28–2:14, 9:11–14, 17:23–18:1, 19:3–16, 19:21–28, 19:29–20:18, and Figure 3. Florek–442 at 5:29–6:4 and 9:1–16. Honkanen at [0144] and [0176]. Hasegawa at [0005]. Park–942 at 10 and 14. Dachs at Figure 2. *See also* claim 1 above.
4. The mobile device of claim 1 wherein the mobile device comprises a mobile phone.	Bangs at Figure 1, [0035], and [0036]. *See also* Bangs at [0006] and [0040]. Yamazaki–279 at [0215]. Kim–277 at [0134]. *See also* Kim–277 at [0033]. Yamazaki–454 at Figure 27B, [0273], [0279], and [0283]. *See also* Yamazaki–454 at [0067] and [0117]. Park–846 at Figure 6a, Figure 6b, and [0067]. Matsuo at Figure 1, Figure 3, Figure 4, Figure 7, Figure 10, Figure 11, Figure 12, Figure 13, Figure 14, [0005], [0033], [0034], [0051], [0075], [0081], and [0086]. Park–589 at [0036]. Wilson at 3:5–23, 9:26–10:10, and 18:9–19. Akaida at [0014] and [0051].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Florek–442 at Abstract, 1:7–15, 2:18–24, 3:10–19, 4:21–31, 4:32–5:6, 5:7–15, 5:16–28, 5:29–6:4, 8:1–3, 10:29–11:6, 13:15–14:4, 16:1–16, 18:22–28, 18:29–34, 19:21–20:9, 20:10–29, 22:9–12, 22:27–23:16, 24:2–11, Figure 5, and Figure 11. Honkanen at Figure 3c, [0005], [0009], [0018], [0030], [0036], [0037], [0041], and [0047]. Park–942 at 3–4, 8–9, 12, 12–13, and 15. Dachs at Abstract, Figure 1, 468, 468–469, 469, 470, and 470–471. Florek–677 at Figure 1, Figure 2, [0001], [0003], [0004], [0006], [0008], [0010], [0012], [0020], [0023], [0024], [0025], and [0027]. *See also* claim 1 above.
5[pre]. A mobile device comprising:	*See* above at 1[pre].
[5a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	*See* above at [1a].
[5b] an antenna tuned to operate at 13.56 MHz;	*See* above at [1b].
[5c] an amplifier coupled between the smartcard controller and the antenna, wherein the amplifier is coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna	Bangs at Figure 2, [0004], [0015], [0036], [0041], [0046], [0047], [0049], [0059], [0069], [0076], and [0079]. *See also* Bangs at Figure 1, [0038], and [0081]. Yamazaki–279 at Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, [0004], [0005], [0006], [0010], [0019], [0023], [0059], [0060], [0061], [0072], [0075], [0076], [0077], [0080], [0082], [0091], and [0092].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
and to provide an amplified signal to the smartcard controller; and	*See also* Yamazaki–279 at Abstract. Kim–277 at Figure 1, Figure 2, Figure 3, Figure 5, [0005], [0015], [0033], [0035], [0036], [0037], [0041], [0045], [0048], [0049], [0050], [0051], [0053], [0055], [0056], [0060], [0063], [0064], [0065], [0069], [0071], [0072], [0073], [0078], [0079], [0080], [0081], [0082], [0089], and [0136]. *See also* Kim–277 at [0054]. Yamazaki–454 at Figure 5, [0061], [0074], and [0121]. Park–846 at Abstract, Figure 2, Figure 3a, Figure 3b, Figure 4a, Figure 4b, Figure 5a, Figure 5b, Figure 6a, Figure 6b, [0018], [0031], [0032], [0034], [0039], [0056], [0065], [0066], [0067], [0069], and [0071]. Matsuo at [0059], [0061], [0063], and [0066]. Park–589 at Figure 2, Figure 3, Figure 4, [0025], [0047], [0052], claim 6, and claim 11. Wilson at 1:28–2:14, 9:11–14, and 19:3–16, 19:21–28. Akaida at Abstract, Figure 1, Figure 4, Figure 5, Figure 8, Figure 9, [0010], [0016], [0017], [0018], [0030], [0032], [0039], and [0056]. Honkanen at [0144] and [0176]. Hasegawa at [0005], [0021], and [0059]. Park–942 at 5–6, 10, 11–12, 12, and 14. *See also* Dachs at Figure 2. Kim–329 at Figure 6. *See also* [1c] above.
[5d] a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna.	Bangs at Figure 2, [0007], [0009], [0014], [0021], [0023], [0050], [0052], [0053], [0070], [0071], [0074], [0075], and [0076]. *See also* Bangs at Figure 5, [0039], [0046], [0069], [0072], [0073], and [0092].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Yamazaki–279 at Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, [0004], [0005], [0006], [0008], [0010], [0011], [0012], [0013], [0014], [0015], [0016], [0017], [0018], [0019], [0023], [0059], [0060], [0070], [0072], [0073], [0076], [0080], [0082], [0091], and [0108]. Kim–277 at Abstract, Figure 1, Figure 2, [0005], [0010], [0012], [0035], [0037], [0040], [0041], [0043], [0046], [0052], [0053], [0054], [0055], [0056], [0059], [0060], [0061], [0062], [0063], [0064], [0067], [0084], [0089], [0137], and [0139]. Yamazaki–454 at Figure 1, Figure 5, Figure 9, [0019], [0020], [0060], [0061], [0062], [0064], [0074], [0110], [0111], [0112], [0114], [0115], [0118], [0119], [0120], [0121], [0137], [0150], [0269], and [0275]. Park–846 at Abstract, Figure 2, Figure 3a, Figure 3b, Figure 4a, Figure 4b, Figure 5a, Figure 5b, Figure 6a, Figure 6b, [0031], [0032], [0034], [0036], [0037], [0049], [0050], [0056], [0058], and [0060]. Matsuo at Figure 6, [0008], [0015], [0048], [0049], [0057], [0058], [0059], [0060], [0066], [0067], [0068], and [0070]. *See also* Matsuo at [0007]. Park–589 at Figure 3, Figure 4, [0032], [0034], [0048], [0050], [0051], claim 6, claim 8, and claim 9. *See also* Park–589 at [0049]. Wilson at 1:28–2:14, 4:16–21, 6:16–7:2, 7:3–12, 11:1–24, 12:3–14, 13:14–27, 14:12–21, 17:23–18:1, 19:3–16, 19:21–28, 19:29–20:18, Figure 1, Figure 2, and Figure 3. Akaida at Abstract, Figure 1, Figure 4, Figure 5, Figure 8, Figure 9, [0008], [0010], [0012], [0016], [0017], [0018], [0030], [0031], [0036], [0038], [0042], [0043], [0048], and [0052]. Florek–442 at Figure 5 and Figure 13. Honkanen at Figure 1, Figure 2b, [0032], [0035], [0144], [0155], [0158], and [0159]. Hasegawa at Abstract, [0003], [0005], [0013], [0045], [0053], [0057], [0092], [0113], [0128], [0129], [0163], [0165], [0168], and [0200]. Park–942 at 5, 5–6, 6–7, 7, 7–8, 9–10, 10, 12, and 13–14. Dachs at Figure 2, 467, Figure 3, and Figure 5. Kim–329 at Figure 3, [0008], [0022], [0044], [0045], and [0046].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	See also Kim–329 at [0041]. Claessen at [0005], [0013], and [0026]. *See also* [1c] above.
6. The mobile device of claim 5 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	*See* above at claim 2. *See also* claim 5.
7. The mobile device of claim 5 wherein the smartcard controller is coupled to be powered by the mobile device.	*See* above at claim 3. *See also* claim 5
8. The mobile device of claim 5 wherein the transmit circuit comprises a load modulation circuit.	Bangs at [0002], [0007], [0050], [0053], [0054], [0055], [0067], and [0074]. *See also* Bangs at Figure 2. Yamazaki–279 at Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, Figure 32, [0006], [0020], [0070], [0080], [0081], [0091], and [0108]. Kim–277 at Abstract, Figure 1, Figure 2, [0010], [0012], [0016], [0037], [0041], [0046], [0053], [0054], [0055], [0056], [0059], [0060], [0062], [0063], [0064], [0067], [0089], [0137], and [0139]. *See also* Kim–277 at [0005] and [0040]. Yamazaki–454 at Figure 1, Figure 5, Figure 9, [0061], [0062], [0064], [0074], [0110], [0112], [0114], [0121], and [0150]. *See also* Yamazaki–454 at [0060]. Park–846 at Figure 2, Figure 4a, Figure 4b, Figure 5a, Figure 5b, [0031], [0032], [0036], [0058], and [0060].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Matsuo at Figure 6, [0007], [0008], [0015], [0048], [0057], [0058], [0059], [0060], [0067], [0068], and [0070]. Park–589 at Figure 3, Figure 4, [0048], [0051], claim 6, and claim 9. *See also* Park–589 at [0049], claim 7, and claim 10. Wilson at 1:28–2:14, 3:24–4:3, 4:4–15, 11:1–24, 12:3–24, 13:14–27, 14:12–21, 15:20–16:3, Figure 1, Figure 2, and Figure 3. Akaida at Figure 8, Figure 9, [0008], [0012], [0030], [0036], and [0038]. Honkanen at [0006], [0032], and [0035]. Hasegawa at Abstract, [0003], [0005], [0006], [0013], [0045], [0051], [0053], [0057], [0113], [0128], [0129], [0163], [0165], and [0168]. Park–942 at 5, 5–6, 6–7, 7, and 9–10. Dachs at 467 and Figure 3. *See also* Dachs at Figure 2. Kim–329 at Figure 3, [0008], [0044], and [0045]. Claessen at [0002], [0003], [0005], [0013], and [0026]. *See also* claim 5.
9. The mobile device of claim 5 wherein the transmit circuit comprises an active transmit driver.	Bangs at Figure 2, [0004], [0015], [0021], [0023], [0036], [0041], [0046], [0050], [0053], [0069], [0070], [0071], [0074], [0075], and [0076]. *See also* Bangs at Figure 1, Figure 5, [0039], [0047], [0072], [0073], [0092], claim 29, and claim 32. Yamazaki–279 at Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, [0004], [0005], [0006], [0008], [0010], [0011], [0012], [0013], [0014], [0015], [0016], [0017], [0018], [0019], [0023], [0059], [0060], [0070], [0072], [0073], [0075], [0076], [0080], [0082], [0091], and [0108]. *See also* Yamazaki–279 at Abstract.

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Kim–277 at Abstract, Figure 1, Figure 2, [0005], [0010], [0012], [0015], [0033], [0035], [0037], [0040], [0041], [0043], [0046], [0052], [0053], [0054], [0055], [0056], [0059], [0060], [0061], [0062], [0063], [0064], [0067], [0084], [0089], [0136], [0137], and [0139]. Yamazaki–454 at Figure 1, Figure 5, Figure 9, Figure 12, [0019], [0020], [0060], [0061], [0062], [0064], [0074], [0110], [0111], [0112], [0114], [0115], [0118], [0119], [0120], [0121], [0137], [0150], [0269], and [0275]. Park–846 at Abstract, Figure 2, Figure 3a, Figure 3b, Figure 4a, Figure 4b, Figure 5a, Figure 5b, Figure 6a, Figure 6b, [0018], [0031], [0032], [0034], [0036], [0037], [0039], [0049], [0050], [0056], [0058], [0060], [0065], [0066], [0067], [0069], and [0071]. Matsuo at Figure 6, [0007], [0008], [0015], [0048], [0049], [0057], [0058], [0059], [0060], [0063], [0066], [0067], [0068], and [0070]. Park–589 at Figure 3, Figure 4, [0032], [0034], [0048], [0050], [0051], claim 6, claim 8, and claim 9. *See also* Park–589 at [0049]. Wilson at 1:28–2:14, 4:16–21, 6:16–7:2, 7:3–12, 9:11–14, 11:1–24, 12:3–24, 13:14–27, 14:12–21, 17:23–18:1, 19:3–16, 19:21–28, 19:29–20:18, Figure 1, Figure 2, and Figure 3. Akaida at Abstract, Figure 1, Figure 4, Figure 5, Figure 8, Figure 9, [0008], [0010], [0012], [0016], [0017], [0018], [0030], [0031], [0036], [0038], [0042], [0043], [0048], and [0052]. Florek–442 at 9:1–16, Figure 5, and Figure 13. *See also* Florek–442 at 5:29–6:4. Honkanen at Figure 1, Figure 2b, [0032], [0035], [0144], [0155], [0158], [0159], and [0176]. Hasegawa at Abstract, [0003], [0005], [0013], [0045], [0053], [0057], [0092], [0113], [0128], [0129], [0163], [0165], [0168], and [0200]. Park–942 at 5, 5–6, 6–7, 7, 7–8, 9–10, 10, 12, 13–14, and 14. Dachs at Figure 2, 467, Figure 3, and Figure 5. Kim–329 at Figure 3, [0008], [0022], [0041], [0044], [0045], and [0046]. Claessen at [0005], [0013], and [0026].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	See also claim 5.
10. The mobile device of claim 5 wherein the mobile device comprises a mobile phone.	*See* above at 4. *See also* claim 5.
11[pre]. A mobile device comprising:	*See* above at 1[pre].
[11a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Bangs at [0002], [0007], [0009], [0014], [0050], [0052], [0053], [0054], [0055], [0067], and [0074]. *See also* Bangs at Figure 2. Yamazaki–279 at Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, Figure 32, [0005], [0006], [0020], [0070], [0076], [0080], [0081], [0091], and [0108]. *See also* Yamazaki–279 at [0010], [0011], [0012], [0013], [0014], [0015], [0016], [0017], [0018], and [0059]. Kim–277 at Abstract, Figure 1, Figure 2, [0005], [0010], [0012], [0016], [0037], [0041], [0046], [0053], [0054], [0055], [0056], [0059], [0060], [0061], [0062], [0063], [0064], [0067], [0089], [0137], and [0139]. *See also* Kim–277 at [0040]. Yamazaki–454 at Figure 1, Figure 5, Figure 9, [0061], [0062], [0064], [0074], [0110], [0112], [0114], [0121], and [0150]. *See also* Yamazaki–454 at [0060]. Park–846 at Abstract, Figure 2, Figure 3a, Figure 3b, Figure 4a, Figure 4b, Figure 5a, Figure 5b, Figure 6a, Figure 6b, [0031], [0032], [0036], [0049], [0050], [0058], and [0060]. Matsuo at Figure 6, [0007], [0008], [0015], [0048], [0057], [0058], [0059], [0060], [0067], [0068], and [0070]. Park–589 at Figure 3, Figure 4, [0048], [0051], claim 6, and claim 9. *See also* Park–589 at [0049], claim 7, and claim 10.

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Wilson at 1:28–2:14, 3:24–4:3, 4:4–9, 11:1–24, 12:3–24, 13:14–27, 14:12–21, 15:20–16:3, 17:23–18:1, 19:21–28, 19:29–20:18, Figure 1, Figure 2, and Figure 3. Akaida at Figure 8, Figure 9, [0008], [0012], [0030], [0036], and [0038]. Honkanen at [0006], [0032], and [0035]. Hasegawa at Abstract, [0003], [0005], [0006], [0013], [0045], [0051], [0053], [0057], [0113], [0128], [0129], [0163], [0165], and [0168]. Park–942 at 5, 5–6, 6–7, 7, and 9–10. Dachs at Figure 2, 467, and Figure 3. Kim–329 at Figure 3, [0008], [0044], and [0045]. Claessen at [0002], [0003], [0005], [0013], and [0026]. *See* above at [1a].
[11b] an antenna tuned to operate at 13.56 MHz;	*See* above at [1b].
[11c] an amplifier coupled to be powered by the mobile device, wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller; and	*See* above at [5c].
[11d] an active transmit driver circuit coupled between the smartcard controller and the antenna, wherein the active transmit driver circuit is coupled to be powered by the mobile device.	Bangs at Figure 2, [0004], [0015], [0021], [0023], [0036], [0041], [0046], [0047], [0050], [0053], [0070], [0071], [0074], [0075], and [0076]. *See also* Bangs at Figure 1, Figure 5, [0033], [0038], [0039], [0069], [0072], [0073], and [0092].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Yamazaki–279 at Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, [0004], [0005], [0006], [0008], [0010], [0011], [0012], [0013], [0014], [0015], [0016], [0017], [0018], [0019], [0023], [0059], [0060], [0070], [0072], [0073], [0075], [0076], [0080], [0082], [0091], and [0108]. *See also* Yamazaki–279 at Abstract. Kim–277 at Abstract, Figure 1, Figure 2, [0005], [0010], [0012], [0015], [0033], [0035], [0037], [0040], [0041], [0043], [0046], [0052], [0053], [0054], [0055], [0056], [0059], [0060], [0061], [0062], [0063], [0064], [0067], [0084], [0089], [0136], [0137], and [0139]. Yamazaki–454 at Figure 1, Figure 5, Figure 9, [0019], [0020], [0060], [0061], [0062], [0064], [0074], [0110], [0111], [0112], [0114], [0115], [0118], [0119], [0120], [0121], [0137], [0150], [0269], and [0275]. Park–846 at Abstract, Figure 2, Figure 3a, Figure 3b, Figure 4a, Figure 4b, Figure 5a, Figure 5b, Figure 6a, Figure 6b, [0018], [0031], [0032], [0034], [0036], [0037], [0039], [0049], [0050], [0056], [0058], [0060], [0065], [0066], [0067], [0069], and [0071]. Matsuo at Figure 6, [0008], [0015], [0048], [0049], [0057], [0058], [0059], [0060], [0063], [0066], [0067], [0068], and [0070]. *See also* Matsuo at [0007]. Park–589 at Figure 3, Figure 4, [0032], [0034], [0048], [0050], [0051], claim 6, claim 8, and claim 9. *See also* Park–589 at [0049]. Wilson at 1:28–2:14, 4:16–21, 6:16–7:2, 7:3–12, 9:11–14, 11:1–24, 12:3–24, 13:14–27, 14:12–21, 17:23–18:1, 19:3–16, 19:21–28, 19:29–20:18, Figure 1, Figure 2, and Figure 3. Akaida at Abstract, Figure 1, Figure 4, Figure 5, Figure 8, Figure 9, [0008], [0010], [0012], [0016], [0017], [0018], [0030], [0031], [0036], [0038], [0042], [0043], [0048], and [0052]. Florek–442 at 5:29–6:4, 9:1–16, Figure 5, and Figure 13. Honkanen at Figure 1, Figure 2b, [0032], [0035], [0144], [0155], [0158], [0159], and [0176]. Hasegawa at Abstract, [0003], [0005], [0013], [0045], [0053], [0057], [0092], [0113], [0128], [0129], [0163], [0165], [0168], and [0200]. Park–942 at 5, 5–6, 6–7, 7, 7–8, 9–10, 10, 12, 13–14, and 14.

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Dachs at Figure 2, 467, Figure 3, and Figure 5. Kim–329 at Figure 3, [0008], [0022], [0044], [0045], and [0046]. *See also* Kim–329 at [0041]. Claessen at [0005], [0013], and [0026]. *See* above at [5d] and claim 9.
12. The mobile device of claim 11 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Bangs at Abstract, Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, [0002], [0008], [0010], [0011], [0012], [0016], [0020], [0021], [0023], [0029], [0030], [0031], [0032], [0039], [0056], [0057], [0058], [0061], [0063], [0072], [0073], [0076], [0077], [0078], [0081], [0087], [0088], [0089], and [0094]. *See also* Bangs at [0001], [0007], [0009], [0017], [0018], [0019], [0022], [0024], [0025], [0046], [0049], [0050], [0053], [0059], [0062], [0064], [0065], [0067], [0068], [0069], [0070], [0071], [0074], [0075], [0079], [0080], [0082], [0083], [0084], [0085], [0086], [0090], [0091], [0092], [0093], [0095], [0096], [0097], claim 29, claim 30, claim 31, claim 32, claim 33, claim 34, claim 35, claim 36, claim 37, claim 38, claim 39, claim 40, claim 41, claim 42, claim 43, claim 44, claim 46, claim 47, and claim 48. Yamazaki–279 at Abstract, Figure 1, Figure 2, Figure 12, Figure 13, Figure 14, Figure 15, [0001], [0005], [0006], [0008], [0010], [0011], [0012], [0020], [0059], [0060], [0061], [0062], [0068], [0069], [0070], [0072], [0076], [0077], [0081], [0082], [0086], [0089], [0091], [0092], [0094], [0096], [0103], [0104], and [0108]. *See also* Yamazaki–279 at [0013], [0014], [0015], [0016], [0017], [0018], [0023], [0114], and [0201]. Kim–277 at Figure 1, Figure 2, Figure 3, Figure 4, Figure 6, [0024], [0036], [0040], [0045], [0063], [0065], [0066], [0069], [0076], [0083], [0084], [0118], and [0137]. *See also* Kim–277 at [0017], [0060], [0067], [0088], and [0138]. Yamazaki–454 at Figure 5, [0008], [0009], [0013], [0020], [0025], [0026], [0055], [0061], [0064], [0065], [0070], [0071], [0073], [0074], [0111], [0114], [0121], [0137], [0167], [0259], [0269], [0271], and [0273]. *See also* Yamazaki–454 at Abstract, Figure 1, Figure 9, [0112], [0255], [0256], [0257], [0258], [0260], [0263], and [0279]. Park–846 at Abstract, Figure 2, Figure 3a, Figure 3b, [0022], [0031], [0032], [0034], [0035], [0036], [0040], [0056], [0058], [0060], [0067], [0069], and [0071].

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
	Matsuo at Figure 6, [0008], [0015], [0047], [0048], [0049], [0053], [0054], [0055], [0056], [0059], [0060], [0061], [0063], [0066], [0067], [0068], [0069], and [0070]. *See also* Matsuo at Figure 2. Park–589 at Abstract, Figure 1, Figure 5, Figure 6, Figure 7, [0006]–[0007], [0019], [0020], [0027], [0032], [0034], [0047], [0052], [0054], [0055], [0056], [0058], [0059], [0060], [0073], [0075], [0081], claim 1, claim 6, claim 8, claim 11, claim 13, claim 14, claim 15, and claim 17. *See also* Park–589 at [0017]. Wilson at 4:4–21, 15:20–16:3. Akaida at Figure 1, Figure 3, Figure 4, Figure 5, Figure 8, Figure 9, [0008], [0010], [0012], [0016], [0017], [0018], [0029], [0030], [0031], [0036], [0038], [0039], [0045], [0046], and [0056]. Florek–442 at 9:1–16, 18:11–15, 19:21–20:9, 22:9–12, 24:24–34, Figure 2, Figure 3, Figure 6, Figure 8, Figure 10, Figure 13, and Figure 14. Honkanen at Figure 1, Figure 2b, Figure 3c, [0005], [0031], [0032], [0034], [0037], [0044], [0057], [0061], and [0144]. Hasegawa at [0005], [0094], and [0186]. Park–942 at Abstract, 2, 3–4, 4–5, 5, 5–6, 9–10, 10–11, 11–12, 12, and 12–13. Dachs at 468, 469, Figure 5, and Figure 7. Kim–329 at Abstract, Figure 2, Figure 3, [0008], [0042], [0043], and [0044]. Florek–677 at Figure 2, [0010], and [0023]. *See* claim 2 above. *See also* claim 11 above.
13. The mobile device of claim 11 wherein the smartcard controller is coupled to be powered by the mobile device.	*See* claim 3 above. *See also* claim 11 above.

Claim Element	Exemplary Citations to Bangs, Yamazaki-279, Kim-277, Kim-329, Yamazaki-454, Park-846, Park-942, Matsuo, Wilson, Akaida, Florek-442, Florek-677, Honkanen, Hasegawa, Dachs, and Claessen
14. The mobile device of claim 11 wherein the mobile device comprises a mobile phone.	*See* above at claim 4. *See also* claim 11 above.

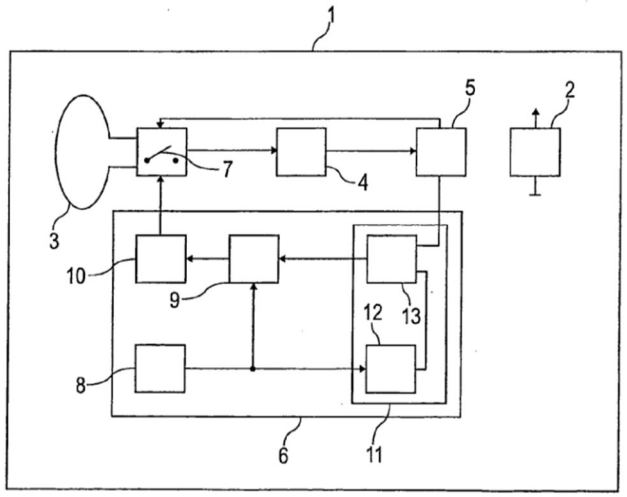
DEFENDANTS' INVALIDITY CONTENTIONS FOR U.S. PAT. 9,483,722

EXHIBIT B01: U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")

As demonstrated in the claim charts below, the claims of U.S. Patent No. 9,483,722 ("the '722 patent") are invalid (a) under one or more sections of 35 U.S.C. § 102 as anticipated by Finkenzeller and (b) under 35 U.S.C. § 103(a) as obvious over Finkenzeller standing alone and as set forth herein, and/or combined with the knowledge of a person of ordinary skill in the art, Applicant's Admitted Prior Art, and/or the additional prior art references discussed in Exhibit B and Exhibits B01–B05, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '722 patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

Defendants have conducted the invalidity analysis herein based at least in part and in some instance entirely upon Plaintiff's apparent application of the claims of the '722 patent. By charting the prior art against the claims and limitations herein, Defendants are not admitting or agreeing to Plaintiff's application of the claims at issue in this case, and these charts should not be interpreted as an admission or concession by Defendants that any particular construction or application of any claim limitation by Plaintiff is correct or proper. Additionally, these charts provide representative examples of portions of the charted references that disclose the indicated limitations of the claims; additional portions of these references other than the representative examples provided herein may also disclose the indicated limitation(s) and Defendants contend that the asserted claims are invalid in light of the charted reference(s) as a whole in its or their entirety. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well.

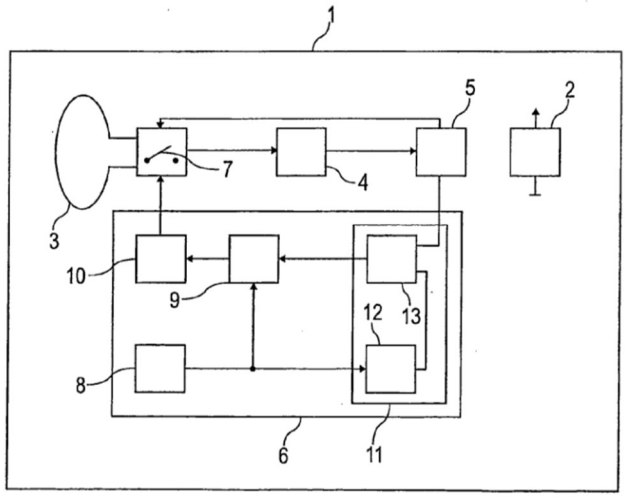
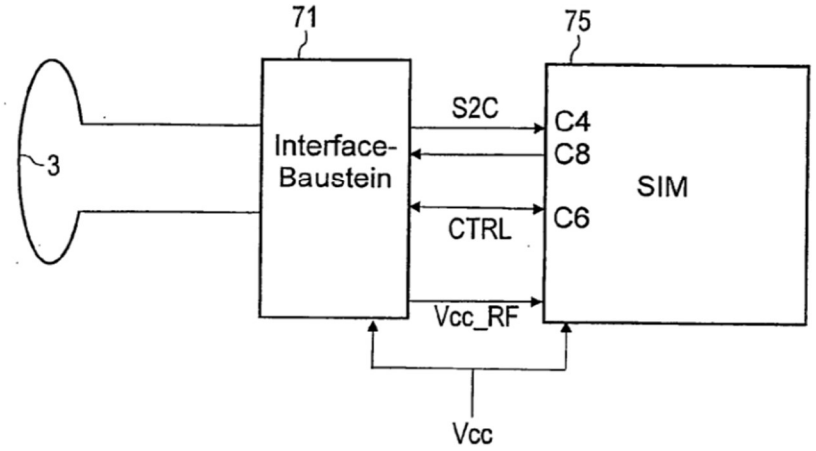
Claim Element	**Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")**
1[pre]. A mobile device comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is a claim limitation. Finkenzeller discloses or renders obvious "[a] mobile device." For example: Finkenzeller at Abstract The invention relates to a transponder unit (1) and to a method for data transfer between the transponder unit and a reading device (100). To increase the range of data transfer from the transponder unit (1) to the reading device (100), the transponder unit (1) has means integrated therein for actively sending a signal to the reading device (100) which can be evaluated by the reading device (100) like a modulation of its own field (110) by a transponder. Finkenzeller at Figure 2

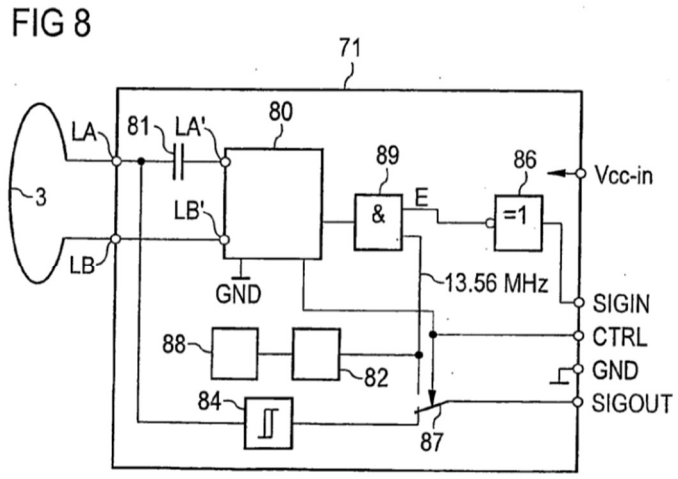
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 2  Finkenzeller at [0006] For simple and fast contactless communication between two devices, the companies Philips and Sony have developed an inductive transmission technology which is known as so-called near field communication (NFC). This technology is integrated for example in mobile telephones or PDAs to permit communication between the devices or with a computer. The coupling of the two devices is effected via coils, the carrier frequency being 13.56 MHz as in RFID systems. As described more closely in the NFC standard ECMA 340, NFC systems have an active communication mode and a passive communication mode. In the active mode, two NFC units alternately generate their own RF field as a signal carrier, thus switching back and forth, coordinated with each other, between transmit mode and receive mode as in a classic mobile phone system. In the passive mode, however, the two NFC units must agree on which unit acts as a reading device and generates a field which the other unit can then influence by means of load modulation. Primarily due to the small antenna diameters used, NFC systems only permit small communication ranges of up to 20 cm. Finkenzeller at [0027]

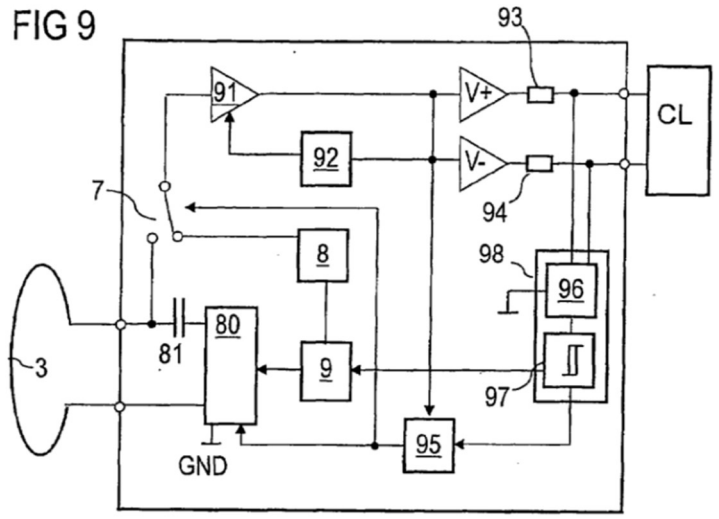
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	The possibility of reading the inventive transponder unit over very large distances is not always desired, for example for privacy protection. It is therefore provided in one embodiment that the inventive circuit configuration can be activated manually if communication over a long range is explicitly desired. Otherwise, communication can be effected via a load modulator provided in the transponder unit, which is usable only for short distances. If no load modulator is provided in the trans-ponder unit, it can be provided for example that the transponder unit is activated for sending data only if the signal emitted by the reading device contains a predetermined code. Finkenzeller at [0028] The transponder unit can also be part of a mobile terminal, for example a mobile telephone. The transponder unit can have its own antenna or use an antenna of the terminal. Finkenzeller at [0032] The transponder unit is preferably integrated in a card or data carrier insertable into the mobile terminal. For example, the transponder unit can be integrated in a SIM card. The advantage is that the mobile terminal, for example a mobile phone or PDA, into which the card with the inventive transponder unit is inserted requires no additional (integrated) antenna to be usable as an RFID unit. Finkenzeller at [0047] Depending on a type of system used, data can be transferred from the trans-ponders 200, 300 to the reading device 100 either by means of load modulation (inductive coupling) or by means of modulated backscatter cross section (electromagnetic backscatter coupling). Embodiments will preferably be described hereinafter for systems that transfer data to the reading device on the principle of load modulation. However, the individual aspects of the embodiments are largely also applicable analogously to systems that work on the principle of modulated backscatter cross sections of the transponder unit. Finkenzeller at [0048] The transponder unit 1 sends for data transfer to the reading device 100 a signal which the reading device 100 can evaluate as a signal of a transponder which carries out a load modulation of the field 110 of the reading device 100. Unlike the conventional transponders 200, 300 which modulate the field 110 of the reading device 100 into a modulated reading device field 102, 103, the transponder unit 1 thus generates and sends its own modulated field 20 as the signal for data transfer. The transponder unit 1 thus uses its own energy for the purpose of data transfer.

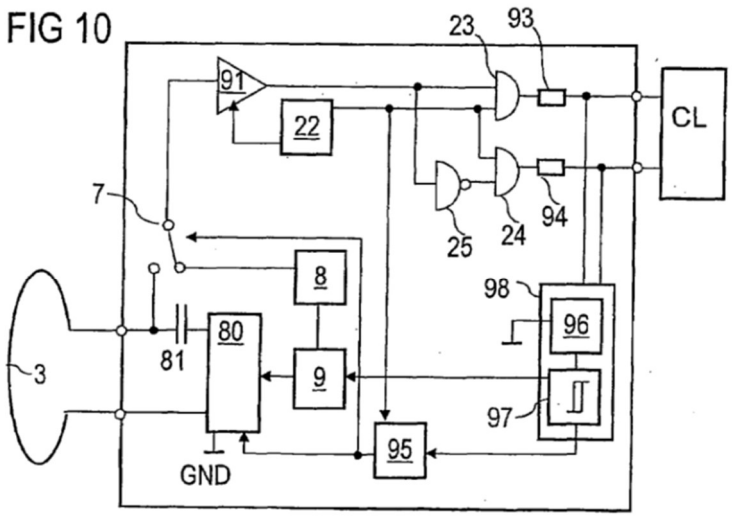
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0054] Further, a mobile terminal comprising an inventive transponder unit could be used as a maintenance or monitoring unit for checking for operability, or remotely maintaining, a multiplicity of RFID reading devices, for example at the cash registers of a supermarket or an access system. Finkenzeller at [0055] FIG. 2 shows purely schematically the transponder unit 1, for example in the form of an inductively coupled chip card, which comprises the usual components not shown explicitly here. For simplification, only one inventive RFID transponder unit in a chip card is shown. The transponder unit has a battery 2, an inductive antenna 3 and an electronic circuit 4, 5, 6, 7. The electronic circuit consists substantially of three functional blocks, a receiver 4, a controller 5 and a transmitter 6. A switch 7 is used for switching the antenna 3 between the receiver 4 and the transmitter 6. Finkenzeller at [0065] The transponder unit 1 is operated in a first (active) operating mode as an actively sending transponder. In a second (passive) operating mode, however, the trans-ponder unit works like an ordinary passive transponder performing a load modulation on the field of the reading device. Finkenzeller at [0124] The interface module adapted to be coupled inductively and a further antenna connected thereto (see reference sign 3 in FIG. 10) can be disposed in a terminal. The range of an ordinary transponder can be increased with the help of such a terminal. The owner of a mobile telephone could for example set up a communication between his transponder and a reading device that is unfavorably disposed or inconvenient to reach for other reasons by holding the transponder against his mobile telephone provided according to the invention with an interface module adapted to be coupled inductively. Finkenzeller at [0129] Thus, an NFC unit could be adapted to behave according to the present solutions in its passive mode in the role ("being card") in which the NFC unit is to perform a load modulation. The NFC unit could for example always act as a component actively emitting its own field. Likewise, the NFC unit could also distinguish, and optionally switch, between a first submode corresponding to a conventional load modulation and an actively sending, second submode in which the load modulation is simulated. A thus improved NFC unit can also communicate with ordinary RFID reading devices over a higher range with

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	the help of the changed passive operating mode. Since NFC units will already have certain units—such as an oscillator, an amplifier and a controller—for independent sending in their conventional active mode, comparatively few modifications of an NFC circuit are required to realize a circuit according to the present application in an NFC unit. Finkenzeller at [0131] The individual functional components of the transponder unit—antenna, interface unit, chip and optionally voltage supply unit—can be disposed in all sorts of combinations separately from each other or integrated jointly in one unit. An inventive transponder unit can be formed for example as a specially designed transponder, in a portable data carrier, in particular a chip card, which optionally has a battery. A portable data carrier, in particular SIM card, with a chip and an interface unit can be connected in a mobile terminal to an external voltage source and/or an external antenna. The interface unit can be disposed in a terminal, connected to its own or an external antenna, and communicate with a chip which is disposed reversibly or firmly in the terminal or temporarily on the terminal. *See also* Finkenzeller at [0010], [0011], [0012], [0020], [0021], [0022], [0024], [0029], [0030], [0040], [0049], [0058], [0060], [0063], [0066], [0081], [0092], [0093], [0106], [0127], and claim 19. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Finkenzeller discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." For example: Finkenzeller at Abstract The invention relates to a transponder unit (1) and to a method for data transfer between the transponder unit and a reading device (100). To increase the range of data transfer from the transponder unit (1) to the reading device (100), the transponder unit (1) has means integrated therein for actively sending a signal to the reading device (100) which can be evaluated by the reading device (100) like a modulation of its own field (110) by a transponder. Finkenzeller at Figure 2

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 2  Finkenzeller at Figure 7 FIG 7 

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at Figure 8  Finkenzeller at Figure 9

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at Figure 10

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at [0006] For simple and fast contactless communication between two devices, the companies Philips and Sony have developed an inductive transmission technology which is known as so-called near field communication (NFC). This technology is integrated for example in mobile telephones or PDAs to permit communication between the devices or with a computer. The coupling of the two devices is effected via coils, the carrier frequency being 13.56 MHz as in RFID systems. As described more closely in the NFC standard ECMA 340, NFC systems have an active communication mode and a passive communication mode. In the active mode, two NFC units alternately generate their own RF field as a signal carrier, thus switching back and forth, coordinated with each other, between transmit mode and receive mode as in a classic mobile phone system. In the passive mode, however, the two NFC units must agree on which unit acts as a reading device and generates a field which the other unit can then influence by means of load modulation. Primarily due to the small antenna diameters used, NFC systems only permit small communication ranges of up to 20 cm. Finkenzeller at [0007]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Even with active transponders there is the problem that data transfer from the transponder to the reading device is limited by the signals becoming weaker with increasing distance between reading device and transponder. As a rule, ranges no longer than 1 to 2 m can therefore be obtained even with an active transponder for example in inductively coupled systems which transfer data to the reading device on the principle of load modulation. For RFID systems working on the principle of backscatter, however, communication ranges of 10 m are typically obtained. Finkenzeller at [0010] According to the invention, a transponder unit sends a signal to a transponder reading device, which can communicate with the transponders by means of modulation of its own field by transponders, in such a way that the reading device can evaluate the signal as modulation by a conventional transponder. Instead of performing a load modulation or backscatter modulation of a field of the reading device, the transponder unit itself thus emits a field that simulates for the reading device a modulation of the reading device field by a transponder. An inventive transponder unit has means for sending the accordingly modulated signal. The total range of the system is consequently no longer limited by the communication range of the reading device, but is extended therebeyond up to a transmit range of the transponder unit. Finkenzeller at [0017] A special advantage of using the described modulators is their compatibility to the prior art, since they deliver an output signal to be sent to the reading device whose (frequency and amplitude) spectrum is very similar to that of a load or backscatter modulation, as described above. Therefore, no technical changes must be performed on conventional reading devices. The inventive transponder can thus be operated with commercially available RFID reading devices, the communication range being many times that of passive or even active transponders. For example, a commercially available ISO 14443 reading device which can communicate with an inductively coupled, contactless chip card according to the prior art over a distance of approx. 10 cm could communicate with an inventive transponder unit over many times this distance. Finkenzeller at [0018] A further advantage is the compatibility with other passive and active transponders, so that both can be located within the response range of the reading device at the same time and can be addressed without mutual interference. Finkenzeller at [0019]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	The inventive transponder unit sends the data only in side bands spaced at the frequency of the (modulated) data signal to the transmitting frequency of the reading device. Finkenzeller at [0020] The electronic circuit of the transponder unit further comprises in the usual way a receiver which is so designed that it can detect signals from a reading device. From said signals the receiver extracts data by means of a demodulation circuit, so that a data stream transferred from the reading device is available at the output of the receiver as a baseband signal (e.g. as an NRZ code, Miller code, etc.). For example, the data can be a simple instruction to activate the controller. However, the data may also contain a more complex instruction to the controller. The demodulated data are supplied to the controller in the electronic circuit. A data signal is thereupon generated in the controller, whereby the data signal can also be based on the extracted data. Finkenzeller at [0021] In a development, the inventive transponder unit has a load modulator according to the prior art, in addition to the above-described circuit having a receiver, a controller, an oscillator and a modulator. Finkenzeller at [0022] The voltage induced on the antenna of the transponder unit can be a problem for the operation of the inventive modulator circuits if the distance between trans-ponder unit and reading device is small and the induced voltage is therefore accordingly great. Therefore, the data to be sent to the reading device which are generated in the controller are supplied alternatively to the load modulator or to the inventive circuit configuration with a modulator. The switchover between the load modulator and the circuit configuration is preferably effected automatically, in dependence on the level of voltage induced on the antenna. The switchover is effected in such a way that the load modulator is used within the normal communication range, and the inventive modulator outside the normal communication range. Finkenzeller at [0025] In particular for communication according to the standard ISO 14443 type A, exact timing is important. With conventional passive transponders, timing is ensured even in the transmit mode (load modulation) by the timing signal (13.56 MHz) continually received from the reading device. However, such a signal is no longer available in the transmit mode of an inventive circuit configuration. In one embodiment of the invention, an oscillator is therefore provided for example in the form of a quartz oscillator.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0026] To avoid a quartz oscillator, which has a large mounting form, an improved embodiment of the invention has the oscillator coupled in phase lock to the signal received from the reading device via a phase locked loop (PLL) circuit when the trans-ponder unit is in the receive mode. In the transmit mode of the transponder unit, that is, during data transfer from the transponder unit to the reading device, the control voltage of the PLL circuit is kept constant so that the frequency of the oscillator is maintained as stable as possible. The PLL can also be referred to as tracking synchronization. The oscillator is so regulated that it follows in phase a reference signal, in the present case the timing signal of the reading device. The regulation circuit continuously compares the phase relationship of the two signals and adjusts that of the oscillator in case of an error signal. A PLL circuit is used primarily for frequency stabilization or synchronization of the oscillator. Additionally, it is possible to also supply the signal generated by the oscillator to the controller and use it as a timing signal relevant for timing. Finkenzeller at [0027] The possibility of reading the inventive transponder unit over very large distances is not always desired, for example for privacy protection. It is therefore provided in one embodiment that the inventive circuit configuration can be activated manually if communication over a long range is explicitly desired. Otherwise, communication can be effected via a load modulator provided in the transponder unit, which is usable only for short distances. If no load modulator is provided in the trans-ponder unit, it can be provided for example that the transponder unit is activated for sending data only if the signal emitted by the reading device contains a predetermined code. Finkenzeller at [0029] According to a first alternative, the circuit configuration for generating and modulating the subcarrier signal is a separate part of the mobile terminal. The trans-ponder unit then has a signal input for receiving the subcarrier signal modulated by means of the data to be sent from the circuit configuration. The signal input is connected via a suitable interface in particular to a chip, for example a smart card chip, which generates and modulates the subcarrier signal. Finkenzeller at [0030] According to a second alternative, the circuit configuration for generating and modulating the subcarrier signal is part of the inventive transponder unit itself. To then connect the transponder unit to a (smart

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	card) chip of the terminal, which supplies data to be sent for example, an interface can be provided via which data are transferred in binary form. Finkenzeller at [0040] FIG. 7 a transponder unit in which a security module is connected to an interface module via an S^2C interface. Finkenzeller at [0047] Depending on a type of system used, data can be transferred from the trans-ponders 200, 300 to the reading device 100 either by means of load modulation (inductive coupling) or by means of modulated backscatter cross section (electromagnetic backscatter coupling). Embodiments will preferably be described hereinafter for systems that transfer data to the reading device on the principle of load modulation. However, the individual aspects of the embodiments are largely also applicable analogously to systems that work on the principle of modulated backscatter cross sections of the transponder unit. Finkenzeller at [0048] The transponder unit 1 sends for data transfer to the reading device 100 a signal which the reading device 100 can evaluate as a signal of a transponder which carries out a load modulation of the field 110 of the reading device 100. Unlike the conventional transponders 200, 300 which modulate the field 110 of the reading device 100 into a modulated reading device field 102, 103, the transponder unit 1 thus generates and sends its own modulated field 20 as the signal for data transfer. The transponder unit 1 thus uses its own energy for the purpose of data transfer. Finkenzeller at [0049] To obtain a better signal-to-noise ratio, in an inductive system with a carrier frequency f_T of the RFID reading device of for example 13.56 MHz a subcarrier f_H with $f_H<f_T$, for example f_H=212 kHz, is used in the known way. The load resistance in the transponder unit is switched on and off at the frequency f_H, so that two subcarrier signals spaced $+/-f_H$ arise in the signal spectrum besides the strong signal of the carrier frequency f_T of the reading device. When the subcarrier is now modulated in the transponder unit 1 according to the data to be transferred, the modulation side bands carrying the information arise in the spectrum below and above the two subcarriers. The data to be transferred are thus contained equally in the side bands of the sub-carriers which are disposed on both sides of the two corresponding spectral lines in each case. Data transfer is effected here by ASK, FSK or PSK modulation of the sub-carrier in time with the data flow. In contrast to load modulation without a subcarrier, by which data are transferred in side

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	bands around the carrier frequency of the reading device, the subcarrier signal can be filtered out and demodulated better in the reading device to thereby retrieve the data. Finkenzeller at [0050] The transponder unit 1 accordingly generates and sends its own field 20 which comprises at least the modulation side bands around the carrier frequency f_T or the modulation side bands around a subcarrier frequency f_H, but as a rule the modulation side bands of both subcarriers together with the two subcarriers. Finkenzeller at [0056] The receiver 4 is provided for demodulating a signal transmitted from the reading device 100 to extract data therefrom. The extracted data are passed on to the controller 5 which processes them and generates data to be sent to the reading device 100. Furthermore, the controller 5 transmits a control signal to the switch 7 which switches between receive mode and transmit mode of the transponder unit. However, a separate antenna can instead be provided for sending. The controller 5 used can be for example a part of the operating system of a portable data carrier, such as a chip card. Finkenzeller at [0057] The transmitter 6 consists of an oscillator 8, a modulator, an execution as a ring modulator 9 first being described, and a terminal repeater 10. Furthermore, the transmitter 6 of the transponder unit shown in FIG. 2 is extended by an electronic assembly 11 for generating and modulating a subcarrier signal to carry out the data transfer from the transponder unit to a reading device 100 with a subcarrier signal. Depending on the use of the transponder unit, the subcarrier signal can have different frequencies, for example 848 kHz according to ISO 14443, 424 kHz according to ISO 15693 and 212 kHz for LEGIC, but might also be completely omitted. Finkenzeller at [0058] In the transponder unit shown in FIG. 2 it is provided that the assembly 11 divides the oscillator frequency by a certain factor by means of a frequency divider 12, for example by binary division. The resulting subcarrier signal is modulated with the data to be sent which are supplied to the assembly 11 by the controller 5. Finkenzeller at [0062] The ring modulator 9 has the feature of carrying out a special form of amplitude modulation. As in usual amplitude modulation, two spectral lines, regarded in the frequency spectrum, are generated spaced at the

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	frequency of the ASK-modulated signal around the frequency of the oscillator signal, the so-called carrier frequency. With amplitude modulation in the ring modulator 9, the carrier frequency of the strong and high-energy oscillator signal is largely suppressed. The data to be sent contained in the ASK-modulated signal are located after the amplitude modulation in the ring modulator 9 in side bands around the two spectral lines of the subcarrier frequency. Such modulation is called double side band (DSB) modulation or double side band suppressed carrier (DSSC) modulation. At the carrier frequency no data are transferred. Instead, the use of the ring modulator 9 which suppresses the carrier frequency achieves the goal of being able to send data to the reading device 100 either at lower transmit power or with a considerably increased range. The increased range is possible primarily when the total transmit power is put into the side bands where the data to be sent are located. The carrier frequency is fundamentally required for demodulation of the signal, for extracting the data transmitted from the transponder unit in the reading device. However, since the carrier frequency is already present in the reading device, it is unnecessary for the transponder signal to contain this frequency itself. Finkenzeller at [0063] At the output of the ring modulator 9 an output signal is then available that contains the two modulation side bands and is identical (exactly enough) to a signal generated by load modulation or backscatter modulation. The output signal generated by the ring modulator 9 can then be optionally amplified by means of the amplifier 10, and be supplied to the antenna 3 for sending the data to be sent, via the switch 7 which is switched to the transmit mode of the transponder unit by a signal of the controller 5. Finkenzeller at [0065] The transponder unit 1 is operated in a first (active) operating mode as an actively sending transponder. In a second (passive) operating mode, however, the trans-ponder unit works like an ordinary passive transponder performing a load modulation on the field of the reading device. Finkenzeller at [0066] For example, the receiver 4 can additionally be formed as a conventional load modulator driven by the controller 5. The controller 5 then either switches the transmitter 6 on and the load modulator off, or the load modulator on and the transmitter 6 off. The switch 7 is switched accordingly. The criterion used for switching from a passive to an active operating state can be for example the received signal strength, the presence and/or sufficiency of an external voltage supply (on an optional connection Vcc not shown), or the sufficiency of an internal voltage supply (state of charge of the battery 2). It is thus for example

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	possible to first operate a transponder unit 1 passively and switch it to an active operating mode if for example the distance from the reading device unintentionally increases. Finkenzeller at [0068] FIG. 3 shows a schematic circuit diagram of a ring modulator 9. As described above, the essential point of using the ring modulator 9 is that it performs an amplitude modulation whereby the modulation side bands of a subcarrier are generated in the usual way but the carrier frequency is very largely suppressed. For example, the inventive transponder unit can use an MC 1496 balanced modulator from the company ON Semiconductor, which is particularly suitable for carrier suppression. The ring modulator can be completely integrated on a transponder chip, so that an inventive transponder chip only needs connections for the antenna 3 and the voltage supply with complete integration of all components. Finkenzeller at [0073] Just as in the structure according to FIG. 2, the binary data signal A is combined with a subcarrier signal B by an AND gate 43. The combined signal is available at a ring modulator 49. The digital ring modulator 49 used can be an XOR element. Departing from the structure of the transmitter in FIG. 2, a carrier signal C is not applied directly to the input of the ring modulator 49. Instead, the carrier signal C is first combined with a data signal A in an AND gate 46. This arrangement obtains better efficiency, as to be described more closely below. The output signal of the ring modulator 49 is amplified in an amplifier 40 before being emitted via the antenna 3 as the field of the transponder unit. The signal types A to C will hereinafter be described more closely by way of example with reference to FIG. 5. Finkenzeller at [0076] The signal D emitted by an antenna 3 to a reading device has a frequency spectrum that is like a frequency spectrum resulting by means of load modulation. The signal D can optionally be amplified by means of an amplifier 40. The amplifier 40 can be for example a push-pull amplifier with digital push-pull output amplifiers. Finkenzeller at [0081] Upon data transfer from a transponder to the reading device an ASK-modulated subcarrier (OOK, on-off keying: HT r>MS) is used according to ISO/IEC 14443-3/type A at the initialization bit rate of 106 kbit/s. When this signal is simulated actively according to the inventive method, the required side bands can be generated most effectively with a ring modulator. The resulting double side band modulation (DSB)

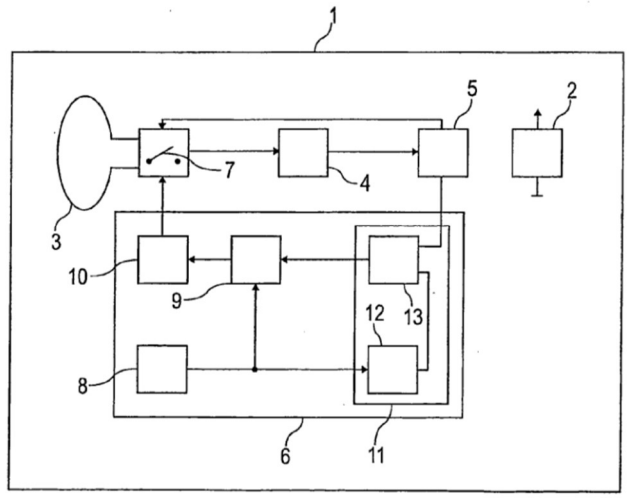
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	should show the best results with regard to communication range, since the carrier frequency (13.56 MHz) is suppressed and the available energy is provided in the side bands. Finkenzeller at [0085] For an external HF interface—for example with the S2C interface described more closely below—an ASK modulator should preferably be used, since the power consumption is the lowest here. If the HF interface is integrated into a smart card chip, or an HF interface providing the signal (TF ∩MS) is used, the optimized ring modulator will preferably be used in case of sufficient energy. If energy is to be saved, however, the ASK modulator can be used here too. Finkenzeller at [0087] In the active simulation of such a signal, a ring modulator provides the best results with regard to communication range here too. The digital ring modulator shows good behavior with regard to carrier suppression. However, the relative current consumption is 100%, since HF energy is radiated for the total duration of a bit. Finkenzeller at [0091] There are smart card chips having a so-called S^2C interface, defined by the company Philips, for connecting the smart card chip to an HF interface of an NFC device. Such smart card chips have hardware means for generating and decoding signals required on an ISO/IEC 14443 interface (Miller code, Manchester code, subcarrier 848 kHz). However, such a chip does not have an HF interface unit of its own. Finkenzeller at [0092] FIG. 7 shows schematically an inventive transponder unit, formed by an interface module 71 connected to an antenna 3, and a chip 75 with a suitable interface, for example an S^2C interface. Such a transponder unit can be formed for example in a mobile telephone with the help of the SIM card as chip 75, which is then preferably connected to the interface module 71 via one or more idle contact surfaces (C6 and/or C4, C8) of the SIM card. Finkenzeller at [0093] Both the interface module 71 and the chip 75 can draw their supply voltage from the device in which they are disposed preferably reversibly. The interface module 71 can act as an ordinary transponder in a second operating mode and supply the chip with an operating voltage Vcc_RF.

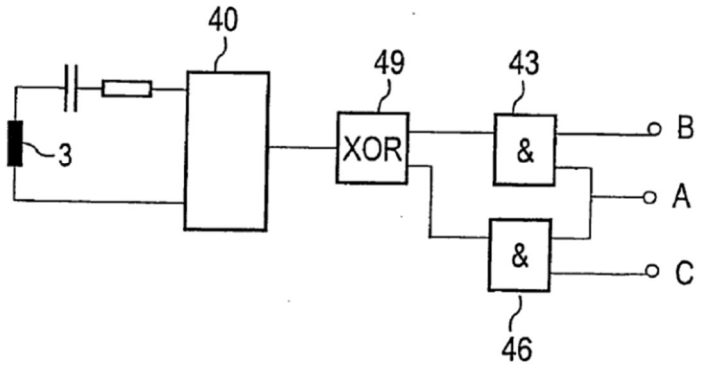
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0094] FIG. 8 shows schematically more exactly the structure of an interface module for a chip with an S^2C interface. Finkenzeller at [0095] The interface module 71 is equipped with a signal input SIGIN and a signal output SIGOUT for passing signals from the antenna to the chip (not shown) and from the chip, which generates the modulated subcarrier signal, to the antenna. A signal at SIGOUT consists of a 13.56 MHz TTL signal which optionally contains a modulation signal of a remote reading device. Finkenzeller at [0098] When the interface module is in the transmit mode, i.e. there is a contactless data transfer to an external reading device or an NFC device, a modulated subcarrier signal is fed in at the signal input SIGIN by the smart card chip and optionally inverted in an inverter 86. The inverted signal E is combined with a 13.56 MHz carrier frequency signal in the AND gate 89 as the carrier frequency modulator, and supplied to the amplifier 80. Finkenzeller at [0100] Further, the smart card chip can be supplied a constant 13.56 MHz timing signal from the oscillator 88 via the output SIGOUT in the transmit mode via the switch 87, if it requires such an (external) timing signal for operation to keep exact timing. As described above, this is necessary for communication according to the standard ISO 14443 type A. Finkenzeller at [0101] In the receive mode, the smart card chip is supplied a digitized received signal tapped from the antenna 1, via the switch 87 and the output SIGOUT. The signal shaper 84 acts here as an amplifier to be able to receive even weak signals, and as a threshold switch to provide a digital output signal at the output of the signal shaper. For example, the threshold switch used can be a Schmitt trigger which outputs a clear high or low level depending on the over- or undershooting of a predetermined threshold value. Finkenzeller at [0103] The oscillator 88 generates the 13.56 MHz carrier frequency signal required in the transmit mode. If the oscillator cannot be switched off in the receive mode since its building-up transient might last too long,

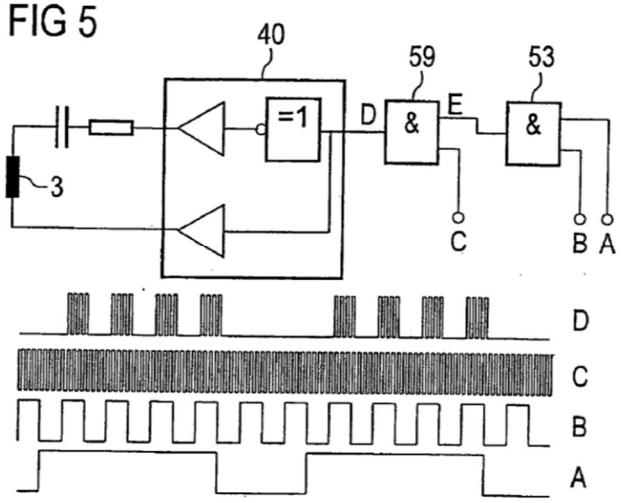
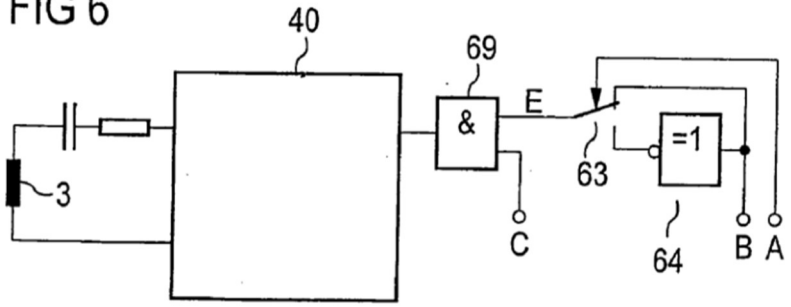
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	the oscillator is operated in the receive mode of the interface module preferably at a multiple N of the carrier frequency signal (e.g. 27.120 MHz) so as not to disturb the possibly weak received signal by crosstalk. In the transmit mode the required 13.56 MHz signal can then be generated by dividing the oscillator signal by N by means of an optional divider 82. Finkenzeller at [0107] The transponder chip CL is a conventional RFID chip according to the prior art. It is normally connected at its connections with an antenna, e.g. in a chip card. Further, the transponder chip CL is so designed that data transfer from the transponder unit to a reading device is carried out by means of load modulation. This is almost always the case in usual RFID systems used at 13.56 MHz or also 125 kHz (e.g. ISO/IEC 14443, ISO/IEC 15693, ISO/IEC 18000-3). Finkenzeller at [0108] The transmit branch consists of a demodulation circuit 97, a modulator circuit 9, an oscillator 8 (e.g. 13.56 MHz), a controller 95, and a transmitter amplifier 80 connected to the antenna 3. The demodulation circuit 98 can consist for example of a rectifier 96 and a threshold switch 97. Finkenzeller at [0112] As soon as the RFID chip CL has received and processed a command, it tries to send a response back to the remote reading device. For this purpose the RFID chip normally uses a load modulation, i.e. an additional parallel resistor in the chip is switched on and off in time with the modulation signal. This leads to measurable fluctuations in the voltage drop across the resistors 93, 94. In other words, the HF alternating voltage at the connections is modulated in amplitude. By the demodulator circuit 98 this amplitude-modulated alternating voltage signal is demodulated and the original modulation signal thus reconstructed again. Finkenzeller at [0114] The modulation signal reconstructed by the demodulation circuit 97 is also supplied to a controller 95. The latter switches the inventive circuit with the first edge of the modulation signal to a transmit mode without delay if possible, so that the data generated by the RFID chip CL can also be transferred to the remote reading device. For this purpose, the switch 7 is first switched from the antenna 3 to the oscillator 8 (13.56 MHz). This is necessary to be able to keep supplying the RFID chip CL with an alternating voltage of the right frequency. At the same time the amplifier 80 is activated by the controller 95.

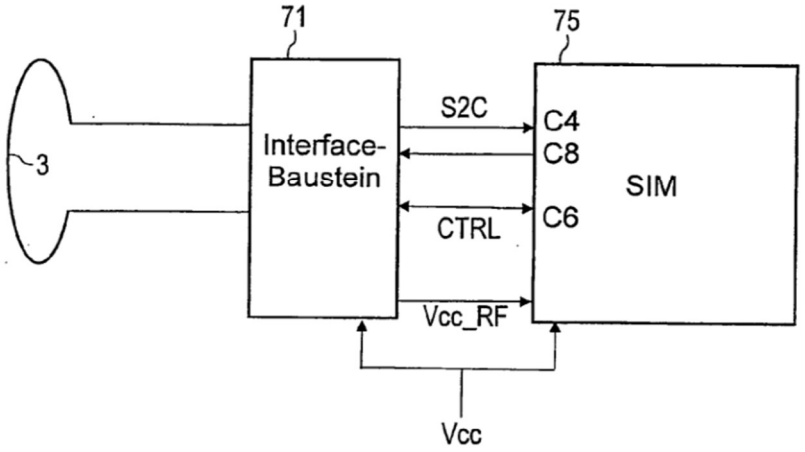
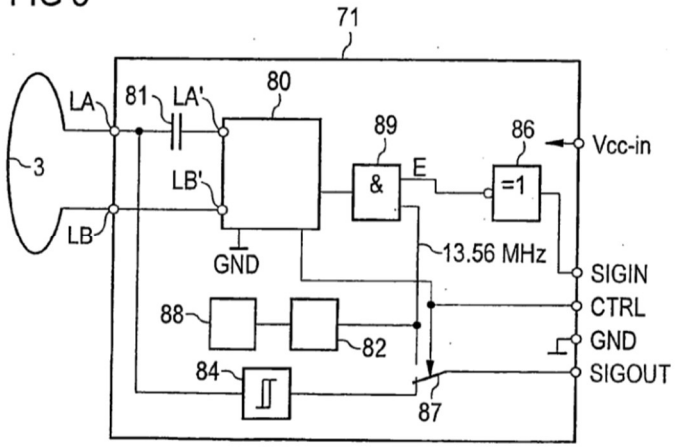
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0115] The reconstructed modulation signal and the signal of the oscillator 8 are supplied to the modulator circuit 9. The exact function of such a circuit has already been described in detail. The output signal of the modulator circuit 9 is supplied to the amplifier 80 and sent via the antenna 3 to the remote reading device. Finkenzeller at [0118] However, a load modulation of the transponder chip CL is recognizable exclusively on the connections, but a modulation signal of the reading device already in the receive branch (91, 92, V+, V−) of the inventive circuit. It is therefore provided to switch the inventive circuit to the transmit mode only when a modulation signal (amplitude modulation) can be detected exclusively on the connections of the RFID chip CL and not in the receive branch, since only in this case is a load modulation involved. This is indicated in FIG. 9 by the signal fed into the controller 95 from the receive branch (91, 92, V+, V−). Finkenzeller at [0119] A second way of distinguishing is to evaluate the modulation depth of the signal on the connections of the RFID chip. By load modulation a modulation depth less than 100% is obtained. In the breadboard setup approx. 25% was determined, other values arise from combining different resistors 93, 94 with different RFID chips CL. It is therefore provided to distinguish between the load modulation and the modulation of the reading device by determining modulation depth with reference to given switching thresholds. If the strength of the modulation signal is above a first, high threshold, a signal from the reading device is present. If the modulation signal is smaller than the first switching threshold and optionally greater than a second switching threshold, however, it is recognized that a load modulation is present. A switch-over to the transmit mode is effected if the modulation was caused by a load modulation. Finkenzeller at [0127] It was ascertained that small antennas, e.g. in a SIM card with its own antenna (approx. 15×25 mm^2), obtain very low read ranges with a conventional load modulation. It is frequently even impossible to communicate with a contactless reading device when the SIM card with an antenna is disposed for example in a mobile telephone. If one of the inventive transmitters is used in a mobile terminal the range is not clearly increased. Moreover, it can be advantageously exploited that mobile terminals such as mobile telephones, PDAs, etc., have their own energy supply (battery) which can also be used for supplying an inventive circuit.

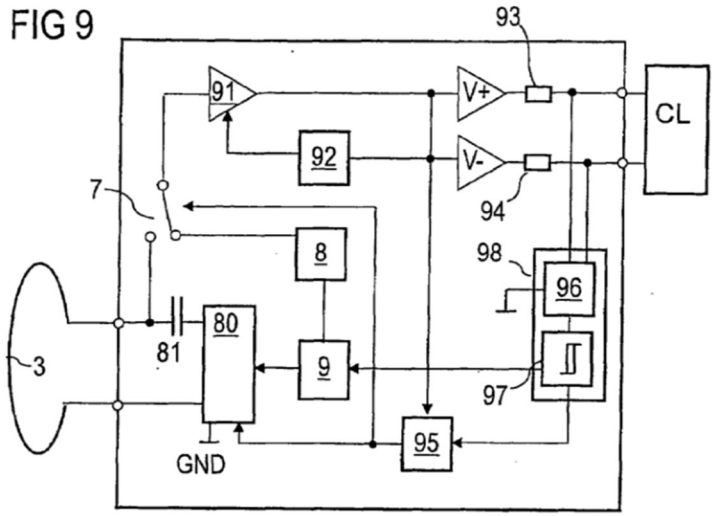
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0129] Thus, an NFC unit could be adapted to behave according to the present solutions in its passive mode in the role ("being card") in which the NFC unit is to perform a load modulation. The NFC unit could for example always act as a component actively emitting its own field. Likewise, the NFC unit could also distinguish, and optionally switch, between a first submode corresponding to a conventional load modulation and an actively sending, second submode in which the load modulation is simulated. A thus improved NFC unit can also communicate with ordinary RFID reading devices over a higher range with the help of the changed passive operating mode. Since NFC units will already have certain units—such as an oscillator, an amplifier and a controller—for independent sending in their conventional active mode, comparatively few modifications of an NFC circuit are required to realize a circuit according to the present application in an NFC unit. Finkenzeller at claim 1 1. A method for transferring data from a transponder unit to a reading device to which data from transponders are transferred by modulation of a field of the reading device, comprising the steps: the transponder unit, in a first operating mode, generates a modulated transponder field and emits the transponder field as a signal which is evaluable for the reading device as a modulation of the reading device field by a transponder, for transferring the data to the reading device. Finkenzeller at claim 16 16. A transponder unit for transferring data to a reading device to which data from transponders are transferred by modulation of a field of the reading device, comprising: means for generating and sending a modulated transponder field as a signal which is evaluable for the reading device as a modulation of the reading device field by a transponder, for transferring the data to the reading device in a first operating mode. Finkenzeller at claim 42 42. An interface unit for signal modulation which is effected for transfer of data to a reading device to which data from transponders can be transferred by modulation of a field of the reading device, comprising means for generating and sending a modulated transponder field as an output signal which is evaluable for the reading device as a modulation of the reading device field by a transponder, for transferring the data to the reading device in a first operating mode of the interface unit.

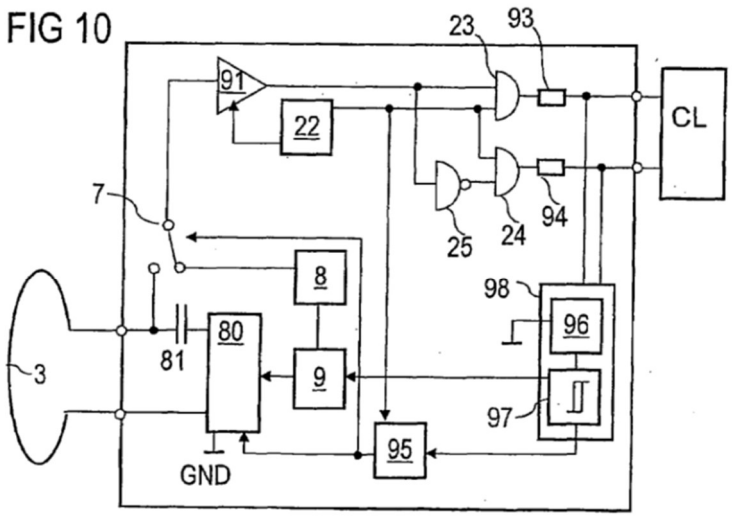
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	See also Finkenzeller at [0011], [0012], [0055], [0110], [0117], [0131], and claim 35. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1b] an antenna tuned to operate at 13.56 MHz; and	Finkenzeller discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." For example: Finkenzeller at Figure 2 FIG 2  Finkenzeller at Figure 4

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 4  Finkenzeller at Figure 5

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 5  Finkenzeller at Figure 6 FIG 6  Finkenzeller at Figure 7

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 7  Finkenzeller at Figure 8 FIG 8 

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at Figure 9  Finkenzeller at Figure 10

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at [0002] Transponders are used for example in radio frequency identification (RFID) systems. Conventionally, both the energy supply to a transponder in an RFID system and the data interchange between the transponder and a reading device are effected using magnetic or electromagnetic fields. RFID transponders have an electronic circuit and, depending on the frequency domain, an antenna coil (e.g. 13.56 MHz) or an electromagnetic antenna (e.g. 868 MHz). Via the antenna the energy required for operating the transponder can be taken from the field of the reading device, as well as the data transfer carried out. Finkenzeller at [0006] For simple and fast contactless communication between two devices, the companies Philips and Sony have developed an inductive transmission technology which is known as so-called near field communication (NFC). This technology is integrated for example in mobile telephones or PDAs to permit communication between the devices or with a computer. The coupling of the two devices is effected via coils, the carrier frequency being 13.56 MHz as in RFID systems. As described more closely in the NFC standard ECMA 340, NFC systems have an active communication mode and a passive communication

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	mode. In the active mode, two NFC units alternately generate their own RF field as a signal carrier, thus switching back and forth, coordinated with each other, between transmit mode and receive mode as in a classic mobile phone system. In the passive mode, however, the two NFC units must agree on which unit acts as a reading device and generates a field which the other unit can then influence by means of load modulation. Primarily due to the small antenna diameters used, NFC systems only permit small communication ranges of up to 20 cm. Finkenzeller at [0011] In an advantageous embodiment, an inventive RFID transponder unit has its own energy supply, at least one antenna for transmitting signals from and/or to a reading device, and an electronic circuit. The electronic circuit of the inventive transponder unit comprises a transmitter consisting of an oscillator and a modulator. Finkenzeller at [0022] The voltage induced on the antenna of the transponder unit can be a problem for the operation of the inventive modulator circuits if the distance between trans-ponder unit and reading device is small and the induced voltage is therefore accordingly great. Therefore, the data to be sent to the reading device which are generated in the controller are supplied alternatively to the load modulator or to the inventive circuit configuration with a modulator. The switchover between the load modulator and the circuit configuration is preferably effected automatically, in dependence on the level of voltage induced on the antenna. The switchover is effected in such a way that the load modulator is used within the normal communication range, and the inventive modulator outside the normal communication range. Finkenzeller at [0025] In particular for communication according to the standard ISO 14443 type A, exact timing is important. With conventional passive transponders, timing is ensured even in the transmit mode (load modulation) by the timing signal (13.56 MHz) continually received from the reading device. However, such a signal is no longer available in the transmit mode of an inventive circuit configuration. In one embodiment of the invention, an oscillator is therefore provided for example in the form of a quartz oscillator. Finkenzeller at [0028] The transponder unit can also be part of a mobile terminal, for example a mobile telephone. The transponder unit can have its own antenna or use an antenna of the terminal.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0055] FIG. 2 shows purely schematically the transponder unit 1, for example in the form of an inductively coupled chip card, which comprises the usual components not shown explicitly here. For simplification, only one inventive RFID transponder unit in a chip card is shown. The transponder unit has a battery 2, an inductive antenna 3 and an electronic circuit 4, 5, 6, 7. The electronic circuit consists substantially of three functional blocks, a receiver 4, a controller 5 and a transmitter 6. A switch 7 is used for switching the antenna 3 between the receiver 4 and the transmitter 6. Finkenzeller at [0056] The receiver 4 is provided for demodulating a signal transmitted from the reading device 100 to extract data therefrom. The extracted data are passed on to the controller 5 which processes them and generates data to be sent to the reading device 100. Furthermore, the controller 5 transmits a control signal to the switch 7 which switches between receive mode and transmit mode of the transponder unit. However, a separate antenna can instead be provided for sending. The controller 5 used can be for example a part of the operating system of a portable data carrier, such as a chip card. Finkenzeller at [0063] At the output of the ring modulator 9 an output signal is then available that contains the two modulation side bands and is identical (exactly enough) to a signal generated by load modulation or backscatter modulation. The output signal generated by the ring modulator 9 can then be optionally amplified by means of the amplifier 10, and be supplied to the antenna 3 for sending the data to be sent, via the switch 7 which is switched to the transmit mode of the transponder unit by a signal of the controller 5. Finkenzeller at [0064] The direct connection of the ring modulator output to the antenna is likewise possible. However, it is then necessary to adapt the antenna accordingly, and take account of a possible reaction of the signal coupled in from the reading device on the ring modulator, since the same antenna is normally used for sending and receiving, and since the reading device sends continually. Finkenzeller at [0069] The input HF of the ring modulator 9 is fed with the high-frequency output signal of the oscillator 8. The frequency of the oscillator signal preferably corresponds exactly to the transmitting frequency of the reading device 100 (e.g. 13.56 MHz). The input NF of the ring modulator 9 is fed with a data signal in the

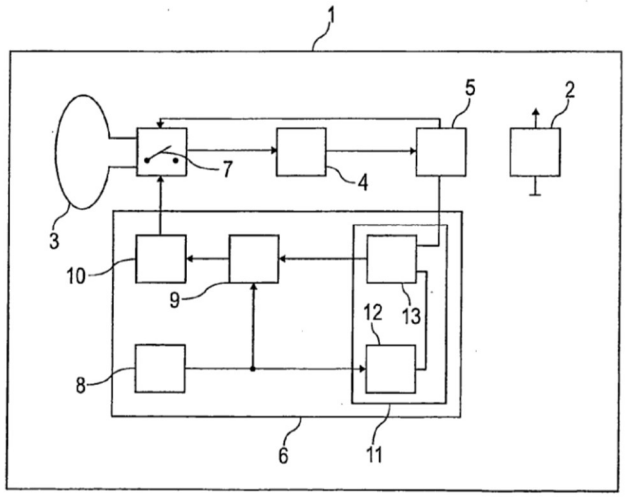
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	baseband (e.g. for Felica system) or with a modulated subcarrier (e.g. for ISO 14443, ISO 15693), as described above. Finkenzeller at [0076] The signal D emitted by an antenna 3 to a reading device has a frequency spectrum that is like a frequency spectrum resulting by means of load modulation. The signal D can optionally be amplified by means of an amplifier 40. The amplifier 40 can be for example a push-pull amplifier with digital push-pull output amplifiers. Finkenzeller at [0078] In the transmitter according to FIG. 5 an amplitude-modulated subcarrier signal is generated, while the transmitter shown in FIG. 6 generates a phase-modulated subcarrier signal. This transmitter, like the transmitter of FIG. 5, is preferably used in an inventive transponder unit only when the data signal A is a binary signal. Correspondingly, the transmitter shown generates a BPSK signal (2-PSK, binary phase shift keying). A subcarrier signal B (e.g. 848 kHz for ISO/IEC 14443) and a carrier signal C (e.g. 13.56 MHz for ISO/IEC 14443) are thereby ANDed by means of the circuit 69. The data signal A in the baseband (e.g. NRZ or Manchester signal) switches the subcarrier signal B between an inverted and a non-inverted state with the help of a switch 63 and an inverter 64. This has an effect corresponding to a phase modulation by 180° (BPSK, binary phase keying). Finkenzeller at [0080] The following table shows a survey of logic operation on signals, electricity consumption and range for different digital modulation circuits (carrier frequency TF=13.56 MHz; subcarrier frequency HT=868 kHz and modulation signal MS in the baseband, Manchester 106 kbit/s). Finkenzeller at [0081] Upon data transfer from a transponder to the reading device an ASK-modulated subcarrier (OOK, on-off keying: HT r>MS) is used according to ISO/IEC 14443-3/type A at the initialization bit rate of 106 kbit/s. When this signal is simulated actively according to the inventive method, the required side bands can be generated most effectively with a ring modulator. The resulting double side band modulation (DSB) should show the best results with regard to communication range, since the carrier frequency (13.56 MHz) is suppressed and the available energy is provided in the side bands. Finkenzeller at [0095]

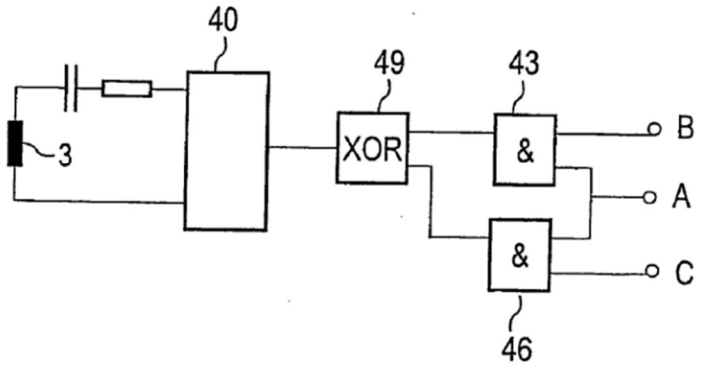
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	The interface module 71 is equipped with a signal input SIGIN and a signal output SIGOUT for passing signals from the antenna to the chip (not shown) and from the chip, which generates the modulated subcarrier signal, to the antenna. A signal at SIGOUT consists of a 13.56 MHz TTL signal which optionally contains a modulation signal of a remote reading device. Finkenzeller at [0098] When the interface module is in the transmit mode, i.e. there is a contactless data transfer to an external reading device or an NFC device, a modulated subcarrier signal is fed in at the signal input SIGIN by the smart card chip and optionally inverted in an inverter 86. The inverted signal E is combined with a 13.56 MHz carrier frequency signal in the AND gate 89 as the carrier frequency modulator, and supplied to the amplifier 80. Finkenzeller at [0100] Further, the smart card chip can be supplied a constant 13.56 MHz timing signal from the oscillator 88 via the output SIGOUT in the transmit mode via the switch 87, if it requires such an (external) timing signal for operation to keep exact timing. As described above, this is necessary for communication according to the standard ISO 14443 type A. Finkenzeller at [0101] In the receive mode, the smart card chip is supplied a digitized received signal tapped from the antenna 1, via the switch 87 and the output SIGOUT. The signal shaper 84 acts here as an amplifier to be able to receive even weak signals, and as a threshold switch to provide a digital output signal at the output of the signal shaper. For example, the threshold switch used can be a Schmitt trigger which outputs a clear high or low level depending on the over- or undershooting of a predetermined threshold value. Finkenzeller at [0102] Via the control input of the push-pull amplifier 80 the push-pull outputs of the output drivers (see amplifier units in FIG. 5) are switched to GND, so that the antenna 3 and the capacitor 41 result in a parallel-resonant circuit. To save energy, the amplifier 80 can be switched to a power save mode in the receive mode of the interface module. Finkenzeller at [0103] The oscillator 88 generates the 13.56 MHz carrier frequency signal required in the transmit mode. If the oscillator cannot be switched off in the receive mode since its building-up transient might last too long,

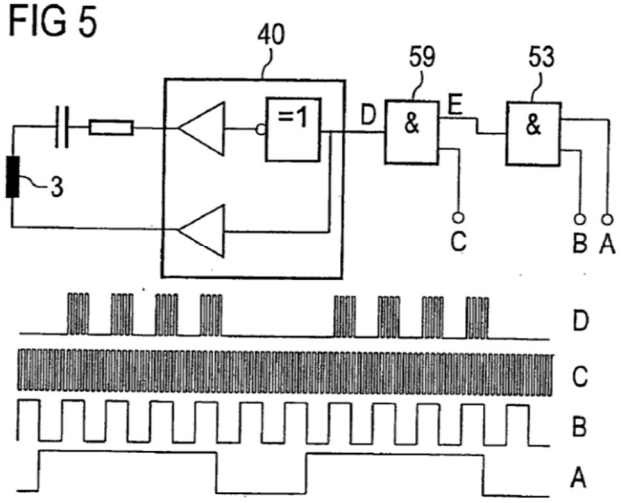
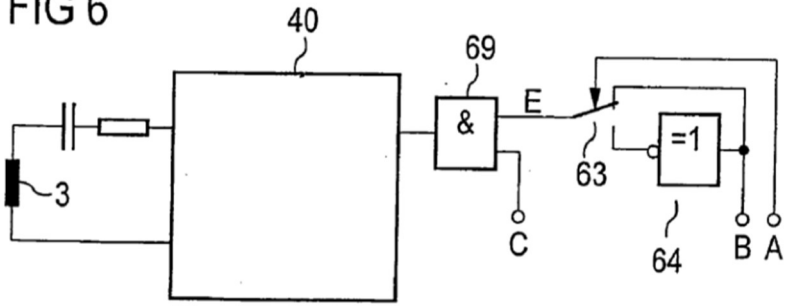
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	the oscillator is operated in the receive mode of the interface module preferably at a multiple N of the carrier frequency signal (e.g. 27.120 MHz) so as not to disturb the possibly weak received signal by crosstalk. In the transmit mode the required 13.56 MHz signal can then be generated by dividing the oscillator signal by N by means of an optional divider 82. Finkenzeller at [0106] The inventive active transponder unit has a receive branch and a transmit branch. The receive branch consists of an antenna 3, an input amplifier 91, an automatic gain control 92 and an amplifier which is preferably designed as a push-pull amplifier (V+, V−). Further, a transponder chip CL is connected via its antenna connections to the push-pull amplifier. Finkenzeller at [0107] The transponder chip CL is a conventional RFID chip according to the prior art. It is normally connected at its connections with an antenna, e.g. in a chip card. Further, the transponder chip CL is so designed that data transfer from the transponder unit to a reading device is carried out by means of load modulation. This is almost always the case in usual RFID systems used at 13.56 MHz or also 125 kHz (e.g. ISO/IEC 14443, ISO/IEC 15693, ISO/IEC 18000-3). Finkenzeller at [0108] The transmit branch consists of a demodulation circuit 97, a modulator circuit 9, an oscillator 8 (e.g. 13.56 MHz), a controller 95, and a transmitter amplifier 80 connected to the antenna 3. The demodulation circuit 98 can consist for example of a rectifier 96 and a threshold switch 97. Finkenzeller at [0109] In the receive mode a voltage is induced in the antenna 3 by the magnetic field of a remote RFID reading device. Together with the capacitor 81 the antenna 3 forms a parallel-resonant circuit whose resonant frequency corresponds approximately to the transmitting frequency of the RFID reading device. The voltage thus available on the resonant circuit is supplied to the input amplifier 91 via the switch 7. Via a gain control 92 the gain factor of the input amplifier 91 is now so adjusted that the output amplitude of the voltage amplified by the input amplifier 91 remains largely constant. The time constant of the control is preferably so adjusted here that the output voltage of the amplifier 91 remains constant in case of varying distance from the reading device (i.e. different levels of induced voltage in the coil 3), but modulation signals (e.g. 10% ASK with 106 kbit/s) are not suppressed by excessively fast control.

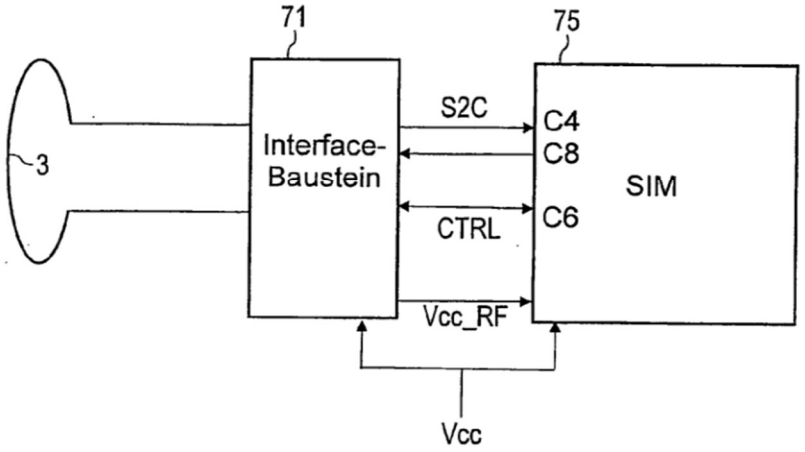
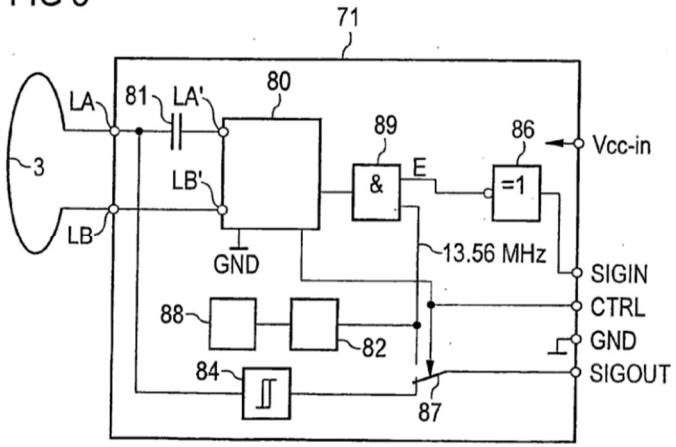
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0114] The modulation signal reconstructed by the demodulation circuit 97 is also supplied to a controller 95. The latter switches the inventive circuit with the first edge of the modulation signal to a transmit mode without delay if possible, so that the data generated by the RFID chip CL can also be transferred to the remote reading device. For this purpose, the switch 7 is first switched from the antenna 3 to the oscillator 8 (13.56 MHz). This is necessary to be able to keep supplying the RFID chip CL with an alternating voltage of the right frequency. At the same time the amplifier 80 is activated by the controller 95. Finkenzeller at [0123] For an inductive coupling, the circuit has an additional antenna 29 which can be made to resonate with the working frequency (e.g. 13.56 MHz) by means of a capacitor 26. A transponder comprising a transponder chip CL and an antenna 28 is positioned in immediate proximity to the antenna 29, so as to obtain the best possible magnetic coupling between the antennas 28 and 29. A load modulation of the transponder chip CL can also be detected easily with this arrangement. Finkenzeller at [0124] The interface module adapted to be coupled inductively and a further antenna connected thereto (see reference sign 3 in FIG. 10) can be disposed in a terminal. The range of an ordinary transponder can be increased with the help of such a terminal. The owner of a mobile telephone could for example set up a communication between his transponder and a reading device that is unfavorably disposed or inconvenient to reach for other reasons by holding the transponder against his mobile telephone provided according to the invention with an interface module adapted to be coupled inductively. Finkenzeller at [0127] It was ascertained that small antennas, e.g. in a SIM card with its own antenna (approx. 15×25 mm^2), obtain very low read ranges with a conventional load modulation. It is frequently even impossible to communicate with a contactless reading device when the SIM card with an antenna is disposed for example in a mobile telephone. If one of the inventive transmitters is used in a mobile terminal the range is not clearly increased. Moreover, it can be advantageously exploited that mobile terminals such as mobile telephones, PDAs, etc., have their own energy supply (battery) which can also be used for supplying an inventive circuit. Finkenzeller at [0131]

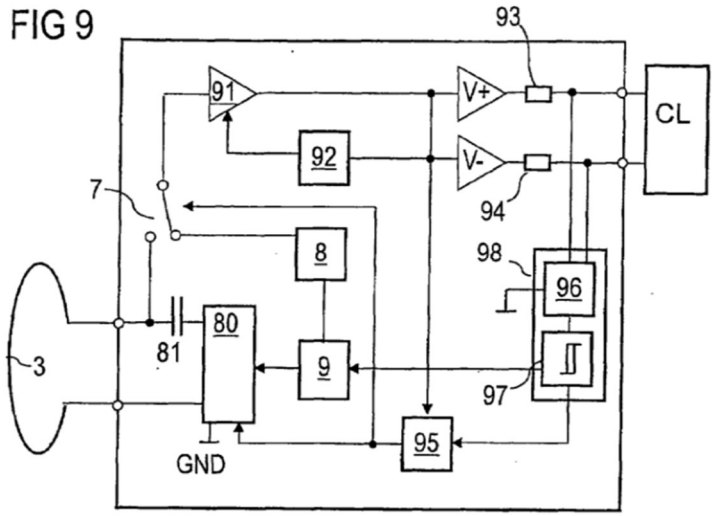
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	The individual functional components of the transponder unit—antenna, interface unit, chip and optionally voltage supply unit—can be disposed in all sorts of combinations separately from each other or integrated jointly in one unit. An inventive transponder unit can be formed for example as a specially designed transponder, in a portable data carrier, in particular a chip card, which optionally has a battery. A portable data carrier, in particular SIM card, with a chip and an interface unit can be connected in a mobile terminal to an external voltage source and/or an external antenna. The interface unit can be disposed in a terminal, connected to its own or an external antenna, and communicate with a chip which is disposed reversibly or firmly in the terminal or temporarily on the terminal. *See also* Finkenzeller at [0007], [0015], [0021], [0024], [0049], [0073], [0075], [0092], [0096], [0099], [0115], [0126], [0129], and claim 19. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1c] at least one active circuit coupled between the smartcard controller and the antenna, wherein the at least one active circuit includes an amplifier coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller, and the at least one active circuit further includes a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna.	Finkenzeller discloses or renders obvious "at least one active circuit coupled between the smartcard controller and the antenna, wherein the at least one active circuit includes an amplifier coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller, and the at least one active circuit further includes a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna." For example: Finkenzeller at Abstract The invention relates to a transponder unit (1) and to a method for data transfer between the transponder unit and a reading device (100). To increase the range of data transfer from the transponder unit (1) to the reading device (100), the transponder unit (1) has means integrated therein for actively sending a signal to the reading device (100) which can be evaluated by the reading device (100) like a modulation of its own field (110) by a transponder. Finkenzeller at Figure 2

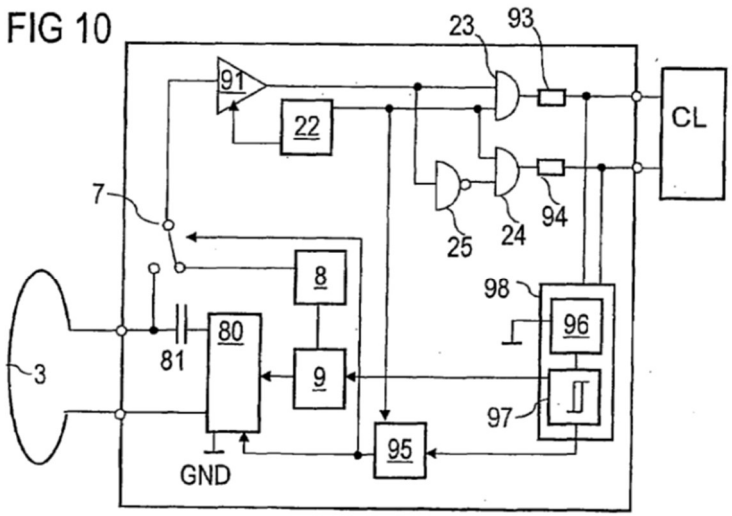
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 2  Finkenzeller at Figure 4

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 4  Finkenzeller at Figure 5

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 5  Finkenzeller at Figure 6 FIG 6  Finkenzeller at Figure 7

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 7  Finkenzeller at Figure 8 FIG 8 

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at Figure 9  Finkenzeller at Figure 10

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at [0002] Transponders are used for example in radio frequency identification (RFID) systems. Conventionally, both the energy supply to a transponder in an RFID system and the data interchange between the transponder and a reading device are effected using magnetic or electromagnetic fields. RFID transponders have an electronic circuit and, depending on the frequency domain, an antenna coil (e.g. 13.56 MHz) or an electromagnetic antenna (e.g. 868 MHz). Via the antenna the energy required for operating the transponder can be taken from the field of the reading device, as well as the data transfer carried out. Finkenzeller at [0004] The range within which communication is possible in the system by data transfer can be increased by using active transponders, that is, transponders with their own energy supply. The energy supply of the active transponder, for example in form of a battery, operates its electronic circuit. Conventional transponders without their own energy supply are referred to as passive transponders, in contrast. Finkenzeller at [0010]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	According to the invention, a transponder unit sends a signal to a transponder reading device, which can communicate with the transponders by means of modulation of its own field by transponders, in such a way that the reading device can evaluate the signal as modulation by a conventional transponder. Instead of performing a load modulation or backscatter modulation of a field of the reading device, the transponder unit itself thus emits a field that simulates for the reading device a modulation of the reading device field by a transponder. An inventive transponder unit has means for sending the accordingly modulated signal. The total range of the system is consequently no longer limited by the communication range of the reading device, but is extended therebeyond up to a transmit range of the transponder unit. Finkenzeller at [0011] In an advantageous embodiment, an inventive RFID transponder unit has its own energy supply, at least one antenna for transmitting signals from and/or to a reading device, and an electronic circuit. The electronic circuit of the inventive transponder unit comprises a transmitter consisting of an oscillator and a modulator. Finkenzeller at [0015] Both modulators (ring modulator and ASK modulator) modulate the oscillator signal by means of the (modulated) data signal and deliver an output signal which is then transmitted to the reading device via the receive antenna or a separate transmitting antenna. Finkenzeller at [0017] A special advantage of using the described modulators is their compatibility to the prior art, since they deliver an output signal to be sent to the reading device whose (frequency and amplitude) spectrum is very similar to that of a load or backscatter modulation, as described above. Therefore, no technical changes must be performed on conventional reading devices. The inventive transponder can thus be operated with commercially available RFID reading devices, the communication range being many times that of passive or even active transponders. For example, a commercially available ISO 14443 reading device which can communicate with an inductively coupled, contactless chip card according to the prior art over a distance of approx. 10 cm could communicate with an inventive transponder unit over many times this distance. Finkenzeller at [0018] A further advantage is the compatibility with other passive and active transponders, so that both can be located within the response range of the reading device at the same time and can be addressed without mutual interference.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0019] The inventive transponder unit sends the data only in side bands spaced at the frequency of the (modulated) data signal to the transmitting frequency of the reading device. Finkenzeller at [0021] In a development, the inventive transponder unit has a load modulator according to the prior art, in addition to the above-described circuit having a receiver, a controller, an oscillator and a modulator. Finkenzeller at [0022] The voltage induced on the antenna of the transponder unit can be a problem for the operation of the inventive modulator circuits if the distance between trans-ponder unit and reading device is small and the induced voltage is therefore accordingly great. Therefore, the data to be sent to the reading device which are generated in the controller are supplied alternatively to the load modulator or to the inventive circuit configuration with a modulator. The switchover between the load modulator and the circuit configuration is preferably effected automatically, in dependence on the level of voltage induced on the antenna. The switchover is effected in such a way that the load modulator is used within the normal communication range, and the inventive modulator outside the normal communication range. Finkenzeller at [0027] The possibility of reading the inventive transponder unit over very large distances is not always desired, for example for privacy protection. It is therefore provided in one embodiment that the inventive circuit configuration can be activated manually if communication over a long range is explicitly desired. Otherwise, communication can be effected via a load modulator provided in the transponder unit, which is usable only for short distances. If no load modulator is provided in the trans-ponder unit, it can be provided for example that the transponder unit is activated for sending data only if the signal emitted by the reading device contains a predetermined code. Finkenzeller at [0028] The transponder unit can also be part of a mobile terminal, for example a mobile telephone. The transponder unit can have its own antenna or use an antenna of the terminal. Finkenzeller at [0048]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	The transponder unit 1 sends for data transfer to the reading device 100 a signal which the reading device 100 can evaluate as a signal of a transponder which carries out a load modulation of the field 110 of the reading device 100. Unlike the conventional transponders 200, 300 which modulate the field 110 of the reading device 100 into a modulated reading device field 102, 103, the transponder unit 1 thus generates and sends its own modulated field 20 as the signal for data transfer. The transponder unit 1 thus uses its own energy for the purpose of data transfer. Finkenzeller at [0049] To obtain a better signal-to-noise ratio, in an inductive system with a carrier frequency f_T of the RFID reading device of for example 13.56 MHz a subcarrier f_H with $f_H<f_T$, for example f_H=212 kHz, is used in the known way. The load resistance in the transponder unit is switched on and off at the frequency f_H, so that two subcarrier signals spaced $+/-f_H$ arise in the signal spectrum besides the strong signal of the carrier frequency f_T of the reading device. When the subcarrier is now modulated in the transponder unit 1 according to the data to be transferred, the modulation side bands carrying the information arise in the spectrum below and above the two subcarriers. The data to be transferred are thus contained equally in the side bands of the sub-carriers which are disposed on both sides of the two corresponding spectral lines in each case. Data transfer is effected here by ASK, FSK or PSK modulation of the sub-carrier in time with the data flow. In contrast to load modulation without a subcarrier, by which data are transferred in side bands around the carrier frequency of the reading device, the subcarrier signal can be filtered out and demodulated better in the reading device to thereby retrieve the data. Finkenzeller at [0050] The transponder unit 1 accordingly generates and sends its own field 20 which comprises at least the modulation side bands around the carrier frequency f_T or the modulation side bands around a subcarrier frequency f_H, but as a rule the modulation side bands of both subcarriers together with the two subcarriers. Finkenzeller at [0055] FIG. 2 shows purely schematically the transponder unit 1, for example in the form of an inductively coupled chip card, which comprises the usual components not shown explicitly here. For simplification, only one inventive RFID transponder unit in a chip card is shown. The transponder unit has a battery 2, an inductive antenna 3 and an electronic circuit 4, 5, 6, 7. The electronic circuit consists substantially of three functional blocks, a receiver 4, a controller 5 and a transmitter 6. A switch 7 is used for switching the antenna 3 between the receiver 4 and the transmitter 6.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0056] The receiver 4 is provided for demodulating a signal transmitted from the reading device 100 to extract data therefrom. The extracted data are passed on to the controller 5 which processes them and generates data to be sent to the reading device 100. Furthermore, the controller 5 transmits a control signal to the switch 7 which switches between receive mode and transmit mode of the transponder unit. However, a separate antenna can instead be provided for sending. The controller 5 used can be for example a part of the operating system of a portable data carrier, such as a chip card. Finkenzeller at [0057] The transmitter 6 consists of an oscillator 8, a modulator, an execution as a ring modulator 9 first being described, and a terminal repeater 10. Furthermore, the transmitter 6 of the transponder unit shown in FIG. 2 is extended by an electronic assembly 11 for generating and modulating a subcarrier signal to carry out the data transfer from the transponder unit to a reading device 100 with a subcarrier signal. Depending on the use of the transponder unit, the subcarrier signal can have different frequencies, for example 848 kHz according to ISO 14443, 424 kHz according to ISO 15693 and 212 kHz for LEGIC, but might also be completely omitted. Finkenzeller at [0060] To supply the active components of the transponder unit at least partly with energy and to increase the energy range between the transponder unit 1 and the reading device 100, the inventive transponder unit has a battery 2. Finkenzeller at [0062] The ring modulator 9 has the feature of carrying out a special form of amplitude modulation. As in usual amplitude modulation, two spectral lines, regarded in the frequency spectrum, are generated spaced at the frequency of the ASK-modulated signal around the frequency of the oscillator signal, the so-called carrier frequency. With amplitude modulation in the ring modulator 9, the carrier frequency of the strong and high-energy oscillator signal is largely suppressed. The data to be sent contained in the ASK-modulated signal are located after the amplitude modulation in the ring modulator 9 in side bands around the two spectral lines of the subcarrier frequency. Such modulation is called double side band (DSB) modulation or double side band suppressed carrier (DSSC) modulation. At the carrier frequency no data are transferred. Instead, the use of the ring modulator 9 which suppresses the carrier frequency achieves the goal of being able to send data to the reading device 100 either at lower transmit power or with a

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	considerably increased range. The increased range is possible primarily when the total transmit power is put into the side bands where the data to be sent are located. The carrier frequency is fundamentally required for demodulation of the signal, for extracting the data transmitted from the transponder unit in the reading device. However, since the carrier frequency is already present in the reading device, it is unnecessary for the transponder signal to contain this frequency itself. Finkenzeller at [0063] At the output of the ring modulator 9 an output signal is then available that contains the two modulation side bands and is identical (exactly enough) to a signal generated by load modulation or backscatter modulation. The output signal generated by the ring modulator 9 can then be optionally amplified by means of the amplifier 10, and be supplied to the antenna 3 for sending the data to be sent, via the switch 7 which is switched to the transmit mode of the transponder unit by a signal of the controller 5. Finkenzeller at [0064] The direct connection of the ring modulator output to the antenna is likewise possible. However, it is then necessary to adapt the antenna accordingly, and take account of a possible reaction of the signal coupled in from the reading device on the ring modulator, since the same antenna is normally used for sending and receiving, and since the reading device sends continually. Finkenzeller at [0065] The transponder unit 1 is operated in a first (active) operating mode as an actively sending transponder. In a second (passive) operating mode, however, the trans-ponder unit works like an ordinary passive transponder performing a load modulation on the field of the reading device. Finkenzeller at [0066] For example, the receiver 4 can additionally be formed as a conventional load modulator driven by the controller 5. The controller 5 then either switches the transmitter 6 on and the load modulator off, or the load modulator on and the transmitter 6 off. The switch 7 is switched accordingly. The criterion used for switching from a passive to an active operating state can be for example the received signal strength, the presence and/or sufficiency of an external voltage supply (on an optional connection Vcc not shown), or the sufficiency of an internal voltage supply (state of charge of the battery 2). It is thus for example possible to first operate a transponder unit 1 passively and switch it to an active operating mode if for example the distance from the reading device unintentionally increases.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0068] FIG. 3 shows a schematic circuit diagram of a ring modulator 9. As described above, the essential point of using the ring modulator 9 is that it performs an amplitude modulation whereby the modulation side bands of a subcarrier are generated in the usual way but the carrier frequency is very largely suppressed. For example, the inventive transponder unit can use an MC 1496 balanced modulator from the company ON Semiconductor, which is particularly suitable for carrier suppression. The ring modulator can be completely integrated on a transponder chip, so that an inventive transponder chip only needs connections for the antenna 3 and the voltage supply with complete integration of all components. Finkenzeller at [0073] Just as in the structure according to FIG. 2, the binary data signal A is combined with a subcarrier signal B by an AND gate 43. The combined signal is available at a ring modulator 49. The digital ring modulator 49 used can be an XOR element. Departing from the structure of the transmitter in FIG. 2, a carrier signal C is not applied directly to the input of the ring modulator 49. Instead, the carrier signal C is first combined with a data signal A in an AND gate 46. This arrangement obtains better efficiency, as to be described more closely below. The output signal of the ring modulator 49 is amplified in an amplifier 40 before being emitted via the antenna 3 as the field of the transponder unit. The signal types A to C will hereinafter be described more closely by way of example with reference to FIG. 5. Finkenzeller at [0076] The signal D emitted by an antenna 3 to a reading device has a frequency spectrum that is like a frequency spectrum resulting by means of load modulation. The signal D can optionally be amplified by means of an amplifier 40. The amplifier 40 can be for example a push-pull amplifier with digital push-pull output amplifiers. Finkenzeller at [0081] Upon data transfer from a transponder to the reading device an ASK-modulated subcarrier (OOK, on-off keying: HT r>MS) is used according to ISO/IEC 14443-3/type A at the initialization bit rate of 106 kbit/s. When this signal is simulated actively according to the inventive method, the required side bands can be generated most effectively with a ring modulator. The resulting double side band modulation (DSB) should show the best results with regard to communication range, since the carrier frequency (13.56 MHz) is suppressed and the available energy is provided in the side bands.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0087] In the active simulation of such a signal, a ring modulator provides the best results with regard to communication range here too. The digital ring modulator shows good behavior with regard to carrier suppression. However, the relative current consumption is 100%, since HF energy is radiated for the total duration of a bit. Finkenzeller at [0093] Both the interface module 71 and the chip 75 can draw their supply voltage from the device in which they are disposed preferably reversibly. The interface module 71 can act as an ordinary transponder in a second operating mode and supply the chip with an operating voltage Vcc_RF. Finkenzeller at [0095] The interface module 71 is equipped with a signal input SIGIN and a signal output SIGOUT for passing signals from the antenna to the chip (not shown) and from the chip, which generates the modulated subcarrier signal, to the antenna. A signal at SIGOUT consists of a 13.56 MHz TTL signal which optionally contains a modulation signal of a remote reading device. Finkenzeller at [0096] The interface module 71 comprises an amplifier 80, an AND gate 89, an oscillator 88, a frequency divider 82, a signal shaper 84 and a switch 87. The amplifier 80 can be for example a push-pull amplifier with (digital) push-pull output amplifiers (not shown). The interface module also has two antenna connections LA and LB and a series capacitor 81. Furthermore, the interface module 71 has connections Vcc-in and GND for energy supply and a control input CTRL for switching between a transmit mode and a receive mode of the interface module by means of the switch 87. Finkenzeller at [0098] When the interface module is in the transmit mode, i.e. there is a contactless data transfer to an external reading device or an NFC device, a modulated subcarrier signal is fed in at the signal input SIGIN by the smart card chip and optionally inverted in an inverter 86. The inverted signal E is combined with a 13.56 MHz carrier frequency signal in the AND gate 89 as the carrier frequency modulator, and supplied to the amplifier 80. Finkenzeller at [0099]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	The antenna 3 and the series capacitor 81 form a series-resonant circuit which is connected to the outputs LA′ and LB′ of the amplifier 80, so that the HF current flowing in case of resonance is limited in the antenna resonant circuit only by the ohmic resistances in the lines and in the amplifier 80. This obtains a greatest possible transmit power of the interface module. Finkenzeller at [0100] Further, the smart card chip can be supplied a constant 13.56 MHz timing signal from the oscillator 88 via the output SIGOUT in the transmit mode via the switch 87, if it requires such an (external) timing signal for operation to keep exact timing. As described above, this is necessary for communication according to the standard ISO 14443 type A. Finkenzeller at [0101] In the receive mode, the smart card chip is supplied a digitized received signal tapped from the antenna 1, via the switch 87 and the output SIGOUT. The signal shaper 84 acts here as an amplifier to be able to receive even weak signals, and as a threshold switch to provide a digital output signal at the output of the signal shaper. For example, the threshold switch used can be a Schmitt trigger which outputs a clear high or low level depending on the over- or undershooting of a predetermined threshold value. Finkenzeller at [0102] Via the control input of the push-pull amplifier 80 the push-pull outputs of the output drivers (see amplifier units in FIG. 5) are switched to GND, so that the antenna 3 and the capacitor 41 result in a parallel-resonant circuit. To save energy, the amplifier 80 can be switched to a power save mode in the receive mode of the interface module. Finkenzeller at [0103] The oscillator 88 generates the 13.56 MHz carrier frequency signal required in the transmit mode. If the oscillator cannot be switched off in the receive mode since its building-up transient might last too long, the oscillator is operated in the receive mode of the interface module preferably at a multiple N of the carrier frequency signal (e.g. 27.120 MHz) so as not to disturb the possibly weak received signal by crosstalk. In the transmit mode the required 13.56 MHz signal can then be generated by dividing the oscillator signal by N by means of an optional divider 82. Finkenzeller at [0106]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	The inventive active transponder unit has a receive branch and a transmit branch. The receive branch consists of an antenna 3, an input amplifier 91, an automatic gain control 92 and an amplifier which is preferably designed as a push-pull amplifier (V+, V−). Further, a transponder chip CL is connected via its antenna connections to the push-pull amplifier. Finkenzeller at [0107] The transponder chip CL is a conventional RFID chip according to the prior art. It is normally connected at its connections with an antenna, e.g. in a chip card. Further, the transponder chip CL is so designed that data transfer from the transponder unit to a reading device is carried out by means of load modulation. This is almost always the case in usual RFID systems used at 13.56 MHz or also 125 kHz (e.g. ISO/IEC 14443, ISO/IEC 15693, ISO/IEC 18000-3). Finkenzeller at [0108] The transmit branch consists of a demodulation circuit 97, a modulator circuit 9, an oscillator 8 (e.g. 13.56 MHz), a controller 95, and a transmitter amplifier 80 connected to the antenna 3. The demodulation circuit 98 can consist for example of a rectifier 96 and a threshold switch 97. Finkenzeller at [0109] In the receive mode a voltage is induced in the antenna 3 by the magnetic field of a remote RFID reading device. Together with the capacitor 81 the antenna 3 forms a parallel-resonant circuit whose resonant frequency corresponds approximately to the transmitting frequency of the RFID reading device. The voltage thus available on the resonant circuit is supplied to the input amplifier 91 via the switch 7. Via a gain control 92 the gain factor of the input amplifier 91 is now so adjusted that the output amplitude of the voltage amplified by the input amplifier 91 remains largely constant. The time constant of the control is preferably so adjusted here that the output voltage of the amplifier 91 remains constant in case of varying distance from the reading device (i.e. different levels of induced voltage in the coil 3), but modulation signals (e.g. 10% ASK with 106 kbit/s) are not suppressed by excessively fast control. Finkenzeller at [0110] The output signal of the amplifier 91 is supplied to a further amplifier, preferably a push-pull amplifier (V+, V−). The output signal of the push-pull amplifier is supplied to the connections of the contactless RFID chip CL via (at least) one series resistor 93. The amplitude of the output signal of the push-pull amplifier V+/V− is so selected here that the RFID chip CL can be supplied with sufficient energy for operation by the output signal.

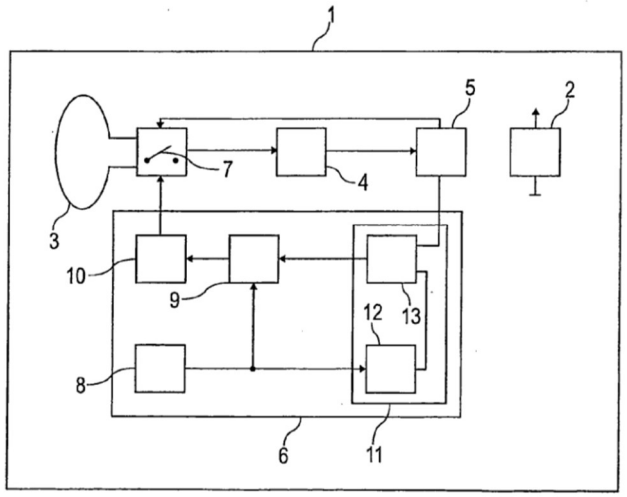
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0112] As soon as the RFID chip CL has received and processed a command, it tries to send a response back to the remote reading device. For this purpose the RFID chip normally uses a load modulation, i.e. an additional parallel resistor in the chip is switched on and off in time with the modulation signal. This leads to measurable fluctuations in the voltage drop across the resistors 93, 94. In other words, the HF alternating voltage at the connections is modulated in amplitude. By the demodulator circuit 98 this amplitude-modulated alternating voltage signal is demodulated and the original modulation signal thus reconstructed again. Finkenzeller at [0114] The modulation signal reconstructed by the demodulation circuit 97 is also supplied to a controller 95. The latter switches the inventive circuit with the first edge of the modulation signal to a transmit mode without delay if possible, so that the data generated by the RFID chip CL can also be transferred to the remote reading device. For this purpose, the switch 7 is first switched from the antenna 3 to the oscillator 8 (13.56 MHz). This is necessary to be able to keep supplying the RFID chip CL with an alternating voltage of the right frequency. At the same time the amplifier 80 is activated by the controller 95. Finkenzeller at [0115] The reconstructed modulation signal and the signal of the oscillator 8 are supplied to the modulator circuit 9. The exact function of such a circuit has already been described in detail. The output signal of the modulator circuit 9 is supplied to the amplifier 80 and sent via the antenna 3 to the remote reading device. Finkenzeller at [0118] However, a load modulation of the transponder chip CL is recognizable exclusively on the connections, but a modulation signal of the reading device already in the receive branch (91, 92, V+, V−) of the inventive circuit. It is therefore provided to switch the inventive circuit to the transmit mode only when a modulation signal (amplitude modulation) can be detected exclusively on the connections of the RFID chip CL and not in the receive branch, since only in this case is a load modulation involved. This is indicated in FIG. 9 by the signal fed into the controller 95 from the receive branch (91, 92, V+, V−). Finkenzeller at [0119] A second way of distinguishing is to evaluate the modulation depth of the signal on the connections of the RFID chip. By load modulation a modulation depth less than 100% is obtained. In the breadboard setup

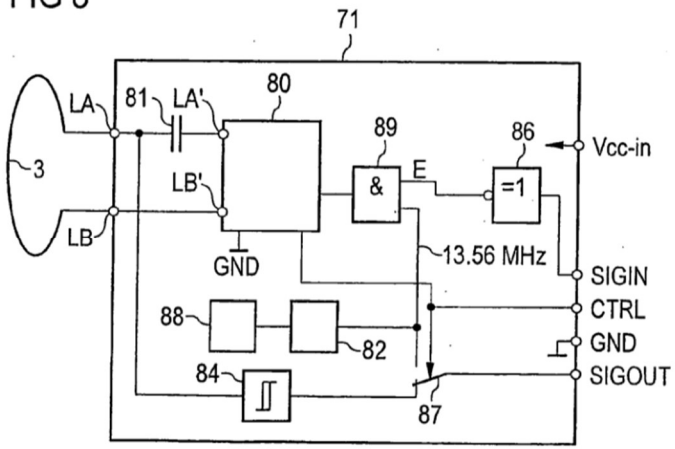
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	approx. 25% was determined, other values arise from combining different resistors 93, 94 with different RFID chips CL. It is therefore provided to distinguish between the load modulation and the modulation of the reading device by determining modulation depth with reference to given switching thresholds. If the strength of the modulation signal is above a first, high threshold, a signal from the reading device is present. If the modulation signal is smaller than the first switching threshold and optionally greater than a second switching threshold, however, it is recognized that a load modulation is present. A switch-over to the transmit mode is effected if the modulation was caused by a load modulation. Finkenzeller at [0123] For an inductive coupling, the circuit has an additional antenna 29 which can be made to resonate with the working frequency (e.g. 13.56 MHz) by means of a capacitor 26. A transponder comprising a transponder chip CL and an antenna 28 is positioned in immediate proximity to the antenna 29, so as to obtain the best possible magnetic coupling between the antennas 28 and 29. A load modulation of the transponder chip CL can also be detected easily with this arrangement. Finkenzeller at [0124] The interface module adapted to be coupled inductively and a further antenna connected thereto (see reference sign 3 in FIG. 10) can be disposed in a terminal. The range of an ordinary transponder can be increased with the help of such a terminal. The owner of a mobile telephone could for example set up a communication between his transponder and a reading device that is unfavorably disposed or inconvenient to reach for other reasons by holding the transponder against his mobile telephone provided according to the invention with an interface module adapted to be coupled inductively. Finkenzeller at [0127] It was ascertained that small antennas, e.g. in a SIM card with its own antenna (approx. 15×25 mm^2), obtain very low read ranges with a conventional load modulation. It is frequently even impossible to communicate with a contactless reading device when the SIM card with an antenna is disposed for example in a mobile telephone. If one of the inventive transmitters is used in a mobile terminal the range is not clearly increased. Moreover, it can be advantageously exploited that mobile terminals such as mobile telephones, PDAs, etc., have their own energy supply (battery) which can also be used for supplying an inventive circuit. Finkenzeller at [0129]

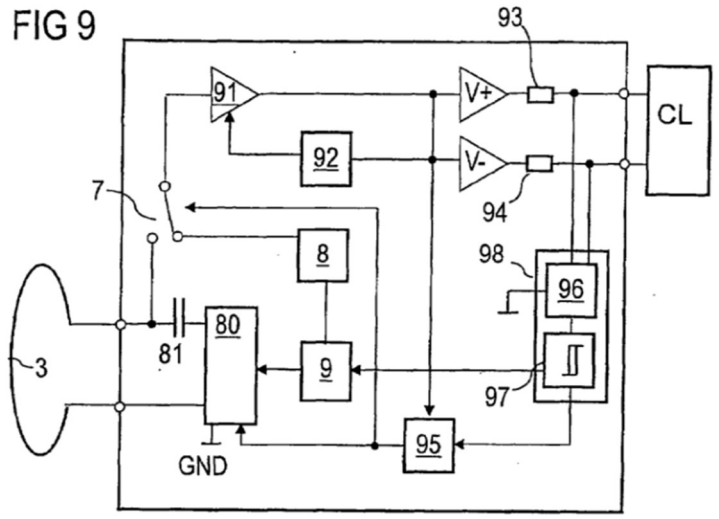
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Thus, an NFC unit could be adapted to behave according to the present solutions in its passive mode in the role ("being card") in which the NFC unit is to perform a load modulation. The NFC unit could for example always act as a component actively emitting its own field. Likewise, the NFC unit could also distinguish, and optionally switch, between a first submode corresponding to a conventional load modulation and an actively sending, second submode in which the load modulation is simulated. A thus improved NFC unit can also communicate with ordinary RFID reading devices over a higher range with the help of the changed passive operating mode. Since NFC units will already have certain units—such as an oscillator, an amplifier and a controller—for independent sending in their conventional active mode, comparatively few modifications of an NFC circuit are required to realize a circuit according to the present application in an NFC unit. Finkenzeller at [0131] The individual functional components of the transponder unit—antenna, interface unit, chip and optionally voltage supply unit—can be disposed in all sorts of combinations separately from each other or integrated jointly in one unit. An inventive transponder unit can be formed for example as a specially designed transponder, in a portable data carrier, in particular a chip card, which optionally has a battery. A portable data carrier, in particular SIM card, with a chip and an interface unit can be connected in a mobile terminal to an external voltage source and/or an external antenna. The interface unit can be disposed in a terminal, connected to its own or an external antenna, and communicate with a chip which is disposed reversibly or firmly in the terminal or temporarily on the terminal. Finkenzeller at claim 1 1. A method for transferring data from a transponder unit to a reading device to which data from transponders are transferred by modulation of a field of the reading device, comprising the steps: the transponder unit, in a first operating mode, generates a modulated transponder field and emits the transponder field as a signal which is evaluable for the reading device as a modulation of the reading device field by a transponder, for transferring the data to the reading device. Finkenzeller at claim 16 16. A transponder unit for transferring data to a reading device to which data from transponders are transferred by modulation of a field of the reading device, comprising: means for generating and sending a modulated transponder field as a signal which is evaluable for the reading device as a modulation of the reading device field by a transponder, for transferring the data to the reading device in a first operating mode.

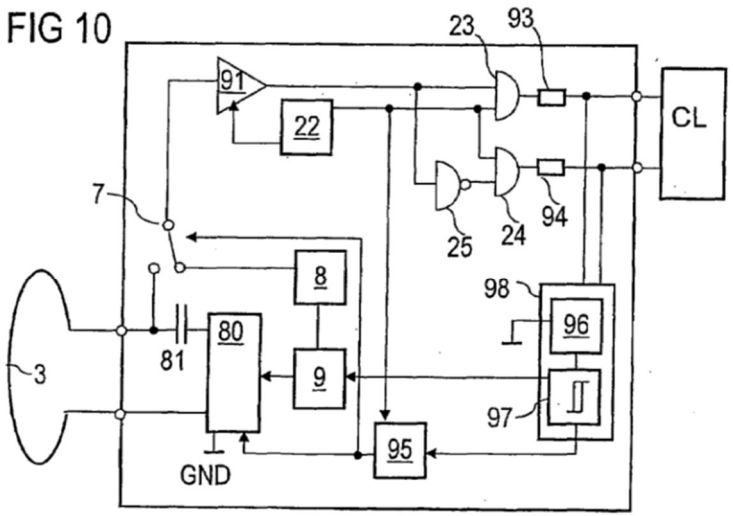
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at claim 19 19. The transponder unit according to claim 16, including at least one antenna for transmitting the signal either or both from and to the reading device; a receiver for demodulating a signal transmitted from the reading device to extract data therefrom; and an electronic circuit which is set up to process the extracted data and to generate data to be sent to the reading device. Finkenzeller at claim 42 42. An interface unit for signal modulation which is effected for transfer of data to a reading device to which data from transponders can be transferred by modulation of a field of the reading device, comprising means for generating and sending a modulated transponder field as an output signal which is evaluable for the reading device as a modulation of the reading device field by a transponder, for transferring the data to the reading device in a first operating mode of the interface unit. *See also* Finkenzeller at [0006], [0007], [0024], [0025], [0080], [0092], and [0126]. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
2. The mobile device of claim 1 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Finkenzeller discloses or renders obvious "[t]he mobile device of claim 1 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." For example: Finkenzeller at [0004] The range within which communication is possible in the system by data transfer can be increased by using active transponders, that is, transponders with their own energy supply. The energy supply of the active transponder, for example in form of a battery, operates its electronic circuit. Conventional transponders without their own energy supply are referred to as passive transponders, in contrast. Finkenzeller at [0006] For simple and fast contactless communication between two devices, the companies Philips and Sony have developed an inductive transmission technology which is known as so-called near field communication (NFC). This technology is integrated for example in mobile telephones or PDAs to permit

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	communication between the devices or with a computer. The coupling of the two devices is effected via coils, the carrier frequency being 13.56 MHz as in RFID systems. As described more closely in the NFC standard ECMA 340, NFC systems have an active communication mode and a passive communication mode. In the active mode, two NFC units alternately generate their own RF field as a signal carrier, thus switching back and forth, coordinated with each other, between transmit mode and receive mode as in a classic mobile phone system. In the passive mode, however, the two NFC units must agree on which unit acts as a reading device and generates a field which the other unit can then influence by means of load modulation. Primarily due to the small antenna diameters used, NFC systems only permit small communication ranges of up to 20 cm. Finkenzeller at [0126] As can be seen from the table, long communication ranges are achieved with the inventive method even with very small antennas. Finkenzeller at [0127] It was ascertained that small antennas, e.g. in a SIM card with its own antenna (approx. 15×25 mm^2), obtain very low read ranges with a conventional load modulation. It is frequently even impossible to communicate with a contactless reading device when the SIM card with an antenna is disposed for example in a mobile telephone. If one of the inventive transmitters is used in a mobile terminal the range is not clearly increased. Moreover, it can be advantageously exploited that mobile terminals such as mobile telephones, PDAs, etc., have their own energy supply (battery) which can also be used for supplying an inventive circuit. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
3. The mobile device of claim 1 wherein the smartcard controller is coupled to be powered by the mobile device.	Finkenzeller discloses or renders obvious "[t]he mobile device of claim 1 wherein the smartcard controller is coupled to be powered by the mobile device." For example: Finkenzeller at Figure 2

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 2  Finkenzeller at Figure 8

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 8  Finkenzeller at Figure 9

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at Figure 10

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at [0011] In an advantageous embodiment, an inventive RFID transponder unit has its own energy supply, at least one antenna for transmitting signals from and/or to a reading device, and an electronic circuit. The electronic circuit of the inventive transponder unit comprises a transmitter consisting of an oscillator and a modulator. Finkenzeller at [0048] The transponder unit 1 sends for data transfer to the reading device 100 a signal which the reading device 100 can evaluate as a signal of a transponder which carries out a load modulation of the field 110 of the reading device 100. Unlike the conventional transponders 200, 300 which modulate the field 110 of the reading device 100 into a modulated reading device field 102, 103, the transponder unit 1 thus generates and sends its own modulated field 20 as the signal for data transfer. The transponder unit 1 thus uses its own energy for the purpose of data transfer. Finkenzeller at [0055] FIG. 2 shows purely schematically the transponder unit 1, for example in the form of an inductively coupled chip card, which comprises the usual components not shown explicitly here. For simplification,

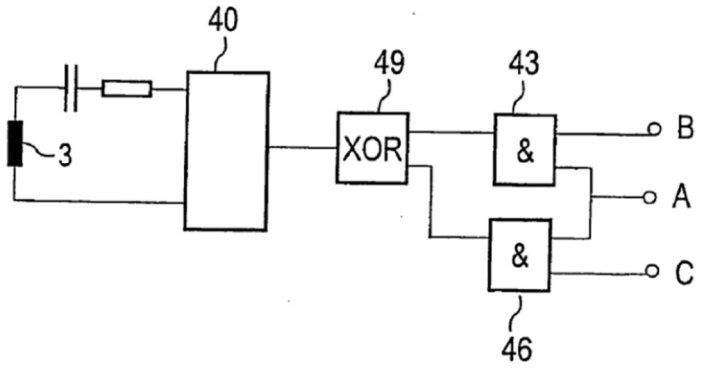
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	only one inventive RFID transponder unit in a chip card is shown. The transponder unit has a battery 2, an inductive antenna 3 and an electronic circuit 4, 5, 6, 7. The electronic circuit consists substantially of three functional blocks, a receiver 4, a controller 5 and a transmitter 6. A switch 7 is used for switching the antenna 3 between the receiver 4 and the transmitter 6. Finkenzeller at [0060] To supply the active components of the transponder unit at least partly with energy and to increase the energy range between the transponder unit 1 and the reading device 100, the inventive transponder unit has a battery 2. Finkenzeller at [0063] At the output of the ring modulator 9 an output signal is then available that contains the two modulation side bands and is identical (exactly enough) to a signal generated by load modulation or backscatter modulation. The output signal generated by the ring modulator 9 can then be optionally amplified by means of the amplifier 10, and be supplied to the antenna 3 for sending the data to be sent, via the switch 7 which is switched to the transmit mode of the transponder unit by a signal of the controller 5. Finkenzeller at [0065] The transponder unit 1 is operated in a first (active) operating mode as an actively sending transponder. In a second (passive) operating mode, however, the trans-ponder unit works like an ordinary passive transponder performing a load modulation on the field of the reading device. Finkenzeller at [0066] For example, the receiver 4 can additionally be formed as a conventional load modulator driven by the controller 5. The controller 5 then either switches the transmitter 6 on and the load modulator off, or the load modulator on and the transmitter 6 off. The switch 7 is switched accordingly. The criterion used for switching from a passive to an active operating state can be for example the received signal strength, the presence and/or sufficiency of an external voltage supply (on an optional connection Vcc not shown), or the sufficiency of an internal voltage supply (state of charge of the battery 2). It is thus for example possible to first operate a transponder unit 1 passively and switch it to an active operating mode if for example the distance from the reading device unintentionally increases. Finkenzeller at [0093]

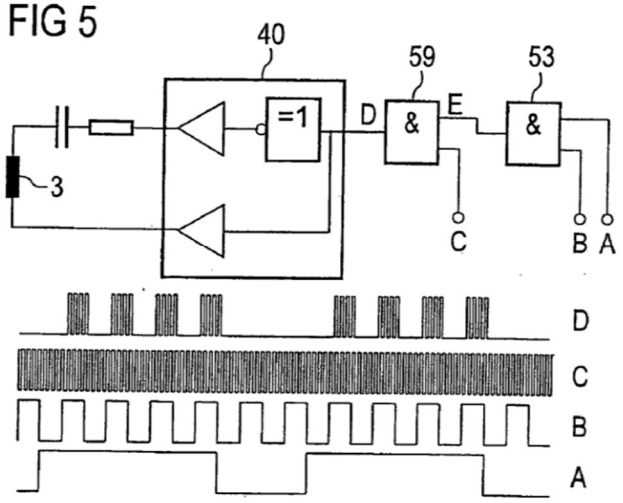
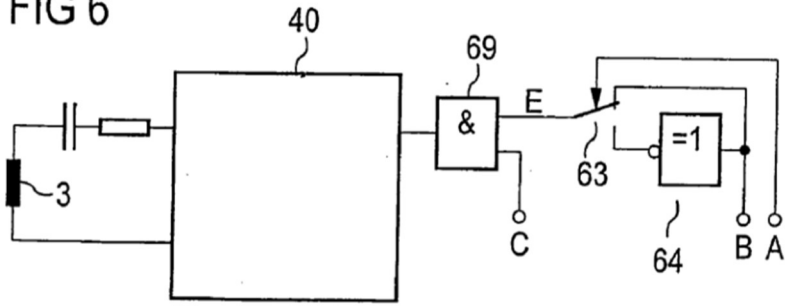
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Both the interface module 71 and the chip 75 can draw their supply voltage from the device in which they are disposed preferably reversibly. The interface module 71 can act as an ordinary transponder in a second operating mode and supply the chip with an operating voltage Vcc_RF. Finkenzeller at [0127] It was ascertained that small antennas, e.g. in a SIM card with its own antenna (approx. 15×25 mm^2), obtain very low read ranges with a conventional load modulation. It is frequently even impossible to communicate with a contactless reading device when the SIM card with an antenna is disposed for example in a mobile telephone. If one of the inventive transmitters is used in a mobile terminal the range is not clearly increased. Moreover, it can be advantageously exploited that mobile terminals such as mobile telephones, PDAs, etc., have their own energy supply (battery) which can also be used for supplying an inventive circuit. Finkenzeller at [0129] Thus, an NFC unit could be adapted to behave according to the present solutions in its passive mode in the role ("being card") in which the NFC unit is to perform a load modulation. The NFC unit could for example always act as a component actively emitting its own field. Likewise, the NFC unit could also distinguish, and optionally switch, between a first submode corresponding to a conventional load modulation and an actively sending, second submode in which the load modulation is simulated. A thus improved NFC unit can also communicate with ordinary RFID reading devices over a higher range with the help of the changed passive operating mode. Since NFC units will already have certain units—such as an oscillator, an amplifier and a controller—for independent sending in their conventional active mode, comparatively few modifications of an NFC circuit are required to realize a circuit according to the present application in an NFC unit. Finkenzeller at [0131] The individual functional components of the transponder unit—antenna, interface unit, chip and optionally voltage supply unit—can be disposed in all sorts of combinations separately from each other or integrated jointly in one unit. An inventive transponder unit can be formed for example as a specially designed transponder, in a portable data carrier, in particular a chip card, which optionally has a battery. A portable data carrier, in particular SIM card, with a chip and an interface unit can be connected in a mobile terminal to an external voltage source and/or an external antenna. The interface unit can be disposed in a terminal, connected to its own or an external antenna, and communicate with a chip which is disposed reversibly or firmly in the terminal or temporarily on the terminal.

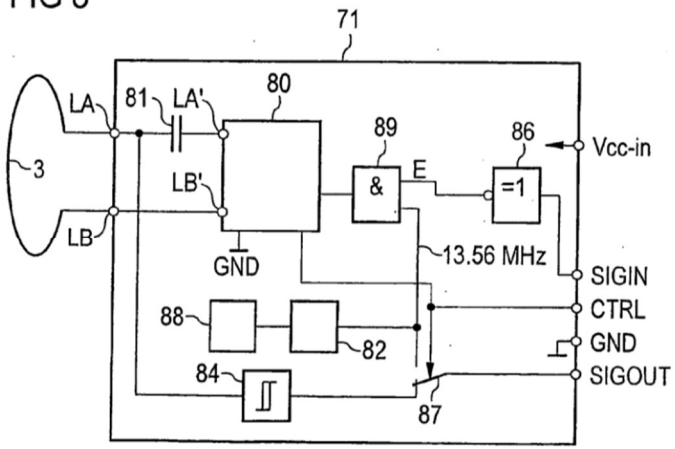
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
4. The mobile device of claim 1 wherein the mobile device comprises a mobile phone.	Finkenzeller discloses or renders obvious "[t]he mobile device of claim 1 wherein the mobile device comprises a mobile phone." For example: Finkenzeller at [0006] For simple and fast contactless communication between two devices, the companies Philips and Sony have developed an inductive transmission technology which is known as so-called near field communication (NFC). This technology is integrated for example in mobile telephones or PDAs to permit communication between the devices or with a computer. The coupling of the two devices is effected via coils, the carrier frequency being 13.56 MHz as in RFID systems. As described more closely in the NFC standard ECMA 340, NFC systems have an active communication mode and a passive communication mode. In the active mode, two NFC units alternately generate their own RF field as a signal carrier, thus switching back and forth, coordinated with each other, between transmit mode and receive mode as in a classic mobile phone system. In the passive mode, however, the two NFC units must agree on which unit acts as a reading device and generates a field which the other unit can then influence by means of load modulation. Primarily due to the small antenna diameters used, NFC systems only permit small communication ranges of up to 20 cm. Finkenzeller at [0028] The transponder unit can also be part of a mobile terminal, for example a mobile telephone. The transponder unit can have its own antenna or use an antenna of the terminal. Finkenzeller at [0032] The transponder unit is preferably integrated in a card or data carrier insertable into the mobile terminal. For example, the transponder unit can be integrated in a SIM card. The advantage is that the mobile terminal, for example a mobile phone or PDA, into which the card with the inventive transponder unit is inserted requires no additional (integrated) antenna to be usable as an RFID unit. Finkenzeller at [0092]

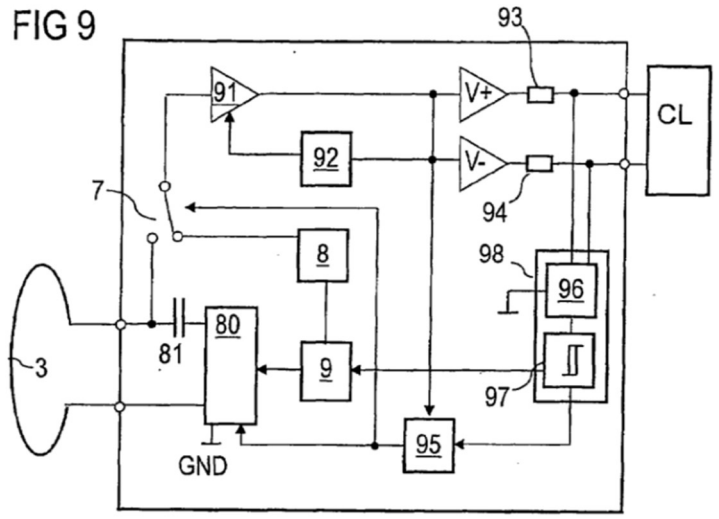
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG. 7 shows schematically an inventive transponder unit, formed by an interface module 71 connected to an antenna 3, and a chip 75 with a suitable interface, for example an S^2C interface. Such a transponder unit can be formed for example in a mobile telephone with the help of the SIM card as chip 75, which is then preferably connected to the interface module 71 via one or more idle contact surfaces (C6 and/or C4, C8) of the SIM card. Finkenzeller at [0124] The interface module adapted to be coupled inductively and a further antenna connected thereto (see reference sign 3 in FIG. 10) can be disposed in a terminal. The range of an ordinary transponder can be increased with the help of such a terminal. The owner of a mobile telephone could for example set up a communication between his transponder and a reading device that is unfavorably disposed or inconvenient to reach for other reasons by holding the transponder against his mobile telephone provided according to the invention with an interface module adapted to be coupled inductively. Finkenzeller at [0127] It was ascertained that small antennas, e.g. in a SIM card with its own antenna (approx. 15×25 mm^2), obtain very low read ranges with a conventional load modulation. It is frequently even impossible to communicate with a contactless reading device when the SIM card with an antenna is disposed for example in a mobile telephone. If one of the inventive transmitters is used in a mobile terminal the range is not clearly increased. Moreover, it can be advantageously exploited that mobile terminals such as mobile telephones, PDAs, etc., have their own energy supply (battery) which can also be used for supplying an inventive circuit. *See also* Finkenzeller at [0001]. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
5[pre]. A mobile device comprising:	Finkenzeller discloses or renders obvious "[a] mobile device." *See* 1[pre] above.

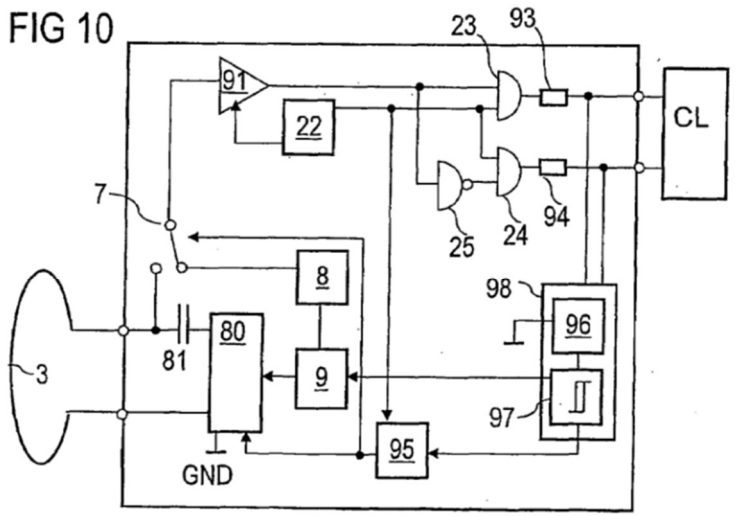
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[5a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Finkenzeller discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." *See* [1a] above.
[5b] an antenna tuned to operate at 13.56 MHz;	Finkenzeller discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." *See* [1b] above.
[5c] an amplifier coupled between the smartcard controller and the antenna, wherein the amplifier is coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller; and	Finkenzeller discloses or renders obvious "an amplifier coupled between the smartcard controller and the antenna, wherein the amplifier is coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller." For example: Finkenzeller at Figure 4

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 4  Finkenzeller at Figure 5

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 5  Finkenzeller at Figure 6 FIG 6  Finkenzeller at Figure 8

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 8  Finkenzeller at Figure 9

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at Figure 10

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at [0048] The transponder unit 1 sends for data transfer to the reading device 100 a signal which the reading device 100 can evaluate as a signal of a transponder which carries out a load modulation of the field 110 of the reading device 100. Unlike the conventional transponders 200, 300 which modulate the field 110 of the reading device 100 into a modulated reading device field 102, 103, the transponder unit 1 thus generates and sends its own modulated field 20 as the signal for data transfer. The transponder unit 1 thus uses its own energy for the purpose of data transfer. Finkenzeller at [0060] To supply the active components of the transponder unit at least partly with energy and to increase the energy range between the transponder unit 1 and the reading device 100, the inventive transponder unit has a battery 2. Finkenzeller at [0063] At the output of the ring modulator 9 an output signal is then available that contains the two modulation side bands and is identical (exactly enough) to a signal generated by load modulation or backscatter modulation. The output signal generated by the ring modulator 9 can then be optionally amplified by

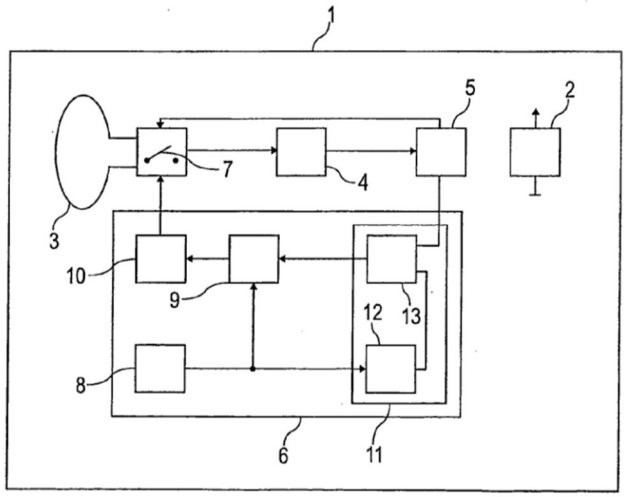
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	means of the amplifier 10, and be supplied to the antenna 3 for sending the data to be sent, via the switch 7 which is switched to the transmit mode of the transponder unit by a signal of the controller 5. Finkenzeller at [0065] The transponder unit 1 is operated in a first (active) operating mode as an actively sending transponder. In a second (passive) operating mode, however, the trans-ponder unit works like an ordinary passive transponder performing a load modulation on the field of the reading device. Finkenzeller at [0066] For example, the receiver 4 can additionally be formed as a conventional load modulator driven by the controller 5. The controller 5 then either switches the transmitter 6 on and the load modulator off, or the load modulator on and the transmitter 6 off. The switch 7 is switched accordingly. The criterion used for switching from a passive to an active operating state can be for example the received signal strength, the presence and/or sufficiency of an external voltage supply (on an optional connection Vcc not shown), or the sufficiency of an internal voltage supply (state of charge of the battery 2). It is thus for example possible to first operate a transponder unit 1 passively and switch it to an active operating mode if for example the distance from the reading device unintentionally increases. Finkenzeller at [0073] Just as in the structure according to FIG. 2, the binary data signal A is combined with a subcarrier signal B by an AND gate 43. The combined signal is available at a ring modulator 49. The digital ring modulator 49 used can be an XOR element. Departing from the structure of the transmitter in FIG. 2, a carrier signal C is not applied directly to the input of the ring modulator 49. Instead, the carrier signal C is first combined with a data signal A in an AND gate 46. This arrangement obtains better efficiency, as to be described more closely below. The output signal of the ring modulator 49 is amplified in an amplifier 40 before being emitted via the antenna 3 as the field of the transponder unit. The signal types A to C will hereinafter be described more closely by way of example with reference to FIG. 5. Finkenzeller at [0076] The signal D emitted by an antenna 3 to a reading device has a frequency spectrum that is like a frequency spectrum resulting by means of load modulation. The signal D can optionally be amplified by means of an amplifier 40. The amplifier 40 can be for example a push-pull amplifier with digital push-pull output amplifiers.

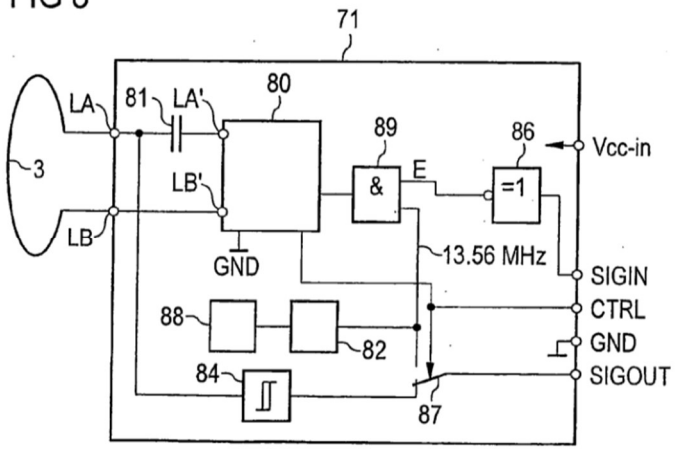
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0093] Both the interface module 71 and the chip 75 can draw their supply voltage from the device in which they are disposed preferably reversibly. The interface module 71 can act as an ordinary transponder in a second operating mode and supply the chip with an operating voltage Vcc_RF. Finkenzeller at [0096] The interface module 71 comprises an amplifier 80, an AND gate 89, an oscillator 88, a frequency divider 82, a signal shaper 84 and a switch 87. The amplifier 80 can be for example a push-pull amplifier with (digital) push-pull output amplifiers (not shown). The interface module also has two antenna connections LA and LB and a series capacitor 81. Furthermore, the interface module 71 has connections Vcc-in and GND for energy supply and a control input CTRL for switching between a transmit mode and a receive mode of the interface module by means of the switch 87. Finkenzeller at [0098] When the interface module is in the transmit mode, i.e. there is a contactless data transfer to an external reading device or an NFC device, a modulated subcarrier signal is fed in at the signal input SIGIN by the smart card chip and optionally inverted in an inverter 86. The inverted signal E is combined with a 13.56 MHz carrier frequency signal in the AND gate 89 as the carrier frequency modulator, and supplied to the amplifier 80. Finkenzeller at [0099] The antenna 3 and the series capacitor 81 form a series-resonant circuit which is connected to the outputs LA′ and LB′ of the amplifier 80, so that the HF current flowing in case of resonance is limited in the antenna resonant circuit only by the ohmic resistances in the lines and in the amplifier 80. This obtains a greatest possible transmit power of the interface module. Finkenzeller at [0101] In the receive mode, the smart card chip is supplied a digitized received signal tapped from the antenna 1, via the switch 87 and the output SIGOUT. The signal shaper 84 acts here as an amplifier to be able to receive even weak signals, and as a threshold switch to provide a digital output signal at the output of the signal shaper. For example, the threshold switch used can be a Schmitt trigger which outputs a clear high or low level depending on the over- or undershooting of a predetermined threshold value.

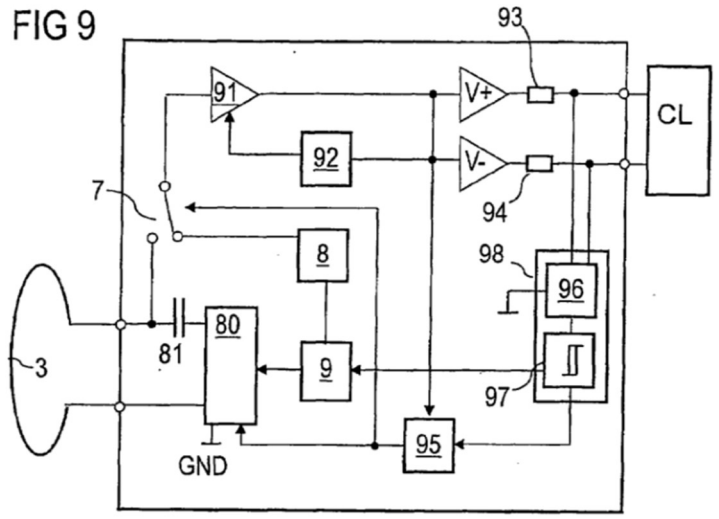
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0102] Via the control input of the push-pull amplifier 80 the push-pull outputs of the output drivers (see amplifier units in FIG. 5) are switched to GND, so that the antenna 3 and the capacitor 41 result in a parallel-resonant circuit. To save energy, the amplifier 80 can be switched to a power save mode in the receive mode of the interface module. Finkenzeller at [0106] The inventive active transponder unit has a receive branch and a transmit branch. The receive branch consists of an antenna 3, an input amplifier 91, an automatic gain control 92 and an amplifier which is preferably designed as a push-pull amplifier (V+, V−). Further, a transponder chip CL is connected via its antenna connections to the push-pull amplifier. Finkenzeller at [0108] The transmit branch consists of a demodulation circuit 97, a modulator circuit 9, an oscillator 8 (e.g. 13.56 MHz), a controller 95, and a transmitter amplifier 80 connected to the antenna 3. The demodulation circuit 98 can consist for example of a rectifier 96 and a threshold switch 97. Finkenzeller at [0109] In the receive mode a voltage is induced in the antenna 3 by the magnetic field of a remote RFID reading device. Together with the capacitor 81 the antenna 3 forms a parallel-resonant circuit whose resonant frequency corresponds approximately to the transmitting frequency of the RFID reading device. The voltage thus available on the resonant circuit is supplied to the input amplifier 91 via the switch 7. Via a gain control 92 the gain factor of the input amplifier 91 is now so adjusted that the output amplitude of the voltage amplified by the input amplifier 91 remains largely constant. The time constant of the control is preferably so adjusted here that the output voltage of the amplifier 91 remains constant in case of varying distance from the reading device (i.e. different levels of induced voltage in the coil 3), but modulation signals (e.g. 10% ASK with 106 kbit/s) are not suppressed by excessively fast control. Finkenzeller at [0110] The output signal of the amplifier 91 is supplied to a further amplifier, preferably a push-pull amplifier (V+, V−). The output signal of the push-pull amplifier is supplied to the connections of the contactless RFID chip CL via (at least) one series resistor 93. The amplitude of the output signal of the push-pull

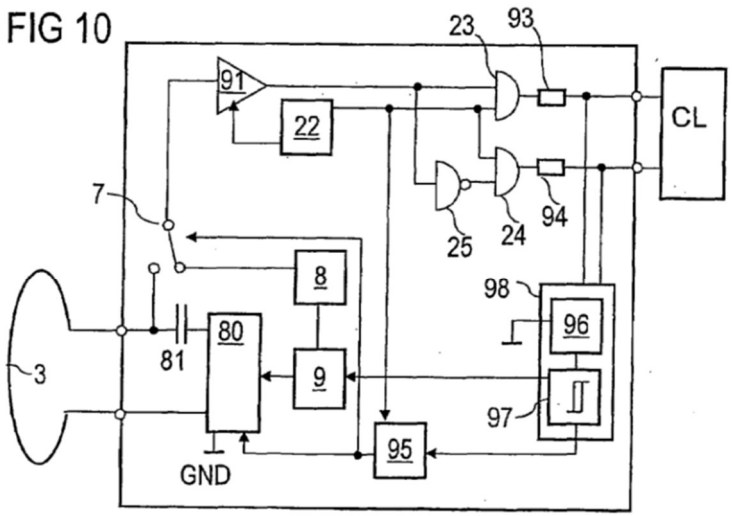
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	amplifier V+/V− is so selected here that the RFID chip CL can be supplied with sufficient energy for operation by the output signal. Finkenzeller at [0114] The modulation signal reconstructed by the demodulation circuit 97 is also supplied to a controller 95. The latter switches the inventive circuit with the first edge of the modulation signal to a transmit mode without delay if possible, so that the data generated by the RFID chip CL can also be transferred to the remote reading device. For this purpose, the switch 7 is first switched from the antenna 3 to the oscillator 8 (13.56 MHz). This is necessary to be able to keep supplying the RFID chip CL with an alternating voltage of the right frequency. At the same time the amplifier 80 is activated by the controller 95. Finkenzeller at [0115] The reconstructed modulation signal and the signal of the oscillator 8 are supplied to the modulator circuit 9. The exact function of such a circuit has already been described in detail. The output signal of the modulator circuit 9 is supplied to the amplifier 80 and sent via the antenna 3 to the remote reading device. Finkenzeller at [0127] It was ascertained that small antennas, e.g. in a SIM card with its own antenna (approx. 15×25 mm^2), obtain very low read ranges with a conventional load modulation. It is frequently even impossible to communicate with a contactless reading device when the SIM card with an antenna is disposed for example in a mobile telephone. If one of the inventive transmitters is used in a mobile terminal the range is not clearly increased. Moreover, it can be advantageously exploited that mobile terminals such as mobile telephones, PDAs, etc., have their own energy supply (battery) which can also be used for supplying an inventive circuit. Finkenzeller at [0129] Thus, an NFC unit could be adapted to behave according to the present solutions in its passive mode in the role ("being card") in which the NFC unit is to perform a load modulation. The NFC unit could for example always act as a component actively emitting its own field. Likewise, the NFC unit could also distinguish, and optionally switch, between a first submode corresponding to a conventional load modulation and an actively sending, second submode in which the load modulation is simulated. A thus improved NFC unit can also communicate with ordinary RFID reading devices over a higher range with the help of the changed passive operating mode. Since NFC units will already have certain units—such as an oscillator, an amplifier and a controller—for independent sending in their conventional active mode,

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	comparatively few modifications of an NFC circuit are required to realize a circuit according to the present application in an NFC unit. *See also* [1c] above. *See also* Finkenzeller at [0004] and [0011]. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[5d] a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna.	Finkenzeller discloses or renders obvious "a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna." For example: Finkenzeller at Abstract The invention relates to a transponder unit (1) and to a method for data transfer between the transponder unit and a reading device (100). To increase the range of data transfer from the transponder unit (1) to the reading device (100), the transponder unit (1) has means integrated therein for actively sending a signal to the reading device (100) which can be evaluated by the reading device (100) like a modulation of its own field (110) by a transponder. Finkenzeller at Figure 2

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 2  Finkenzeller at Figure 8

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 8  Finkenzeller at Figure 9

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at Figure 10

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at [0004] The range within which communication is possible in the system by data transfer can be increased by using active transponders, that is, transponders with their own energy supply. The energy supply of the active transponder, for example in form of a battery, operates its electronic circuit. Conventional transponders without their own energy supply are referred to as passive transponders, in contrast. Finkenzeller at [0010] According to the invention, a transponder unit sends a signal to a transponder reading device, which can communicate with the transponders by means of modulation of its own field by transponders, in such a way that the reading device can evaluate the signal as modulation by a conventional transponder. Instead of performing a load modulation or backscatter modulation of a field of the reading device, the transponder unit itself thus emits a field that simulates for the reading device a modulation of the reading device field by a transponder. An inventive transponder unit has means for sending the accordingly modulated signal. The total range of the system is consequently no longer limited by the communication range of the reading device, but is extended therebeyond up to a transmit range of the transponder unit. Finkenzeller at [0011]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	In an advantageous embodiment, an inventive RFID transponder unit has its own energy supply, at least one antenna for transmitting signals from and/or to a reading device, and an electronic circuit. The electronic circuit of the inventive transponder unit comprises a transmitter consisting of an oscillator and a modulator. Finkenzeller at [0015] Both modulators (ring modulator and ASK modulator) modulate the oscillator signal by means of the (modulated) data signal and deliver an output signal which is then transmitted to the reading device via the receive antenna or a separate transmitting antenna. Finkenzeller at [0017] A special advantage of using the described modulators is their compatibility to the prior art, since they deliver an output signal to be sent to the reading device whose (frequency and amplitude) spectrum is very similar to that of a load or backscatter modulation, as described above. Therefore, no technical changes must be performed on conventional reading devices. The inventive transponder can thus be operated with commercially available RFID reading devices, the communication range being many times that of passive or even active transponders. For example, a commercially available ISO 14443 reading device which can communicate with an inductively coupled, contactless chip card according to the prior art over a distance of approx. 10 cm could communicate with an inventive transponder unit over many times this distance. Finkenzeller at [0018] A further advantage is the compatibility with other passive and active transponders, so that both can be located within the response range of the reading device at the same time and can be addressed without mutual interference. Finkenzeller at [0019] The inventive transponder unit sends the data only in side bands spaced at the frequency of the (modulated) data signal to the transmitting frequency of the reading device. Finkenzeller at [0021] In a development, the inventive transponder unit has a load modulator according to the prior art, in addition to the above-described circuit having a receiver, a controller, an oscillator and a modulator. Finkenzeller at [0022]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	The voltage induced on the antenna of the transponder unit can be a problem for the operation of the inventive modulator circuits if the distance between trans-ponder unit and reading device is small and the induced voltage is therefore accordingly great. Therefore, the data to be sent to the reading device which are generated in the controller are supplied alternatively to the load modulator or to the inventive circuit configuration with a modulator. The switchover between the load modulator and the circuit configuration is preferably effected automatically, in dependence on the level of voltage induced on the antenna. The switchover is effected in such a way that the load modulator is used within the normal communication range, and the inventive modulator outside the normal communication range. Finkenzeller at [0027] The possibility of reading the inventive transponder unit over very large distances is not always desired, for example for privacy protection. It is therefore provided in one embodiment that the inventive circuit configuration can be activated manually if communication over a long range is explicitly desired. Otherwise, communication can be effected via a load modulator provided in the transponder unit, which is usable only for short distances. If no load modulator is provided in the trans-ponder unit, it can be provided for example that the transponder unit is activated for sending data only if the signal emitted by the reading device contains a predetermined code. Finkenzeller at [0048] The transponder unit 1 sends for data transfer to the reading device 100 a signal which the reading device 100 can evaluate as a signal of a transponder which carries out a load modulation of the field 110 of the reading device 100. Unlike the conventional transponders 200, 300 which modulate the field 110 of the reading device 100 into a modulated reading device field 102, 103, the transponder unit 1 thus generates and sends its own modulated field 20 as the signal for data transfer. The transponder unit 1 thus uses its own energy for the purpose of data transfer. Finkenzeller at [0049] To obtain a better signal-to-noise ratio, in an inductive system with a carrier frequency f_T of the RFID reading device of for example 13.56 MHz a subcarrier f_H with $f_H<f_T$, for example $f_H=212$ kHz, is used in the known way. The load resistance in the transponder unit is switched on and off at the frequency f_H, so that two subcarrier signals spaced $+/-f_H$ arise in the signal spectrum besides the strong signal of the carrier frequency f_T of the reading device. When the subcarrier is now modulated in the transponder unit 1 according to the data to be transferred, the modulation side bands carrying the information arise in the spectrum below and above the two subcarriers. The data to be transferred are thus contained equally in the

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	side bands of the sub-carriers which are disposed on both sides of the two corresponding spectral lines in each case. Data transfer is effected here by ASK, FSK or PSK modulation of the sub-carrier in time with the data flow. In contrast to load modulation without a subcarrier, by which data are transferred in side bands around the carrier frequency of the reading device, the subcarrier signal can be filtered out and demodulated better in the reading device to thereby retrieve the data. Finkenzeller at [0050] The transponder unit 1 accordingly generates and sends its own field 20 which comprises at least the modulation side bands around the carrier frequency f_T or the modulation side bands around a subcarrier frequency f_H, but as a rule the modulation side bands of both subcarriers together with the two subcarriers. Finkenzeller at [0055] FIG. 2 shows purely schematically the transponder unit 1, for example in the form of an inductively coupled chip card, which comprises the usual components not shown explicitly here. For simplification, only one inventive RFID transponder unit in a chip card is shown. The transponder unit has a battery 2, an inductive antenna 3 and an electronic circuit 4, 5, 6, 7. The electronic circuit consists substantially of three functional blocks, a receiver 4, a controller 5 and a transmitter 6. A switch 7 is used for switching the antenna 3 between the receiver 4 and the transmitter 6. Finkenzeller at [0056] The receiver 4 is provided for demodulating a signal transmitted from the reading device 100 to extract data therefrom. The extracted data are passed on to the controller 5 which processes them and generates data to be sent to the reading device 100. Furthermore, the controller 5 transmits a control signal to the switch 7 which switches between receive mode and transmit mode of the transponder unit. However, a separate antenna can instead be provided for sending. The controller 5 used can be for example a part of the operating system of a portable data carrier, such as a chip card. Finkenzeller at [0057] The transmitter 6 consists of an oscillator 8, a modulator, an execution as a ring modulator 9 first being described, and a terminal repeater 10. Furthermore, the transmitter 6 of the transponder unit shown in FIG. 2 is extended by an electronic assembly 11 for generating and modulating a subcarrier signal to carry out the data transfer from the transponder unit to a reading device 100 with a subcarrier signal. Depending on the use of the transponder unit, the subcarrier signal can have different frequencies, for example 848

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	kHz according to ISO 14443, 424 kHz according to ISO 15693 and 212 kHz for LEGIC, but might also be completely omitted. Finkenzeller at [0060] To supply the active components of the transponder unit at least partly with energy and to increase the energy range between the transponder unit 1 and the reading device 100, the inventive transponder unit has a battery 2. Finkenzeller at [0062] The ring modulator 9 has the feature of carrying out a special form of amplitude modulation. As in usual amplitude modulation, two spectral lines, regarded in the frequency spectrum, are generated spaced at the frequency of the ASK-modulated signal around the frequency of the oscillator signal, the so-called carrier frequency. With amplitude modulation in the ring modulator 9, the carrier frequency of the strong and high-energy oscillator signal is largely suppressed. The data to be sent contained in the ASK-modulated signal are located after the amplitude modulation in the ring modulator 9 in side bands around the two spectral lines of the subcarrier frequency. Such modulation is called double side band (DSB) modulation or double side band suppressed carrier (DSSC) modulation. At the carrier frequency no data are transferred. Instead, the use of the ring modulator 9 which suppresses the carrier frequency achieves the goal of being able to send data to the reading device 100 either at lower transmit power or with a considerably increased range. The increased range is possible primarily when the total transmit power is put into the side bands where the data to be sent are located. The carrier frequency is fundamentally required for demodulation of the signal, for extracting the data transmitted from the transponder unit in the reading device. However, since the carrier frequency is already present in the reading device, it is unnecessary for the transponder signal to contain this frequency itself. Finkenzeller at [0063] At the output of the ring modulator 9 an output signal is then available that contains the two modulation side bands and is identical (exactly enough) to a signal generated by load modulation or backscatter modulation. The output signal generated by the ring modulator 9 can then be optionally amplified by means of the amplifier 10, and be supplied to the antenna 3 for sending the data to be sent, via the switch 7 which is switched to the transmit mode of the transponder unit by a signal of the controller 5. Finkenzeller at [0065]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	The transponder unit 1 is operated in a first (active) operating mode as an actively sending transponder. In a second (passive) operating mode, however, the trans-ponder unit works like an ordinary passive transponder performing a load modulation on the field of the reading device. Finkenzeller at [0066] For example, the receiver 4 can additionally be formed as a conventional load modulator driven by the controller 5. The controller 5 then either switches the transmitter 6 on and the load modulator off, or the load modulator on and the transmitter 6 off. The switch 7 is switched accordingly. The criterion used for switching from a passive to an active operating state can be for example the received signal strength, the presence and/or sufficiency of an external voltage supply (on an optional connection Vcc not shown), or the sufficiency of an internal voltage supply (state of charge of the battery 2). It is thus for example possible to first operate a transponder unit 1 passively and switch it to an active operating mode if for example the distance from the reading device unintentionally increases. Finkenzeller at [0068] FIG. 3 shows a schematic circuit diagram of a ring modulator 9. As described above, the essential point of using the ring modulator 9 is that it performs an amplitude modulation whereby the modulation side bands of a subcarrier are generated in the usual way but the carrier frequency is very largely suppressed. For example, the inventive transponder unit can use an MC 1496 balanced modulator from the company ON Semiconductor, which is particularly suitable for carrier suppression. The ring modulator can be completely integrated on a transponder chip, so that an inventive transponder chip only needs connections for the antenna 3 and the voltage supply with complete integration of all components. Finkenzeller at [0073] Just as in the structure according to FIG. 2, the binary data signal A is combined with a subcarrier signal B by an AND gate 43. The combined signal is available at a ring modulator 49. The digital ring modulator 49 used can be an XOR element. Departing from the structure of the transmitter in FIG. 2, a carrier signal C is not applied directly to the input of the ring modulator 49. Instead, the carrier signal C is first combined with a data signal A in an AND gate 46. This arrangement obtains better efficiency, as to be described more closely below. The output signal of the ring modulator 49 is amplified in an amplifier 40 before being emitted via the antenna 3 as the field of the transponder unit. The signal types A to C will hereinafter be described more closely by way of example with reference to FIG. 5. Finkenzeller at [0076]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	The signal D emitted by an antenna 3 to a reading device has a frequency spectrum that is like a frequency spectrum resulting by means of load modulation. The signal D can optionally be amplified by means of an amplifier 40. The amplifier 40 can be for example a push-pull amplifier with digital push-pull output amplifiers. Finkenzeller at [0081] Upon data transfer from a transponder to the reading device an ASK-modulated subcarrier (OOK, on-off keying: HT r>MS) is used according to ISO/IEC 14443-3/type A at the initialization bit rate of 106 kbit/s. When this signal is simulated actively according to the inventive method, the required side bands can be generated most effectively with a ring modulator. The resulting double side band modulation (DSB) should show the best results with regard to communication range, since the carrier frequency (13.56 MHz) is suppressed and the available energy is provided in the side bands. Finkenzeller at [0087] In the active simulation of such a signal, a ring modulator provides the best results with regard to communication range here too. The digital ring modulator shows good behavior with regard to carrier suppression. However, the relative current consumption is 100%, since HF energy is radiated for the total duration of a bit. Finkenzeller at [0093] Both the interface module 71 and the chip 75 can draw their supply voltage from the device in which they are disposed preferably reversibly. The interface module 71 can act as an ordinary transponder in a second operating mode and supply the chip with an operating voltage Vcc_RF. Finkenzeller at [0096] The interface module 71 comprises an amplifier 80, an AND gate 89, an oscillator 88, a frequency divider 82, a signal shaper 84 and a switch 87. The amplifier 80 can be for example a push-pull amplifier with (digital) push-pull output amplifiers (not shown). The interface module also has two antenna connections LA and LB and a series capacitor 81. Furthermore, the interface module 71 has connections Vcc-in and GND for energy supply and a control input CTRL for switching between a transmit mode and a receive mode of the interface module by means of the switch 87. Finkenzeller at [0098]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	When the interface module is in the transmit mode, i.e. there is a contactless data transfer to an external reading device or an NFC device, a modulated subcarrier signal is fed in at the signal input SIGIN by the smart card chip and optionally inverted in an inverter 86. The inverted signal E is combined with a 13.56 MHz carrier frequency signal in the AND gate 89 as the carrier frequency modulator, and supplied to the amplifier 80. Finkenzeller at [0099] The antenna 3 and the series capacitor 81 form a series-resonant circuit which is connected to the outputs LA′ and LB′ of the amplifier 80, so that the HF current flowing in case of resonance is limited in the antenna resonant circuit only by the ohmic resistances in the lines and in the amplifier 80. This obtains a greatest possible transmit power of the interface module. Finkenzeller at [0100] Further, the smart card chip can be supplied a constant 13.56 MHz timing signal from the oscillator 88 via the output SIGOUT in the transmit mode via the switch 87, if it requires such an (external) timing signal for operation to keep exact timing. As described above, this is necessary for communication according to the standard ISO 14443 type A. Finkenzeller at [0103] The oscillator 88 generates the 13.56 MHz carrier frequency signal required in the transmit mode. If the oscillator cannot be switched off in the receive mode since its building-up transient might last too long, the oscillator is operated in the receive mode of the interface module preferably at a multiple N of the carrier frequency signal (e.g. 27.120 MHz) so as not to disturb the possibly weak received signal by crosstalk. In the transmit mode the required 13.56 MHz signal can then be generated by dividing the oscillator signal by N by means of an optional divider 82. Finkenzeller at [0112] As soon as the RFID chip CL has received and processed a command, it tries to send a response back to the remote reading device. For this purpose the RFID chip normally uses a load modulation, i.e. an additional parallel resistor in the chip is switched on and off in time with the modulation signal. This leads to measurable fluctuations in the voltage drop across the resistors 93, 94. In other words, the HF alternating voltage at the connections is modulated in amplitude. By the demodulator circuit 98 this amplitude-modulated alternating voltage signal is demodulated and the original modulation signal thus reconstructed again.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0118] However, a load modulation of the transponder chip CL is recognizable exclusively on the connections, but a modulation signal of the reading device already in the receive branch (91, 92, V+, V−) of the inventive circuit. It is therefore provided to switch the inventive circuit to the transmit mode only when a modulation signal (amplitude modulation) can be detected exclusively on the connections of the RFID chip CL and not in the receive branch, since only in this case is a load modulation involved. This is indicated in FIG. 9 by the signal fed into the controller 95 from the receive branch (91, 92, V+, V−). Finkenzeller at [0119] A second way of distinguishing is to evaluate the modulation depth of the signal on the connections of the RFID chip. By load modulation a modulation depth less than 100% is obtained. In the breadboard setup approx. 25% was determined, other values arise from combining different resistors 93, 94 with different RFID chips CL. It is therefore provided to distinguish between the load modulation and the modulation of the reading device by determining modulation depth with reference to given switching thresholds. If the strength of the modulation signal is above a first, high threshold, a signal from the reading device is present. If the modulation signal is smaller than the first switching threshold and optionally greater than a second switching threshold, however, it is recognized that a load modulation is present. A switch-over to the transmit mode is effected if the modulation was caused by a load modulation. Finkenzeller at [0127] It was ascertained that small antennas, e.g. in a SIM card with its own antenna (approx. 15×25 mm^2), obtain very low read ranges with a conventional load modulation. It is frequently even impossible to communicate with a contactless reading device when the SIM card with an antenna is disposed for example in a mobile telephone. If one of the inventive transmitters is used in a mobile terminal the range is not clearly increased. Moreover, it can be advantageously exploited that mobile terminals such as mobile telephones, PDAs, etc., have their own energy supply (battery) which can also be used for supplying an inventive circuit. Finkenzeller at [0129] Thus, an NFC unit could be adapted to behave according to the present solutions in its passive mode in the role ("being card") in which the NFC unit is to perform a load modulation. The NFC unit could for example always act as a component actively emitting its own field. Likewise, the NFC unit could also distinguish, and optionally switch, between a first submode corresponding to a conventional load

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	modulation and an actively sending, second submode in which the load modulation is simulated. A thus improved NFC unit can also communicate with ordinary RFID reading devices over a higher range with the help of the changed passive operating mode. Since NFC units will already have certain units—such as an oscillator, an amplifier and a controller—for independent sending in their conventional active mode, comparatively few modifications of an NFC circuit are required to realize a circuit according to the present application in an NFC unit. Finkenzeller at [0131] The individual functional components of the transponder unit—antenna, interface unit, chip and optionally voltage supply unit—can be disposed in all sorts of combinations separately from each other or integrated jointly in one unit. An inventive transponder unit can be formed for example as a specially designed transponder, in a portable data carrier, in particular a chip card, which optionally has a battery. A portable data carrier, in particular SIM card, with a chip and an interface unit can be connected in a mobile terminal to an external voltage source and/or an external antenna. The interface unit can be disposed in a terminal, connected to its own or an external antenna, and communicate with a chip which is disposed reversibly or firmly in the terminal or temporarily on the terminal. Finkenzeller at claim 1 1. A method for transferring data from a transponder unit to a reading device to which data from transponders are transferred by modulation of a field of the reading device, comprising the steps: the transponder unit, in a first operating mode, generates a modulated transponder field and emits the transponder field as a signal which is evaluable for the reading device as a modulation of the reading device field by a transponder, for transferring the data to the reading device. Finkenzeller at claim 16 16. A transponder unit for transferring data to a reading device to which data from transponders are transferred by modulation of a field of the reading device, comprising: means for generating and sending a modulated transponder field as a signal which is evaluable for the reading device as a modulation of the reading device field by a transponder, for transferring the data to the reading device in a first operating mode. Finkenzeller at claim 19 19. The transponder unit according to claim 16, including at least one antenna for transmitting the signal either or both from and to the reading device;

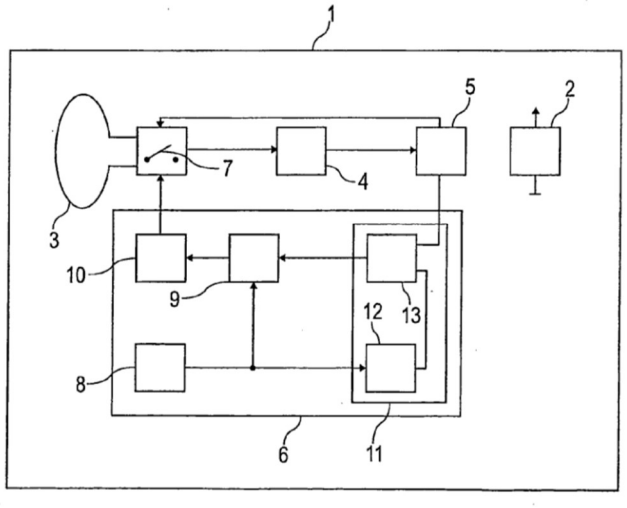
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	a receiver for demodulating a signal transmitted from the reading device to extract data therefrom; and an electronic circuit which is set up to process the extracted data and to generate data to be sent to the reading device. Finkenzeller at claim 42 42. An interface unit for signal modulation which is effected for transfer of data to a reading device to which data from transponders can be transferred by modulation of a field of the reading device, comprising means for generating and sending a modulated transponder field as an output signal which is evaluable for the reading device as a modulation of the reading device field by a transponder, for transferring the data to the reading device in a first operating mode of the interface unit. *See also* [1c] above. *See also* Finkenzeller at [0107] and [0115]. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
6. The mobile device of claim 5 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Finkenzeller discloses or renders obvious "[t]he mobile device of claim 5 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." *See* claim 2 above. *See also* claim 5 above.
7. The mobile device of claim 5 wherein the smartcard controller is coupled to be powered by the mobile device.	Finkenzeller discloses or renders obvious "[t]he mobile device of claim 5 wherein the smartcard controller is coupled to be powered by the mobile device." *See* claim 3 above. *See also* claim 5 above.
8. The mobile device of claim 5 wherein the transmit circuit	Finkenzeller discloses or renders obvious "[t]he mobile device of claim 5 wherein the transmit circuit comprises a load modulation circuit." For example:

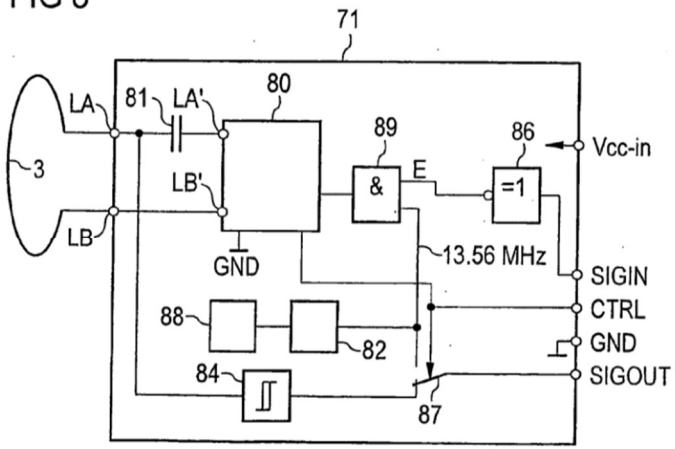
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
comprises a load modulation circuit.	Finkenzeller at [0006] For simple and fast contactless communication between two devices, the companies Philips and Sony have developed an inductive transmission technology which is known as so-called near field communication (NFC). This technology is integrated for example in mobile telephones or PDAs to permit communication between the devices or with a computer. The coupling of the two devices is effected via coils, the carrier frequency being 13.56 MHz as in RFID systems. As described more closely in the NFC standard ECMA 340, NFC systems have an active communication mode and a passive communication mode. In the active mode, two NFC units alternately generate their own RF field as a signal carrier, thus switching back and forth, coordinated with each other, between transmit mode and receive mode as in a classic mobile phone system. In the passive mode, however, the two NFC units must agree on which unit acts as a reading device and generates a field which the other unit can then influence by means of load modulation. Primarily due to the small antenna diameters used, NFC systems only permit small communication ranges of up to 20 cm. Finkenzeller at [0007] Even with active transponders there is the problem that data transfer from the transponder to the reading device is limited by the signals becoming weaker with increasing distance between reading device and transponder. As a rule, ranges no longer than 1 to 2 m can therefore be obtained even with an active transponder for example in inductively coupled systems which transfer data to the reading device on the principle of load modulation. For RFID systems working on the principle of backscatter, however, communication ranges of 10 m are typically obtained. Finkenzeller at [0021] In a development, the inventive transponder unit has a load modulator according to the prior art, in addition to the above-described circuit having a receiver, a controller, an oscillator and a modulator. Finkenzeller at [0022] The voltage induced on the antenna of the transponder unit can be a problem for the operation of the inventive modulator circuits if the distance between trans-ponder unit and reading device is small and the induced voltage is therefore accordingly great. Therefore, the data to be sent to the reading device which are generated in the controller are supplied alternatively to the load modulator or to the inventive circuit configuration with a modulator. The switchover between the load modulator and the circuit configuration is preferably effected automatically, in dependence on the level of voltage induced on the antenna. The

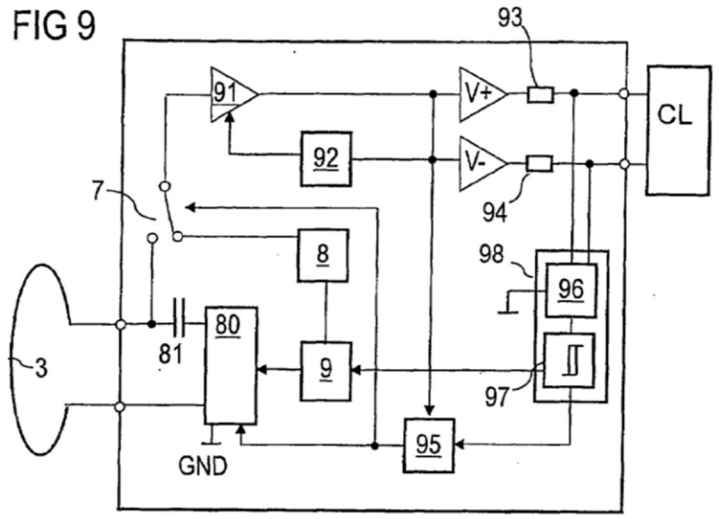
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	switchover is effected in such a way that the load modulator is used within the normal communication range, and the inventive modulator outside the normal communication range. Finkenzeller at [0025] In particular for communication according to the standard ISO 14443 type A, exact timing is important. With conventional passive transponders, timing is ensured even in the transmit mode (load modulation) by the timing signal (13.56 MHz) continually received from the reading device. However, such a signal is no longer available in the transmit mode of an inventive circuit configuration. In one embodiment of the invention, an oscillator is therefore provided for example in the form of a quartz oscillator. Finkenzeller at [0027] The possibility of reading the inventive transponder unit over very large distances is not always desired, for example for privacy protection. It is therefore provided in one embodiment that the inventive circuit configuration can be activated manually if communication over a long range is explicitly desired. Otherwise, communication can be effected via a load modulator provided in the transponder unit, which is usable only for short distances. If no load modulator is provided in the trans-ponder unit, it can be provided for example that the transponder unit is activated for sending data only if the signal emitted by the reading device contains a predetermined code. Finkenzeller at [0047] Depending on a type of system used, data can be transferred from the trans-ponders 200, 300 to the reading device 100 either by means of load modulation (inductive coupling) or by means of modulated backscatter cross section (electromagnetic backscatter coupling). Embodiments will preferably be described hereinafter for systems that transfer data to the reading device on the principle of load modulation. However, the individual aspects of the embodiments are largely also applicable analogously to systems that work on the principle of modulated backscatter cross sections of the transponder unit. Finkenzeller at [0065] The transponder unit 1 is operated in a first (active) operating mode as an actively sending transponder. In a second (passive) operating mode, however, the trans-ponder unit works like an ordinary passive transponder performing a load modulation on the field of the reading device. Finkenzeller at [0066]

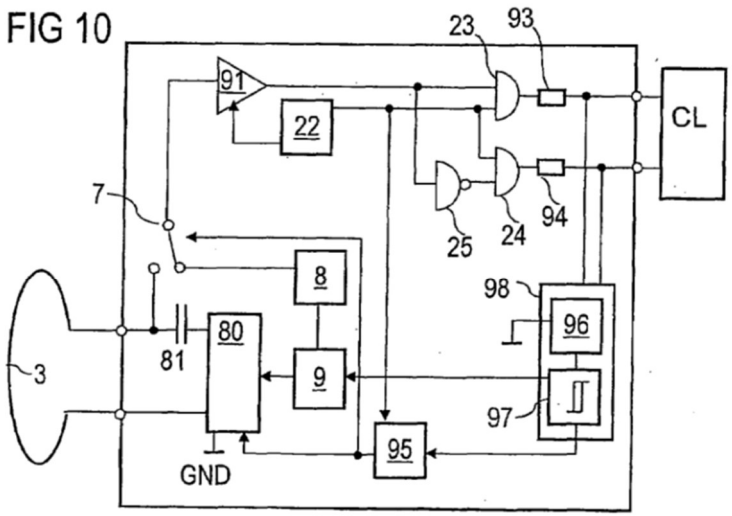
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	For example, the receiver 4 can additionally be formed as a conventional load modulator driven by the controller 5. The controller 5 then either switches the transmitter 6 on and the load modulator off, or the load modulator on and the transmitter 6 off. The switch 7 is switched accordingly. The criterion used for switching from a passive to an active operating state can be for example the received signal strength, the presence and/or sufficiency of an external voltage supply (on an optional connection Vcc not shown), or the sufficiency of an internal voltage supply (state of charge of the battery 2). It is thus for example possible to first operate a transponder unit 1 passively and switch it to an active operating mode if for example the distance from the reading device unintentionally increases. Finkenzeller at [0107] The transponder chip CL is a conventional RFID chip according to the prior art. It is normally connected at its connections with an antenna, e.g. in a chip card. Further, the transponder chip CL is so designed that data transfer from the transponder unit to a reading device is carried out by means of load modulation. This is almost always the case in usual RFID systems used at 13.56 MHz or also 125 kHz (e.g. ISO/IEC 14443, ISO/IEC 15693, ISO/IEC 18000-3). Finkenzeller at [0112] As soon as the RFID chip CL has received and processed a command, it tries to send a response back to the remote reading device. For this purpose the RFID chip normally uses a load modulation, i.e. an additional parallel resistor in the chip is switched on and off in time with the modulation signal. This leads to measurable fluctuations in the voltage drop across the resistors 93, 94. In other words, the HF alternating voltage at the connections is modulated in amplitude. By the demodulator circuit 98 this amplitude-modulated alternating voltage signal is demodulated and the original modulation signal thus reconstructed again. Finkenzeller at [0115] The reconstructed modulation signal and the signal of the oscillator 8 are supplied to the modulator circuit 9. The exact function of such a circuit has already been described in detail. The output signal of the modulator circuit 9 is supplied to the amplifier 80 and sent via the antenna 3 to the remote reading device. Finkenzeller at [0118] However, a load modulation of the transponder chip CL is recognizable exclusively on the connections, but a modulation signal of the reading device already in the receive branch (91, 92, V+, V−) of the inventive circuit. It is therefore provided to switch the inventive circuit to the transmit mode only when a

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	modulation signal (amplitude modulation) can be detected exclusively on the connections of the RFID chip CL and not in the receive branch, since only in this case is a load modulation involved. This is indicated in FIG. 9 by the signal fed into the controller 95 from the receive branch (91, 92, V+, V−). Finkenzeller at [0119] A second way of distinguishing is to evaluate the modulation depth of the signal on the connections of the RFID chip. By load modulation a modulation depth less than 100% is obtained. In the breadboard setup approx. 25% was determined, other values arise from combining different resistors 93, 94 with different RFID chips CL. It is therefore provided to distinguish between the load modulation and the modulation of the reading device by determining modulation depth with reference to given switching thresholds. If the strength of the modulation signal is above a first, high threshold, a signal from the reading device is present. If the modulation signal is smaller than the first switching threshold and optionally greater than a second switching threshold, however, it is recognized that a load modulation is present. A switch-over to the transmit mode is effected if the modulation was caused by a load modulation. Finkenzeller at [0127] It was ascertained that small antennas, e.g. in a SIM card with its own antenna (approx. 15×25 mm^2), obtain very low read ranges with a conventional load modulation. It is frequently even impossible to communicate with a contactless reading device when the SIM card with an antenna is disposed for example in a mobile telephone. If one of the inventive transmitters is used in a mobile terminal the range is not clearly increased. Moreover, it can be advantageously exploited that mobile terminals such as mobile telephones, PDAs, etc., have their own energy supply (battery) which can also be used for supplying an inventive circuit. Finkenzeller at [0129] Thus, an NFC unit could be adapted to behave according to the present solutions in its passive mode in the role ("being card") in which the NFC unit is to perform a load modulation. The NFC unit could for example always act as a component actively emitting its own field. Likewise, the NFC unit could also distinguish, and optionally switch, between a first submode corresponding to a conventional load modulation and an actively sending, second submode in which the load modulation is simulated. A thus improved NFC unit can also communicate with ordinary RFID reading devices over a higher range with the help of the changed passive operating mode. Since NFC units will already have certain units—such as an oscillator, an amplifier and a controller—for independent sending in their conventional active mode,

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	comparatively few modifications of an NFC circuit are required to realize a circuit according to the present application in an NFC unit. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 5 above.
9. The mobile device of claim 5 wherein the transmit circuit comprises an active transmit driver.	Finkenzeller discloses or renders obvious "[t]he mobile device of claim 5 wherein the transmit circuit comprises an active transmit driver." For example: Finkenzeller at Figure 2 FIG 2  Finkenzeller at Figure 8

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 8  Finkenzeller at Figure 9

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at Figure 10

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at [0004] The range within which communication is possible in the system by data transfer can be increased by using active transponders, that is, transponders with their own energy supply. The energy supply of the active transponder, for example in form of a battery, operates its electronic circuit. Conventional transponders without their own energy supply are referred to as passive transponders, in contrast. Finkenzeller at [0010] According to the invention, a transponder unit sends a signal to a transponder reading device, which can communicate with the transponders by means of modulation of its own field by transponders, in such a way that the reading device can evaluate the signal as modulation by a conventional transponder. Instead of performing a load modulation or backscatter modulation of a field of the reading device, the transponder unit itself thus emits a field that simulates for the reading device a modulation of the reading device field by a transponder. An inventive transponder unit has means for sending the accordingly modulated signal. The total range of the system is consequently no longer limited by the communication range of the reading device, but is extended therebeyond up to a transmit range of the transponder unit. Finkenzeller at [0011]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	In an advantageous embodiment, an inventive RFID transponder unit has its own energy supply, at least one antenna for transmitting signals from and/or to a reading device, and an electronic circuit. The electronic circuit of the inventive transponder unit comprises a transmitter consisting of an oscillator and a modulator. Finkenzeller at [0015] Both modulators (ring modulator and ASK modulator) modulate the oscillator signal by means of the (modulated) data signal and deliver an output signal which is then transmitted to the reading device via the receive antenna or a separate transmitting antenna. Finkenzeller at [0017] A special advantage of using the described modulators is their compatibility to the prior art, since they deliver an output signal to be sent to the reading device whose (frequency and amplitude) spectrum is very similar to that of a load or backscatter modulation, as described above. Therefore, no technical changes must be performed on conventional reading devices. The inventive transponder can thus be operated with commercially available RFID reading devices, the communication range being many times that of passive or even active transponders. For example, a commercially available ISO 14443 reading device which can communicate with an inductively coupled, contactless chip card according to the prior art over a distance of approx. 10 cm could communicate with an inventive transponder unit over many times this distance. Finkenzeller at [0021] In a development, the inventive transponder unit has a load modulator according to the prior art, in addition to the above-described circuit having a receiver, a controller, an oscillator and a modulator. Finkenzeller at [0022] The voltage induced on the antenna of the transponder unit can be a problem for the operation of the inventive modulator circuits if the distance between trans-ponder unit and reading device is small and the induced voltage is therefore accordingly great. Therefore, the data to be sent to the reading device which are generated in the controller are supplied alternatively to the load modulator or to the inventive circuit configuration with a modulator. The switchover between the load modulator and the circuit configuration is preferably effected automatically, in dependence on the level of voltage induced on the antenna. The switchover is effected in such a way that the load modulator is used within the normal communication range, and the inventive modulator outside the normal communication range.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0027] The possibility of reading the inventive transponder unit over very large distances is not always desired, for example for privacy protection. It is therefore provided in one embodiment that the inventive circuit configuration can be activated manually if communication over a long range is explicitly desired. Otherwise, communication can be effected via a load modulator provided in the transponder unit, which is usable only for short distances. If no load modulator is provided in the trans-ponder unit, it can be provided for example that the transponder unit is activated for sending data only if the signal emitted by the reading device contains a predetermined code. Finkenzeller at [0048] The transponder unit 1 sends for data transfer to the reading device 100 a signal which the reading device 100 can evaluate as a signal of a transponder which carries out a load modulation of the field 110 of the reading device 100. Unlike the conventional transponders 200, 300 which modulate the field 110 of the reading device 100 into a modulated reading device field 102, 103, the transponder unit 1 thus generates and sends its own modulated field 20 as the signal for data transfer. The transponder unit 1 thus uses its own energy for the purpose of data transfer. Finkenzeller at [0055] FIG. 2 shows purely schematically the transponder unit 1, for example in the form of an inductively coupled chip card, which comprises the usual components not shown explicitly here. For simplification, only one inventive RFID transponder unit in a chip card is shown. The transponder unit has a battery 2, an inductive antenna 3 and an electronic circuit 4, 5, 6, 7. The electronic circuit consists substantially of three functional blocks, a receiver 4, a controller 5 and a transmitter 6. A switch 7 is used for switching the antenna 3 between the receiver 4 and the transmitter 6. Finkenzeller at [0056] The receiver 4 is provided for demodulating a signal transmitted from the reading device 100 to extract data therefrom. The extracted data are passed on to the controller 5 which processes them and generates data to be sent to the reading device 100. Furthermore, the controller 5 transmits a control signal to the switch 7 which switches between receive mode and transmit mode of the transponder unit. However, a separate antenna can instead be provided for sending. The controller 5 used can be for example a part of the operating system of a portable data carrier, such as a chip card.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0057] The transmitter 6 consists of an oscillator 8, a modulator, an execution as a ring modulator 9 first being described, and a terminal repeater 10. Furthermore, the transmitter 6 of the transponder unit shown in FIG. 2 is extended by an electronic assembly 11 for generating and modulating a subcarrier signal to carry out the data transfer from the transponder unit to a reading device 100 with a subcarrier signal. Depending on the use of the transponder unit, the subcarrier signal can have different frequencies, for example 848 kHz according to ISO 14443, 424 kHz according to ISO 15693 and 212 kHz for LEGIC, but might also be completely omitted. Finkenzeller at [0060] To supply the active components of the transponder unit at least partly with energy and to increase the energy range between the transponder unit 1 and the reading device 100, the inventive transponder unit has a battery 2. Finkenzeller at [0063] At the output of the ring modulator 9 an output signal is then available that contains the two modulation side bands and is identical (exactly enough) to a signal generated by load modulation or backscatter modulation. The output signal generated by the ring modulator 9 can then be optionally amplified by means of the amplifier 10, and be supplied to the antenna 3 for sending the data to be sent, via the switch 7 which is switched to the transmit mode of the transponder unit by a signal of the controller 5. Finkenzeller at [0065] The transponder unit 1 is operated in a first (active) operating mode as an actively sending transponder. In a second (passive) operating mode, however, the trans-ponder unit works like an ordinary passive transponder performing a load modulation on the field of the reading device. Finkenzeller at [0066] For example, the receiver 4 can additionally be formed as a conventional load modulator driven by the controller 5. The controller 5 then either switches the transmitter 6 on and the load modulator off, or the load modulator on and the transmitter 6 off. The switch 7 is switched accordingly. The criterion used for switching from a passive to an active operating state can be for example the received signal strength, the presence and/or sufficiency of an external voltage supply (on an optional connection Vcc not shown), or the sufficiency of an internal voltage supply (state of charge of the battery 2). It is thus for example

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	possible to first operate a transponder unit 1 passively and switch it to an active operating mode if for example the distance from the reading device unintentionally increases. Finkenzeller at [0073] Just as in the structure according to FIG. 2, the binary data signal A is combined with a subcarrier signal B by an AND gate 43. The combined signal is available at a ring modulator 49. The digital ring modulator 49 used can be an XOR element. Departing from the structure of the transmitter in FIG. 2, a carrier signal C is not applied directly to the input of the ring modulator 49. Instead, the carrier signal C is first combined with a data signal A in an AND gate 46. This arrangement obtains better efficiency, as to be described more closely below. The output signal of the ring modulator 49 is amplified in an amplifier 40 before being emitted via the antenna 3 as the field of the transponder unit. The signal types A to C will hereinafter be described more closely by way of example with reference to FIG. 5. Finkenzeller at [0076] The signal D emitted by an antenna 3 to a reading device has a frequency spectrum that is like a frequency spectrum resulting by means of load modulation. The signal D can optionally be amplified by means of an amplifier 40. The amplifier 40 can be for example a push-pull amplifier with digital push-pull output amplifiers. Finkenzeller at [0093] Both the interface module 71 and the chip 75 can draw their supply voltage from the device in which they are disposed preferably reversibly. The interface module 71 can act as an ordinary transponder in a second operating mode and supply the chip with an operating voltage Vcc_RF. Finkenzeller at [0096] The interface module 71 comprises an amplifier 80, an AND gate 89, an oscillator 88, a frequency divider 82, a signal shaper 84 and a switch 87. The amplifier 80 can be for example a push-pull amplifier with (digital) push-pull output amplifiers (not shown). The interface module also has two antenna connections LA and LB and a series capacitor 81. Furthermore, the interface module 71 has connections Vcc-in and GND for energy supply and a control input CTRL for switching between a transmit mode and a receive mode of the interface module by means of the switch 87. Finkenzeller at [0098]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	When the interface module is in the transmit mode, i.e. there is a contactless data transfer to an external reading device or an NFC device, a modulated subcarrier signal is fed in at the signal input SIGIN by the smart card chip and optionally inverted in an inverter 86. The inverted signal E is combined with a 13.56 MHz carrier frequency signal in the AND gate 89 as the carrier frequency modulator, and supplied to the amplifier 80. Finkenzeller at [0099] The antenna 3 and the series capacitor 81 form a series-resonant circuit which is connected to the outputs LA′ and LB′ of the amplifier 80, so that the HF current flowing in case of resonance is limited in the antenna resonant circuit only by the ohmic resistances in the lines and in the amplifier 80. This obtains a greatest possible transmit power of the interface module. Finkenzeller at [0100] Further, the smart card chip can be supplied a constant 13.56 MHz timing signal from the oscillator 88 via the output SIGOUT in the transmit mode via the switch 87, if it requires such an (external) timing signal for operation to keep exact timing. As described above, this is necessary for communication according to the standard ISO 14443 type A. Finkenzeller at [0103] The oscillator 88 generates the 13.56 MHz carrier frequency signal required in the transmit mode. If the oscillator cannot be switched off in the receive mode since its building-up transient might last too long, the oscillator is operated in the receive mode of the interface module preferably at a multiple N of the carrier frequency signal (e.g. 27.120 MHz) so as not to disturb the possibly weak received signal by crosstalk. In the transmit mode the required 13.56 MHz signal can then be generated by dividing the oscillator signal by N by means of an optional divider 82. Finkenzeller at [0112] As soon as the RFID chip CL has received and processed a command, it tries to send a response back to the remote reading device. For this purpose the RFID chip normally uses a load modulation, i.e. an additional parallel resistor in the chip is switched on and off in time with the modulation signal. This leads to measurable fluctuations in the voltage drop across the resistors 93, 94. In other words, the HF alternating voltage at the connections is modulated in amplitude. By the demodulator circuit 98 this amplitude-modulated alternating voltage signal is demodulated and the original modulation signal thus reconstructed again.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0118] However, a load modulation of the transponder chip CL is recognizable exclusively on the connections, but a modulation signal of the reading device already in the receive branch (91, 92, V+, V−) of the inventive circuit. It is therefore provided to switch the inventive circuit to the transmit mode only when a modulation signal (amplitude modulation) can be detected exclusively on the connections of the RFID chip CL and not in the receive branch, since only in this case is a load modulation involved. This is indicated in FIG. 9 by the signal fed into the controller 95 from the receive branch (91, 92, V+, V−). Finkenzeller at [0119] A second way of distinguishing is to evaluate the modulation depth of the signal on the connections of the RFID chip. By load modulation a modulation depth less than 100% is obtained. In the breadboard setup approx. 25% was determined, other values arise from combining different resistors 93, 94 with different RFID chips CL. It is therefore provided to distinguish between the load modulation and the modulation of the reading device by determining modulation depth with reference to given switching thresholds. If the strength of the modulation signal is above a first, high threshold, a signal from the reading device is present. If the modulation signal is smaller than the first switching threshold and optionally greater than a second switching threshold, however, it is recognized that a load modulation is present. A switch-over to the transmit mode is effected if the modulation was caused by a load modulation. Finkenzeller at [0127] It was ascertained that small antennas, e.g. in a SIM card with its own antenna (approx. 15×25 mm^2), obtain very low read ranges with a conventional load modulation. It is frequently even impossible to communicate with a contactless reading device when the SIM card with an antenna is disposed for example in a mobile telephone. If one of the inventive transmitters is used in a mobile terminal the range is not clearly increased. Moreover, it can be advantageously exploited that mobile terminals such as mobile telephones, PDAs, etc., have their own energy supply (battery) which can also be used for supplying an inventive circuit. Finkenzeller at [0129] Thus, an NFC unit could be adapted to behave according to the present solutions in its passive mode in the role ("being card") in which the NFC unit is to perform a load modulation. The NFC unit could for example always act as a component actively emitting its own field. Likewise, the NFC unit could also distinguish, and optionally switch, between a first submode corresponding to a conventional load

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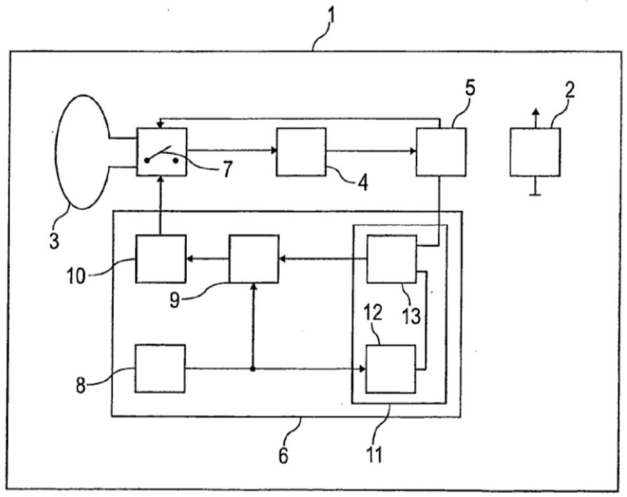
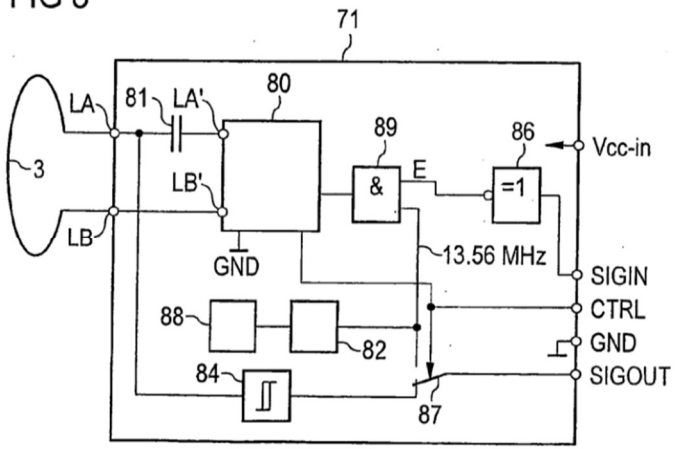
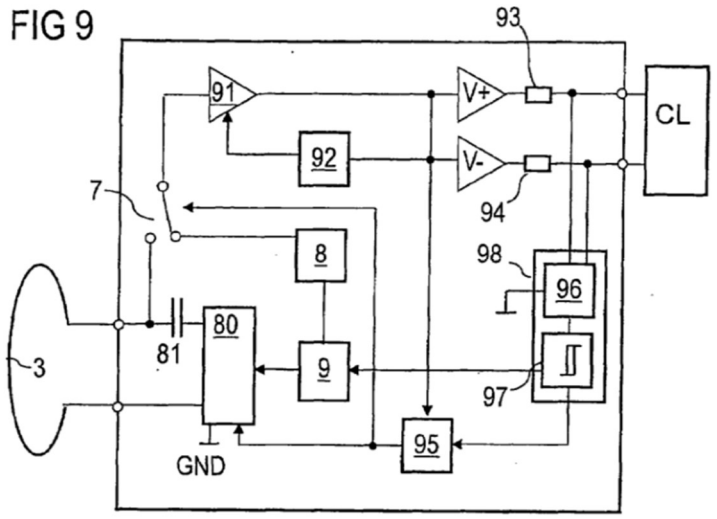
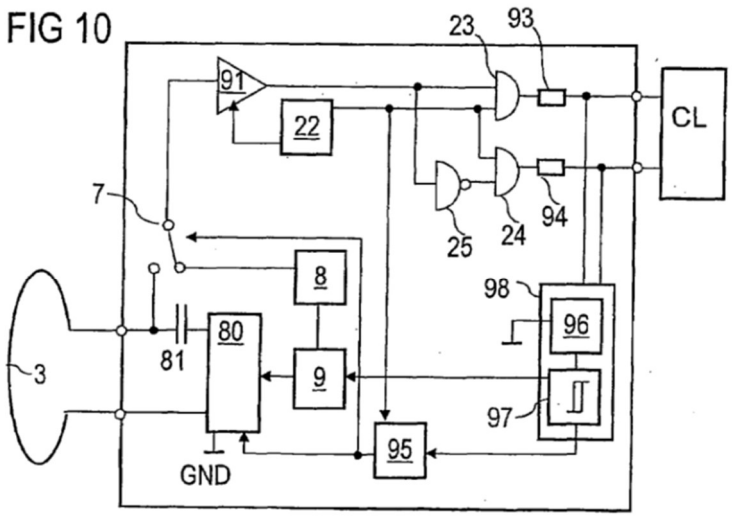
	modulation and an actively sending, second submode in which the load modulation is simulated. A thus improved NFC unit can also communicate with ordinary RFID reading devices over a higher range with the help of the changed passive operating mode. Since NFC units will already have certain units—such as an oscillator, an amplifier and a controller—for independent sending in their conventional active mode, comparatively few modifications of an NFC circuit are required to realize a circuit according to the present application in an NFC unit. Finkenzeller at [0131] The individual functional components of the transponder unit—antenna, interface unit, chip and optionally voltage supply unit—can be disposed in all sorts of combinations separately from each other or integrated jointly in one unit. An inventive transponder unit can be formed for example as a specially designed transponder, in a portable data carrier, in particular a chip card, which optionally has a battery. A portable data carrier, in particular SIM card, with a chip and an interface unit can be connected in a mobile terminal to an external voltage source and/or an external antenna. The interface unit can be disposed in a terminal, connected to its own or an external antenna, and communicate with a chip which is disposed reversibly or firmly in the terminal or temporarily on the terminal. Finkenzeller at claim 19 19. The transponder unit according to claim 16, including at least one antenna for transmitting the signal either or both from and to the reading device; a receiver for demodulating a signal transmitted from the reading device to extract data therefrom; and an electronic circuit which is set up to process the extracted data and to generate data to be sent to the reading device. *See also* Finkenzeller at [0107] and [0115]. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 5 above.
10. The mobile device of claim 5 wherein the mobile device comprises a mobile phone.	Finkenzeller discloses or renders obvious "[t]he mobile device of claim 5 wherein the mobile device comprises a mobile phone." *See* claim 4 above.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	See also claim 5 above.
11[pre]. A mobile device comprising:	By providing this disclosure, Defendants does not take a position on whether the preamble is a claim limitation. Finkenzeller discloses or renders obvious "[a] mobile device." *See* 1[pre] above.
[11a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Finkenzeller discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." *See* above at [1a]. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[11b] an antenna tuned to operate at 13.56 MHz;	Finkenzeller discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." *See* [1b] above.
[11c] an amplifier coupled to be powered by the mobile device, wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller; and	Finkenzeller discloses or renders obvious "an amplifier coupled to be powered by the mobile device, wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller." *See* [5c] above.
[11d] an active transmit driver circuit coupled between the smartcard controller and the antenna, wherein the active transmit driver circuit is coupled to be powered by the mobile device.	Finkenzeller discloses or renders obvious "an active transmit driver circuit coupled between the smartcard controller and the antenna, wherein the active transmit driver circuit is coupled to be powered by the mobile device." For example: Finkenzeller at Figure 2

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 2  Finkenzeller at Figure 8

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 8  Finkenzeller at Figure 9

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	 Finkenzeller at Figure 10

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	FIG 10  Finkenzeller at [0004] The range within which communication is possible in the system by data transfer can be increased by using active transponders, that is, transponders with their own energy supply. The energy supply of the active transponder, for example in form of a battery, operates its electronic circuit. Conventional transponders without their own energy supply are referred to as passive transponders, in contrast. Finkenzeller at [0010] According to the invention, a transponder unit sends a signal to a transponder reading device, which can communicate with the transponders by means of modulation of its own field by transponders, in such a way that the reading device can evaluate the signal as modulation by a conventional transponder. Instead of performing a load modulation or backscatter modulation of a field of the reading device, the transponder unit itself thus emits a field that simulates for the reading device a modulation of the reading device field by a transponder. An inventive transponder unit has means for sending the accordingly modulated signal. The total range of the system is consequently no longer limited by the communication range of the reading device, but is extended therebeyond up to a transmit range of the transponder unit. Finkenzeller at [0011]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	In an advantageous embodiment, an inventive RFID transponder unit has its own energy supply, at least one antenna for transmitting signals from and/or to a reading device, and an electronic circuit. The electronic circuit of the inventive transponder unit comprises a transmitter consisting of an oscillator and a modulator. Finkenzeller at [0015] Both modulators (ring modulator and ASK modulator) modulate the oscillator signal by means of the (modulated) data signal and deliver an output signal which is then transmitted to the reading device via the receive antenna or a separate transmitting antenna. Finkenzeller at [0017] A special advantage of using the described modulators is their compatibility to the prior art, since they deliver an output signal to be sent to the reading device whose (frequency and amplitude) spectrum is very similar to that of a load or backscatter modulation, as described above. Therefore, no technical changes must be performed on conventional reading devices. The inventive transponder can thus be operated with commercially available RFID reading devices, the communication range being many times that of passive or even active transponders. For example, a commercially available ISO 14443 reading device which can communicate with an inductively coupled, contactless chip card according to the prior art over a distance of approx. 10 cm could communicate with an inventive transponder unit over many times this distance. Finkenzeller at [0021] In a development, the inventive transponder unit has a load modulator according to the prior art, in addition to the above-described circuit having a receiver, a controller, an oscillator and a modulator. Finkenzeller at [0022] The voltage induced on the antenna of the transponder unit can be a problem for the operation of the inventive modulator circuits if the distance between trans-ponder unit and reading device is small and the induced voltage is therefore accordingly great. Therefore, the data to be sent to the reading device which are generated in the controller are supplied alternatively to the load modulator or to the inventive circuit configuration with a modulator. The switchover between the load modulator and the circuit configuration is preferably effected automatically, in dependence on the level of voltage induced on the antenna. The switchover is effected in such a way that the load modulator is used within the normal communication range, and the inventive modulator outside the normal communication range.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0027] The possibility of reading the inventive transponder unit over very large distances is not always desired, for example for privacy protection. It is therefore provided in one embodiment that the inventive circuit configuration can be activated manually if communication over a long range is explicitly desired. Otherwise, communication can be effected via a load modulator provided in the transponder unit, which is usable only for short distances. If no load modulator is provided in the trans-ponder unit, it can be provided for example that the transponder unit is activated for sending data only if the signal emitted by the reading device contains a predetermined code. Finkenzeller at [0048] The transponder unit 1 sends for data transfer to the reading device 100 a signal which the reading device 100 can evaluate as a signal of a transponder which carries out a load modulation of the field 110 of the reading device 100. Unlike the conventional transponders 200, 300 which modulate the field 110 of the reading device 100 into a modulated reading device field 102, 103, the transponder unit 1 thus generates and sends its own modulated field 20 as the signal for data transfer. The transponder unit 1 thus uses its own energy for the purpose of data transfer. Finkenzeller at [0055] FIG. 2 shows purely schematically the transponder unit 1, for example in the form of an inductively coupled chip card, which comprises the usual components not shown explicitly here. For simplification, only one inventive RFID transponder unit in a chip card is shown. The transponder unit has a battery 2, an inductive antenna 3 and an electronic circuit 4, 5, 6, 7. The electronic circuit consists substantially of three functional blocks, a receiver 4, a controller 5 and a transmitter 6. A switch 7 is used for switching the antenna 3 between the receiver 4 and the transmitter 6. Finkenzeller at [0056] The receiver 4 is provided for demodulating a signal transmitted from the reading device 100 to extract data therefrom. The extracted data are passed on to the controller 5 which processes them and generates data to be sent to the reading device 100. Furthermore, the controller 5 transmits a control signal to the switch 7 which switches between receive mode and transmit mode of the transponder unit. However, a separate antenna can instead be provided for sending. The controller 5 used can be for example a part of the operating system of a portable data carrier, such as a chip card.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0057] The transmitter 6 consists of an oscillator 8, a modulator, an execution as a ring modulator 9 first being described, and a terminal repeater 10. Furthermore, the transmitter 6 of the transponder unit shown in FIG. 2 is extended by an electronic assembly 11 for generating and modulating a subcarrier signal to carry out the data transfer from the transponder unit to a reading device 100 with a subcarrier signal. Depending on the use of the transponder unit, the subcarrier signal can have different frequencies, for example 848 kHz according to ISO 14443, 424 kHz according to ISO 15693 and 212 kHz for LEGIC, but might also be completely omitted. Finkenzeller at [0060] To supply the active components of the transponder unit at least partly with energy and to increase the energy range between the transponder unit 1 and the reading device 100, the inventive transponder unit has a battery 2. Finkenzeller at [0063] At the output of the ring modulator 9 an output signal is then available that contains the two modulation side bands and is identical (exactly enough) to a signal generated by load modulation or backscatter modulation. The output signal generated by the ring modulator 9 can then be optionally amplified by means of the amplifier 10, and be supplied to the antenna 3 for sending the data to be sent, via the switch 7 which is switched to the transmit mode of the transponder unit by a signal of the controller 5. Finkenzeller at [0065] The transponder unit 1 is operated in a first (active) operating mode as an actively sending transponder. In a second (passive) operating mode, however, the trans-ponder unit works like an ordinary passive transponder performing a load modulation on the field of the reading device. Finkenzeller at [0066] For example, the receiver 4 can additionally be formed as a conventional load modulator driven by the controller 5. The controller 5 then either switches the transmitter 6 on and the load modulator off, or the load modulator on and the transmitter 6 off. The switch 7 is switched accordingly. The criterion used for switching from a passive to an active operating state can be for example the received signal strength, the presence and/or sufficiency of an external voltage supply (on an optional connection Vcc not shown), or the sufficiency of an internal voltage supply (state of charge of the battery 2). It is thus for example

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	possible to first operate a transponder unit 1 passively and switch it to an active operating mode if for example the distance from the reading device unintentionally increases. Finkenzeller at [0073] Just as in the structure according to FIG. 2, the binary data signal A is combined with a subcarrier signal B by an AND gate 43. The combined signal is available at a ring modulator 49. The digital ring modulator 49 used can be an XOR element. Departing from the structure of the transmitter in FIG. 2, a carrier signal C is not applied directly to the input of the ring modulator 49. Instead, the carrier signal C is first combined with a data signal A in an AND gate 46. This arrangement obtains better efficiency, as to be described more closely below. The output signal of the ring modulator 49 is amplified in an amplifier 40 before being emitted via the antenna 3 as the field of the transponder unit. The signal types A to C will hereinafter be described more closely by way of example with reference to FIG. 5. Finkenzeller at [0076] The signal D emitted by an antenna 3 to a reading device has a frequency spectrum that is like a frequency spectrum resulting by means of load modulation. The signal D can optionally be amplified by means of an amplifier 40. The amplifier 40 can be for example a push-pull amplifier with digital push-pull output amplifiers. Finkenzeller at [0093] Both the interface module 71 and the chip 75 can draw their supply voltage from the device in which they are disposed preferably reversibly. The interface module 71 can act as an ordinary transponder in a second operating mode and supply the chip with an operating voltage Vcc_RF. Finkenzeller at [0096] The interface module 71 comprises an amplifier 80, an AND gate 89, an oscillator 88, a frequency divider 82, a signal shaper 84 and a switch 87. The amplifier 80 can be for example a push-pull amplifier with (digital) push-pull output amplifiers (not shown). The interface module also has two antenna connections LA and LB and a series capacitor 81. Furthermore, the interface module 71 has connections Vcc-in and GND for energy supply and a control input CTRL for switching between a transmit mode and a receive mode of the interface module by means of the switch 87. Finkenzeller at [0098]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	When the interface module is in the transmit mode, i.e. there is a contactless data transfer to an external reading device or an NFC device, a modulated subcarrier signal is fed in at the signal input SIGIN by the smart card chip and optionally inverted in an inverter 86. The inverted signal E is combined with a 13.56 MHz carrier frequency signal in the AND gate 89 as the carrier frequency modulator, and supplied to the amplifier 80. Finkenzeller at [0099] The antenna 3 and the series capacitor 81 form a series-resonant circuit which is connected to the outputs LA′ and LB′ of the amplifier 80, so that the HF current flowing in case of resonance is limited in the antenna resonant circuit only by the ohmic resistances in the lines and in the amplifier 80. This obtains a greatest possible transmit power of the interface module. Finkenzeller at [0100] Further, the smart card chip can be supplied a constant 13.56 MHz timing signal from the oscillator 88 via the output SIGOUT in the transmit mode via the switch 87, if it requires such an (external) timing signal for operation to keep exact timing. As described above, this is necessary for communication according to the standard ISO 14443 type A. Finkenzeller at [0103] The oscillator 88 generates the 13.56 MHz carrier frequency signal required in the transmit mode. If the oscillator cannot be switched off in the receive mode since its building-up transient might last too long, the oscillator is operated in the receive mode of the interface module preferably at a multiple N of the carrier frequency signal (e.g. 27.120 MHz) so as not to disturb the possibly weak received signal by crosstalk. In the transmit mode the required 13.56 MHz signal can then be generated by dividing the oscillator signal by N by means of an optional divider 82. Finkenzeller at [0112] As soon as the RFID chip CL has received and processed a command, it tries to send a response back to the remote reading device. For this purpose the RFID chip normally uses a load modulation, i.e. an additional parallel resistor in the chip is switched on and off in time with the modulation signal. This leads to measurable fluctuations in the voltage drop across the resistors 93, 94. In other words, the HF alternating voltage at the connections is modulated in amplitude. By the demodulator circuit 98 this amplitude-modulated alternating voltage signal is demodulated and the original modulation signal thus reconstructed again.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	Finkenzeller at [0118] However, a load modulation of the transponder chip CL is recognizable exclusively on the connections, but a modulation signal of the reading device already in the receive branch (91, 92, V+, V−) of the inventive circuit. It is therefore provided to switch the inventive circuit to the transmit mode only when a modulation signal (amplitude modulation) can be detected exclusively on the connections of the RFID chip CL and not in the receive branch, since only in this case is a load modulation involved. This is indicated in FIG. 9 by the signal fed into the controller 95 from the receive branch (91, 92, V+, V−). Finkenzeller at [0119] A second way of distinguishing is to evaluate the modulation depth of the signal on the connections of the RFID chip. By load modulation a modulation depth less than 100% is obtained. In the breadboard setup approx. 25% was determined, other values arise from combining different resistors 93, 94 with different RFID chips CL. It is therefore provided to distinguish between the load modulation and the modulation of the reading device by determining modulation depth with reference to given switching thresholds. If the strength of the modulation signal is above a first, high threshold, a signal from the reading device is present. If the modulation signal is smaller than the first switching threshold and optionally greater than a second switching threshold, however, it is recognized that a load modulation is present. A switch-over to the transmit mode is effected if the modulation was caused by a load modulation. Finkenzeller at [0127] It was ascertained that small antennas, e.g. in a SIM card with its own antenna (approx. 15×25 mm^2), obtain very low read ranges with a conventional load modulation. It is frequently even impossible to communicate with a contactless reading device when the SIM card with an antenna is disposed for example in a mobile telephone. If one of the inventive transmitters is used in a mobile terminal the range is not clearly increased. Moreover, it can be advantageously exploited that mobile terminals such as mobile telephones, PDAs, etc., have their own energy supply (battery) which can also be used for supplying an inventive circuit. Finkenzeller at [0129] Thus, an NFC unit could be adapted to behave according to the present solutions in its passive mode in the role ("being card") in which the NFC unit is to perform a load modulation. The NFC unit could for example always act as a component actively emitting its own field. Likewise, the NFC unit could also distinguish, and optionally switch, between a first submode corresponding to a conventional load

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
	modulation and an actively sending, second submode in which the load modulation is simulated. A thus improved NFC unit can also communicate with ordinary RFID reading devices over a higher range with the help of the changed passive operating mode. Since NFC units will already have certain units—such as an oscillator, an amplifier and a controller—for independent sending in their conventional active mode, comparatively few modifications of an NFC circuit are required to realize a circuit according to the present application in an NFC unit. Finkenzeller at [0131] The individual functional components of the transponder unit—antenna, interface unit, chip and optionally voltage supply unit—can be disposed in all sorts of combinations separately from each other or integrated jointly in one unit. An inventive transponder unit can be formed for example as a specially designed transponder, in a portable data carrier, in particular a chip card, which optionally has a battery. A portable data carrier, in particular SIM card, with a chip and an interface unit can be connected in a mobile terminal to an external voltage source and/or an external antenna. The interface unit can be disposed in a terminal, connected to its own or an external antenna, and communicate with a chip which is disposed reversibly or firmly in the terminal or temporarily on the terminal. Finkenzeller at claim 19 19. The transponder unit according to claim 16, including at least one antenna for transmitting the signal either or both from and to the reading device; a receiver for demodulating a signal transmitted from the reading device to extract data therefrom; and an electronic circuit which is set up to process the extracted data and to generate data to be sent to the reading device. *See also* Finkenzeller at [0107] and [0115]. *See* [5d] and claim 9 above. To the extent this limitation is not disclosed by Finkenzeller, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Finkenzeller, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
12. The mobile device of claim 11 wherein the antenna comprises an inductive element too small to draw enough power sufficient to	Finkenzeller discloses or renders obvious "[t]he mobile device of claim 11 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field."

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2009/0040022 ("Finkenzeller")
operate the smartcard controller from the interrogating radio frequency (RF) field.	*See* claim 2 above. *See also* claim 11 above.
13. The mobile device of claim 11 wherein the smartcard controller is coupled to be powered by the mobile device.	Finkenzeller discloses or renders obvious "[t]he mobile device of claim 11 wherein the smartcard controller is coupled to be powered by the mobile device." *See* claim 3 above. *See also* claim 11 above.
14. The mobile device of claim 11 wherein the mobile device comprises a mobile phone.	Finkenzeller discloses or renders obvious "[t]he mobile device of claim 11 wherein the mobile device comprises a mobile phone." *See* claim 4 above. *See also* claim 11 above.

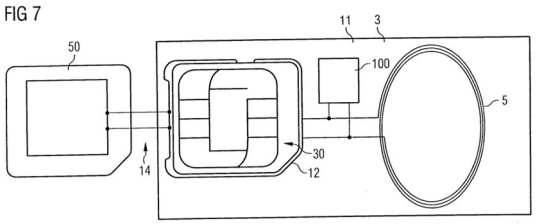
DEFENDANTS' INVALIDITY CONTENTIONS FOR U.S. PAT. 9,483,722

EXHIBIT B02: D.E. 102007019272 ("Gerstenberger")

As demonstrated in the claim charts below, the claims of U.S. Patent No. 9,483,722 ("the '722 patent") are invalid (a) under one or more sections of 35 U.S.C. § 102 as anticipated by Gerstenberger and (b) under 35 U.S.C. § 103(a) as obvious over Gerstenberger standing alone and as set forth herein, and/or combined with the knowledge of a person of ordinary skill in the art, Applicant's Admitted Prior Art, and/or the additional prior art references discussed in Exhibit B and Exhibits B01–B05, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '722 patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

Defendants have conducted the invalidity analysis herein based at least in part and in some instance entirely upon Plaintiff's apparent application of the claims of the '722 patent. By charting the prior art against the claims and limitations herein, Defendants are not admitting or agreeing to Plaintiff's application of the claims at issue in this case, and these charts should not be interpreted as an admission or concession by Defendants that any particular construction or application of any claim limitation by Plaintiff is correct or proper. Additionally, these charts provide representative examples of portions of the charted references that disclose the indicated limitations of the claims; additional portions of these references other than the representative examples provided herein may also disclose the indicated limitation(s) and Defendants contend that the asserted claims are invalid in light of the charted reference(s) as a whole in its or their entirety. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well.

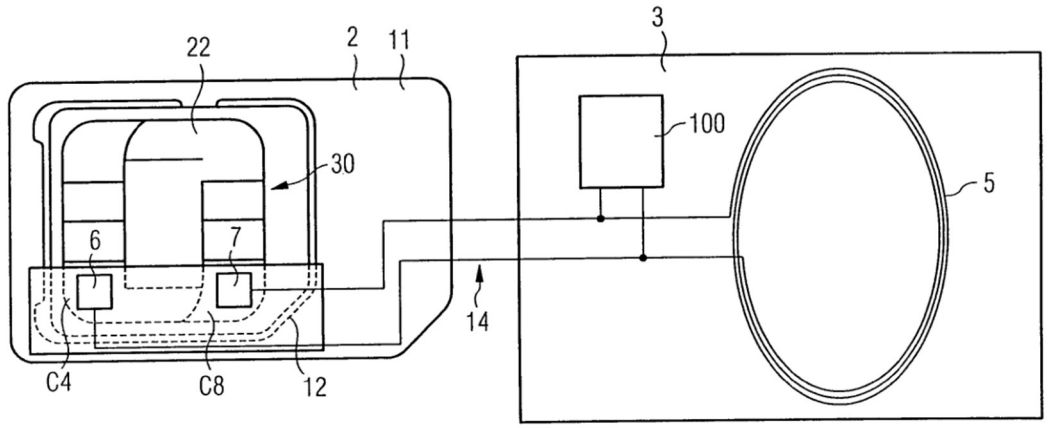
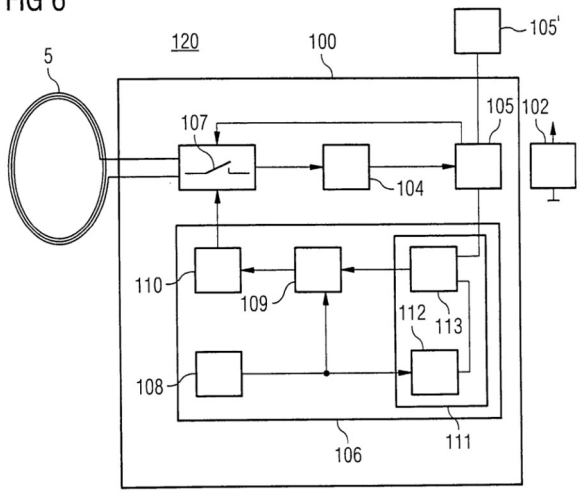
Claim Element	**Exemplary Citations to D.E. 102007019272 ("Gerstenberger")**
1[pre]. A mobile device comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is a claim limitation. Gerstenberger discloses or renders obvious "[a] mobile device." For example: Gerstenberger at Abstract The adapter (1) has a flexibly designed antenna holder (3) comprising an antenna (5) and an antenna connection connected with the antenna, where the antenna connection is arranged in an antenna connection holder (2). The connection holder is formed to cooperate with a flat side of a data carrier and formed as a foil. A data carrier holder is provided with an accommodation area for accommodating the data carrier, where the area is formed as a flat recess. An independent claim is also included for a system comprising a mobile phone and an antenna adapter. Gerstenberger at Figure 7

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	 Gerstenberger at [0001] The invention relates to the technical field of card-shaped data carriers with integrated circuits, which are equipped with an antenna for contactless functionalities. The invention further relates to a system comprising a mobile phone, a SIM card and such an antenna. Gerstenberger at [0002] Card-shaped data carriers with an integrated circuit, in particular chip cards or smart cards, which have an antenna for contactless communication with the integrated circuit of the data carrier, are known in a large number of different embodiments, for example as smart cards with contactless functionality for contactless payment transactions, for ski passes, for access controls or for the use of local public transport. Such functionalities can in principle also be implemented on SIM cards (subscriber identity module). SIM cards are chip cards in a smaller format, usually in the ID-000 format according to GSM11.11 and TS102.221 and are used in mobile phones to authenticate the mobile phone when logging into a mobile network. Since the SIM card is already present in the mobile phone, it makes sense to use the integrated circuit of the SIM card to implement additional contactless functionalities on the mobile phone. Gerstenberger at [0003] In addition to appropriate hardware and software adaptations, an antenna is required for the contactless functionality. Due to their small format, SIM cards do not offer enough space for an integrated antenna with the appropriate range. The location intended for the SIM card in the mobile phone may also be unfavorable for the antenna, for example because of shielding by neighboring components, such as a battery. This

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	problem can also occur in a similar way with electronic data storage devices of other types and forms that are used in other devices. Gerstenberger at [0004] In DE 10 2004 029 984 A1 it is proposed to design a portable data carrier, in particular a SIM card for mobile telephones, with an integrated antenna in such a way that the integrated circuit of the data carrier is arranged in a first flat-piece-like region and the antenna is arranged in a second flat-piece-like region, wherein the flat-piece-like antenna region is designed to be flexible. The first flat area has the usual dimensions of a standard SIM card and can be inserted into a mobile phone in the conventional way. The flat antenna area can be bent, for example around a cell phone battery, so that the antenna is not unnecessarily shielded by cell phone components. The surface of the flat-piece-like antenna region can accordingly be formed to be substantially larger than the first flat-piece-like region containing the integrated circuit. Gerstenberger at [0007] This object is achieved by an antenna adapter having the features of claim 1. A system comprising a mobile phone, a SIM card and such an antenna adapter is specified in claim 21. The dependent claims relate to advantageous developments and embodiments of the invention. Gerstenberger at [0008] With the aid of the antenna adapter according to the invention, conventional card-shaped data carriers with an integrated circuit, in particular SIM cards in the form of plug-ins or mini-plug-ins for mobile phones, can be equipped with an antenna for contactless data transfer over medium ranges (for example Near Field Communication NFC). The antenna adapter according to the invention comprises, in accordance with the prior art described above, an antenna which is arranged in a flat, flexible antenna holder, as well as an antenna connection connected to the antenna. Unlike in the prior art, however, the antenna connection is not designed as a plug connection, but is itself located in a flat antenna connection holder, which is connected to the antenna holder, for example, via a cable and which interacts with a flat side of the card-shaped data carrier in order to communicate with the integrated circuit of the data carrier. In this way, it is possible to use the interface device already present in the data carrier, via which the integrated circuit of the data carrier communicates with an external device, for communication with the antenna without any modification of the data carrier being necessary. Rather, conventional data storage devices can be upgraded for additional contactless functionality by appropriately placing the antenna adapter on one of its flat sides.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at [0018] The antenna holder carrying the antenna is significantly larger in area than the antenna connection holder and the data carrier holder. The antenna holder of an antenna adapter for a SIM card of a mobile phone is accordingly larger than the SIM card itself, but preferably smaller than the largest side surface of a battery of a mobile phone, so that the antenna holder can be placed on one side of the battery, while the SIM card is located, for example, under or next to the battery. Gerstenberger at [0035] Fig. 3 shows a second embodiment of an antenna adapter 1 according to the invention. Here, the antenna connection holder 2 is designed like a pocket so that the SIM card 20 can be inserted. The adhesive connection 9 can then be dispensed with. This also makes it easier to replace the SIM card 20. The antenna connection holder 2 is again formed by a film which is sufficiently thin that the SIM card 20 with the pocket-shaped antenna connection holder 2 can be inserted into a mobile phone without having to modify the device. It may be expedient to make the pocket open on two sides and, if necessary, to insert the SIM card 20 crosswise instead of lengthwise, as in Fig. 3. Gerstenberger at [0040] For shielding purposes, the antenna adapter 1 of the described embodiments can be designed in multiple layers at least in the area of the antenna holder 3 and, for example, can first have a copper foil and then a ferrite foil on a side facing an interference influence at the installation location. Such an antenna adapter is then particularly suitable for being folded around the battery of a mobile phone, for example. The SIM card 20 or the MiniPlugIn 30 are then located below the battery and the large antenna holder 3 is on the opposite side of the battery. If the battery and the SIM card 20 or the mini plug-in 30 are instead arranged next to one another within the mobile phone, depending on the situation as to whether the antenna holder 3 is to be located above or below the battery, it may be expedient to provide the aforementioned additional shielding layers on the other side of the antenna holder 3. Gerstenberger at [0042] For data transmission, the transponder unit sends a signal to a reader, which the reader can evaluate as a signal from a transponder that performs a load modulation of the reader's field. In contrast to conventional transponders, which modulate the reader field into a modulated reader field, the transponder unit generates and transmits its own modulated field as the data transmission signal. The transponder unit therefore uses its own energy for the purpose of data transmission.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at [0043] Fig. 6 shows schematically the actively transmitting transponder unit 120. The transponder unit has a power supply 102, the antenna 5 and the electronic circuit 100. The circuit 100 essentially consists of three functional blocks: a receiver 104, a controller 105 and a transmitter 106. A switch 107 is used to switch the antenna 5 between the receiver 104 and the transmitter 106. The energy supply 102 is normally provided by the battery of the mobile phone into which the data carrier to be coupled with the antenna adapter is inserted. But a simple battery can also serve this purpose. Gerstenberger at [0055] Fig. 7 illustrates a further embodiment of the antenna adapter 1 . The antenna holder 3 and the data carrier holder 11 are integrally formed therein. The circuit 100 is again flat and arranged on the antenna holder 3. The receiving area 12 of the data carrier holder 11 is designed as a base for receiving a SIM card 30 in the size of a mini plug-in. It is also possible to design the receiving area 12 to accommodate card-shaped data carriers of other formats. A device connector 50, which is connected to the receiving area 12 of the data carrier holder 11 via flexible separate cables 14, is inserted into the mobile phone instead of the SIM card and has a corresponding SIM card format. The SIM card 30 receives the signals necessary for operation, such as, for example, the status, via the flexible cables 14. B. VCC, GND, I/O, RESET, CLK, from the device connector 50 . The circuit 100 is supplied with energy from the battery of the mobile phone via the device connection 50. To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Gerstenberger discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." For example: Gerstenberger at Figure 5

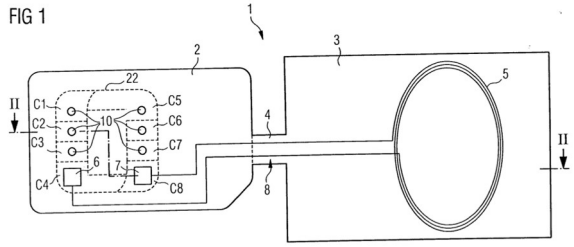
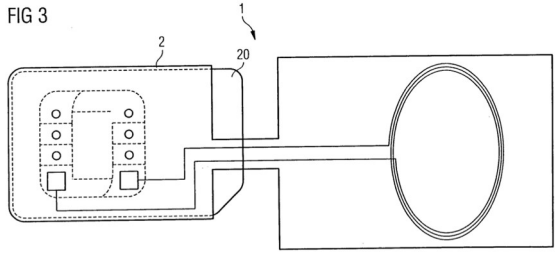
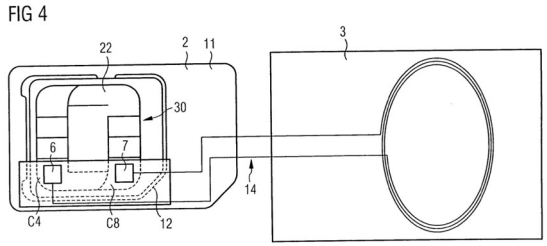
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	FIG 5  Gerstenberger at Figure 6 FIG 6 

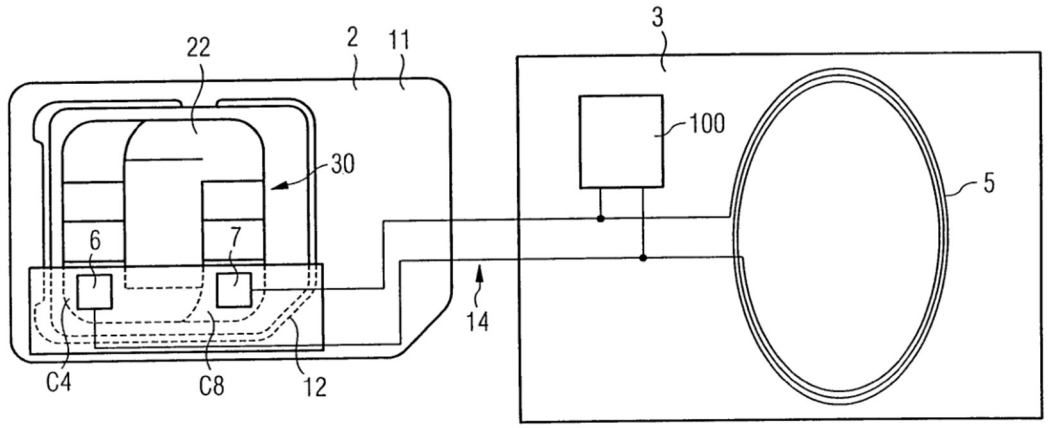
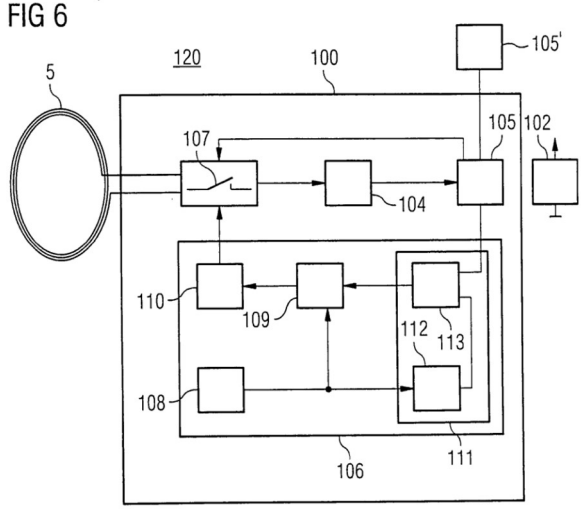
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at [0009] As a rule, such data carriers have a contact field with six or eight contact surfaces for contact-based data transfer, which are standardized and designated C1 to C8 according to the ISO/IEC 7816-2 standard. Of these contact surfaces, contact surfaces C4 and C8, for example, can be used for antenna contacting. If the integrated circuit of the data carrier has an S2C interface (an interface for NFC devices defined by Philips), the SIGIN connections for the signal input and SIGOUT for the signal output can be addressed equally via the contact surfaces C4 and C8. In the same way, the antenna connections of a dual-interface chip equipped with a passive RFID (radio frequency identification) interface can be contacted via the contact surfaces C4 and C8. Accordingly, the antenna connection holder of the antenna adapter is placed above the contact field in such a way that a galvanic contact is established between the antenna connection and the contact surfaces C4 and C8. Gerstenberger at [0042] For data transmission, the transponder unit sends a signal to a reader, which the reader can evaluate as a signal from a transponder that performs a load modulation of the reader's field. In contrast to conventional transponders, which modulate the reader field into a modulated reader field, the transponder unit generates and transmits its own modulated field as the data transmission signal. The transponder unit therefore uses its own energy for the purpose of data transmission. Gerstenberger at [0043] Fig. 6 shows schematically the actively transmitting transponder unit 120. The transponder unit has a power supply 102, the antenna 5 and the electronic circuit 100. The circuit 100 essentially consists of three functional blocks: a receiver 104, a controller 105 and a transmitter 106. A switch 107 is used to switch the antenna 5 between the receiver 104 and the transmitter 106. The energy supply 102 is normally provided by the battery of the mobile phone into which the data carrier to be coupled with the antenna adapter is inserted. But a simple battery can also serve this purpose. Gerstenberger at [0044] The receiver 104 is intended to demodulate a signal transmitted by the reader in order to extract data therefrom. The extracted data is forwarded to the controller 105, which processes it and generates data to be sent to the reader. Furthermore, the controller 105 transmits a control signal to the switch 107, which switches between receiving and transmitting operation of the transponder unit 120. However, a separate antenna

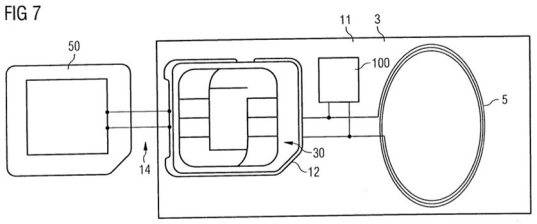
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	can also be provided for transmitting instead. The controller 105 can, for example, be supported or replaced by a part of the operating system 105' of the SIM card 30. Gerstenberger at [0045] The transmitter 106 consists of an oscillator 108, a modulator 109 and a power amplifier 110. Furthermore, the transmitter 106 is extended by an electronic assembly 111 for generating and modulating a subcarrier signal in order to carry out the data transmission from the transponder unit 120 to the reading device by means of the subcarrier signal. Depending on the use of the transponder unit, the subcarrier signal may have different frequencies or may even be omitted entirely. Gerstenberger at [0046] In the transponder unit 120 shown in Fig. 6, it is provided that the assembly 111 divides the oscillator frequency by a certain factor by means of a frequency divider 112, for example by binary division. The subcarrier signal generated thereby is modulated with the data to be transmitted, which are supplied to the module 111 by the controller 105. Gerstenberger at [0047] The modulation of the subcarrier in the module 111 is carried out, for example, in an AND gate 113 by a so-called 100% amplitude key shifting (ASK). The amplitude of the signal generated by frequency division is switched between two states ON and OFF based on the data to be sent. Alternatively, (B)PSK modulation (binary phase key shifting), for example according to ISO 14443 Type B, or FSK modulation (frequency key shifting) can be used. Gerstenberger at [0049] The ring modulator 109 has the special feature that it performs a special form of amplitude modulation. As with conventional amplitude modulation, two spectral lines are generated in the frequency spectrum at a distance of the frequency of the ASK-modulated signal around the frequency of the oscillator signal, the so-called carrier frequency. During amplitude modulation in the ring modulator 109, the carrier frequency of the strong and high-energy oscillator signal is largely suppressed. The data to be transmitted contained in the ASK-modulated signal are located in sidebands around the two spectral lines of the auxiliary frequency after the amplitude modulation in the ring modulator 109. Such modulation is called double-side band (DSB) modulation. Called double-side band suppressed carrier (DSSC) modulation. No data is transmitted using the carrier frequency. Rather, by using the ring modulator 109, which suppresses the carrier frequency, the goal of being able to send data to the reader either with low transmission power or

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	with a significantly greater range is achieved. The increased range is especially possible when the entire transmission power is put into the sidebands in which the data to be transmitted is located. The carrier frequency is basically required for demodulating the signal in order to extract the data transmitted by the transponder unit 120 in the reader. However, since the carrier frequency is present in the reader anyway, it is not necessary for the transponder signal itself to contain this frequency. Gerstenberger at [0050] An output signal is then available at the output of the ring modulator 109, which contains the two modulation sidebands and is combined with a signal generated by load modulation or The signal generated by the cross-section modulation matches (sufficiently accurately). The output signal generated by the ring modulator can then be amplified by means of an amplifier 110 if necessary and fed to the antenna 5 for sending the data to be sent via the switch 107, which is switched to transmission mode of the transponder unit 120 by a signal from the controller 105. Gerstenberger at [0051] The transponder unit 120 is operated in a first (active) operating mode as an actively transmitting transponder unit. In a second (passive) operating mode, the transponder unit works like a normal passive transponder, performing load modulation on the field of the reader. For example, the receiver 104 can additionally be designed as a conventional load modulator controlled by the controller 105. The controller then either switches the transmitter 106 on and the load modulator off or switches the transmitter 106 off and the load modulator on. The switch 107 is switched accordingly. The criteria for switching from a passive to an active operating state can be, for example, the received signal strength, the presence and/or sufficiency of an external power supply or the sufficiency of an internal power supply. It is thus possible, for example, to initially operate a transponder unit 120 passively and to switch to an active operating mode if, for example, the distance to the reader unintentionally increases. It can also be provided that the switching is carried out depending on the level of a voltage induced at the antenna 5, e.g. B. automatically when the induced voltage exceeds or falls below a certain value. Gerstenberger at claim 22 22. Antenna adapter (1) according to claim 21, characterized in that the circuit (100) is designed to transmit a signal which can be evaluated by an external reading device as a modulation by a transponder in order to transmit data to the reading device in a first operating mode. Gerstenberger at claim 23

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	23. Antenna adapter (1) according to claim 21 or 22, characterized in that the circuit (100) is arranged to modulate the field of an external reader in order to transmit data to the reader in a second operating mode. Gerstenberger at claim 26 26. Antenna adapter (1) according to one of claims 21 to 25, characterized in that the circuit (100) comprises a receiver (104) for demodulating a signal received from an external reader in order to extract data therefrom, and a controller (105) which is arranged to process the extracted data and to generate data to be sent to the reader. Gerstenberger at claim 30 30. Antenna adapter according to claim 29, characterized in that the circuit (100) comprises an electronic assembly (111) for modulating a subcarrier signal with a specific frequency by means of data to be transmitted generated in the controller (105) in order to supply the data to be transmitted to the modulator (109) as a modulated subcarrier signal. To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1b] an antenna tuned to operate at 13.56 MHz; and	Gerstenberger discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." For example: Gerstenberger at Abstract The adapter (1) has a flexibly designed antenna holder (3) comprising an antenna (5) and an antenna connection connected with the antenna, where the antenna connection is arranged in an antenna connection holder (2). The connection holder is formed to cooperate with a flat side of a data carrier and formed as a foil. A data carrier holder is provided with an accommodation area for accommodating the data carrier, where the area is formed as a flat recess. An independent claim is also included for a system comprising a mobile phone and an antenna adapter. Gerstenberger at Figure 1

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	 Gerstenberger at Figure 3  Gerstenberger at Figure 4  Gerstenberger at Figure 5

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	FIG 5  Gerstenberger at Figure 6 FIG 6 

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at Figure 7  Gerstenberger at [0001] The invention relates to the technical field of card-shaped data carriers with integrated circuits, which are equipped with an antenna for contactless functionalities. The invention further relates to a system comprising a mobile phone, a SIM card and such an antenna. Gerstenberger at [0002] Card-shaped data carriers with an integrated circuit, in particular chip cards or smart cards, which have an antenna for contactless communication with the integrated circuit of the data carrier, are known in a large number of different embodiments, for example as smart cards with contactless functionality for contactless payment transactions, for ski passes, for access controls or for the use of local public transport. Such functionalities can in principle also be implemented on SIM cards (subscriber identity module). SIM cards are chip cards in a smaller format, usually in the ID-000 format according to GSM11.11 and TS102.221 and are used in mobile phones to authenticate the mobile phone when logging into a mobile network. Since the SIM card is already present in the mobile phone, it makes sense to use the integrated circuit of the SIM card to implement additional contactless functionalities on the mobile phone. Gerstenberger at [0003] In addition to appropriate hardware and software adaptations, an antenna is required for the contactless functionality. Due to their small format, SIM cards do not offer enough space for an integrated antenna with the appropriate range. The location intended for the SIM card in the mobile phone may also be unfavorable

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	for the antenna, for example because of shielding by neighboring components, such as a battery. This problem can also occur in a similar way with electronic data storage devices of other types and forms that are used in other devices. Gerstenberger at [0004] In DE 10 2004 029 984 A1 it is proposed to design a portable data carrier, in particular a SIM card for mobile telephones, with an integrated antenna in such a way that the integrated circuit of the data carrier is arranged in a first flat-piece-like region and the antenna is arranged in a second flat-piece-like region, wherein the flat-piece-like antenna region is designed to be flexible. The first flat area has the usual dimensions of a standard SIM card and can be inserted into a mobile phone in the conventional way. The flat antenna area can be bent, for example around a cell phone battery, so that the antenna is not unnecessarily shielded by cell phone components. The surface of the flat-piece-like antenna region can accordingly be formed to be substantially larger than the first flat-piece-like region containing the integrated circuit. Gerstenberger at [0007] This object is achieved by an antenna adapter having the features of claim 1. A system comprising a mobile phone, a SIM card and such an antenna adapter is specified in claim 21. The dependent claims relate to advantageous developments and embodiments of the invention. Gerstenberger at [0008] With the aid of the antenna adapter according to the invention, conventional card-shaped data carriers with an integrated circuit, in particular SIM cards in the form of plug-ins or mini-plug-ins for mobile phones, can be equipped with an antenna for contactless data transfer over medium ranges (for example Near Field Communication NFC). The antenna adapter according to the invention comprises, in accordance with the prior art described above, an antenna which is arranged in a flat, flexible antenna holder, as well as an antenna connection connected to the antenna. Unlike in the prior art, however, the antenna connection is not designed as a plug connection, but is itself located in a flat antenna connection holder, which is connected to the antenna holder, for example, via a cable and which interacts with a flat side of the card-shaped data carrier in order to communicate with the integrated circuit of the data carrier. In this way, it is possible to use the interface device already present in the data carrier, via which the integrated circuit of the data carrier communicates with an external device, for communication with the antenna without any modification of the data carrier being necessary. Rather, conventional data storage devices can be upgraded for additional contactless functionality by appropriately placing the antenna adapter on one of its flat sides.

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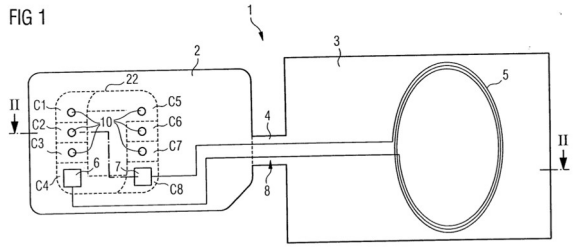
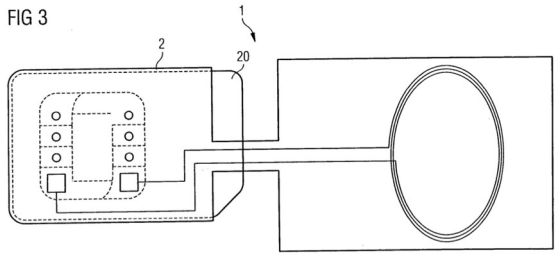
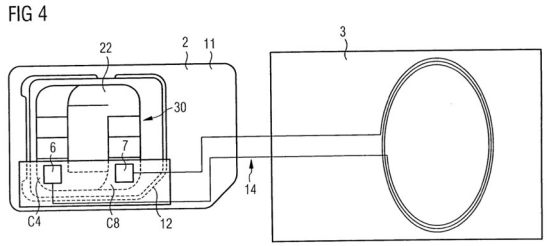
	Gerstenberger at [0009] As a rule, such data carriers have a contact field with six or eight contact surfaces for contact-based data transfer, which are standardized and designated C1 to C8 according to the ISO/IEC 7816-2 standard. Of these contact surfaces, contact surfaces C4 and C8, for example, can be used for antenna contacting. If the integrated circuit of the data carrier has an S2C interface (an interface for NFC devices defined by Philips), the SIGIN connections for the signal input and SIGOUT for the signal output can be addressed equally via the contact surfaces C4 and C8. In the same way, the antenna connections of a dual-interface chip equipped with a passive RFID (radio frequency identification) interface can be contacted via the contact surfaces C4 and C8. Accordingly, the antenna connection holder of the antenna adapter is placed above the contact field in such a way that a galvanic contact is established between the antenna connection and the contact surfaces C4 and C8. Gerstenberger at [0010] Other data carriers are only or additionally (dual interface card) equipped with a contactless interface for contactless data transfer, e.g. B. according to ISO/IEC. The antenna adapter can also communicate with such an interface, which usually works inductively or capacitively, if the antenna connection is designed accordingly for contactless data transfer and is placed in the reception/reading area of the data carrier's interface. Gerstenberger at [0011] The antenna connection holder can be easily designed as a film, for example made of polyimide. A film only adds insignificantly to the overall thickness of the card-shaped data carrier and will generally not hinder the use of the data carrier in the usual device-side data carrier holders. Preferably, the antenna connection holder is designed as an adhesive label, optionally covered by a removable adhesive protective film, so that the antenna connection holder can be easily applied to the flat side of the card-shaped data carrier above the data carrier interface after removing the protective film. Gerstenberger at [0012] In order to facilitate the exact positioning of the antenna connection holder, it is advantageous if the peripheral contour of the antenna connection holder corresponds to the dimensions of the data carrier. In the case of a SIM card, the peripheral contours have ID-000 format and in the case of a mini-plug-in, the size of the 3rd form factor. Gerstenberger at [0014]

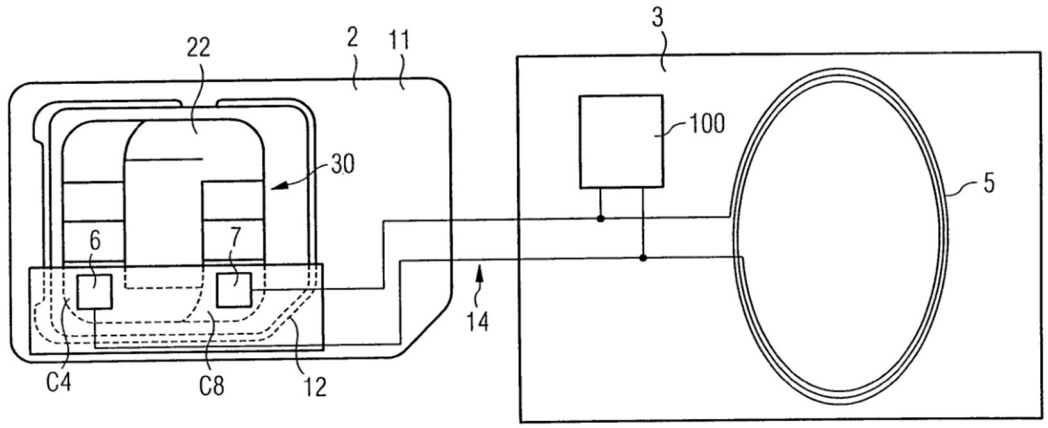
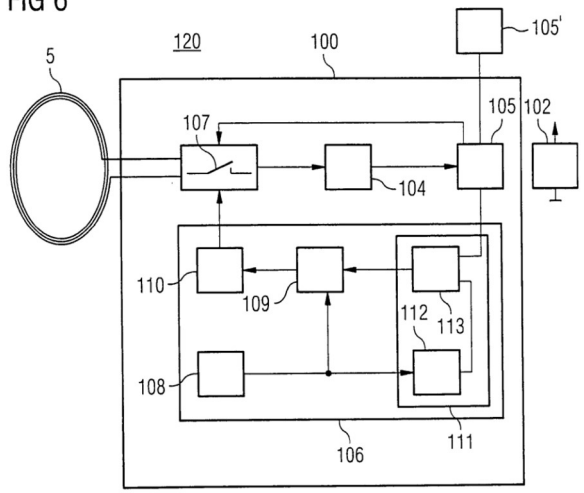
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	According to a preferred embodiment of the invention, the antenna adapter has a flat-piece-like data carrier holder with a receiving area for receiving the data carrier. The flat piece-like data carrier holder and the flat piece-like antenna holder can also be realized as an integrally formed flat piece. In the latter case, if the contact surfaces of the data carrier are covered by the data carrier holder during use, the through-holes of the antenna connection used for external contacting are located in the receiving area of the data carrier holder used to hold the data carrier. Gerstenberger at [0017] If the antenna connection holder is not implemented together with the data carrier holder as an integrally formed flat piece, the antenna connection holder, for example in a foil design, is attached at a suitable location above a flat side of the data carrier arranged in the receiving area of the card carrier holder. The data carrier holder and the antenna connection holder can form a pocket for the data carrier. In particular, it is within the scope of the invention if the antenna connection holder is connected, for example glued, to the data carrier holder only after the data carrier has been inserted into the receptacle of the data carrier holder. Gerstenberger at [0018] The antenna holder carrying the antenna is significantly larger in area than the antenna connection holder and the data carrier holder. The antenna holder of an antenna adapter for a SIM card of a mobile phone is accordingly larger than the SIM card itself, but preferably smaller than the largest side surface of a battery of a mobile phone, so that the antenna holder can be placed on one side of the battery, while the SIM card is located, for example, under or next to the battery. Gerstenberger at [0024] Fig. 1 shows a first embodiment of an antenna adapter according to the invention with SIM card schematically in plan view, Gerstenberger at [0028] Fig. 5 shows a fourth embodiment of an antenna adapter according to the invention, similar to that in Fig. 4, with a circuit for actively transmitting a signal, Gerstenberger at [0032]

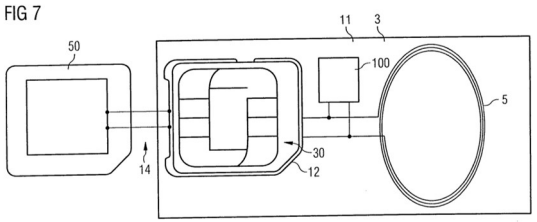
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	The antenna adapter 1 consists of the antenna connection holder 2, an antenna holder 3 and a web 4 connecting the antenna connection holder 2 to the antenna holder 3. B. are formed from a common polyimide film. The web 4 can also be wider and correspond, for example, to the width of the SIM card 2. The antenna holder 3 carries a coil antenna 5 with several turns, and the antenna connection holder 2 carries an antenna connection formed from two contacts 6 and 7, which is galvanically connected to the antenna 5 via a two-wire connecting cable 8. Gerstenberger at [0033] The peripheral contour of the antenna connection holder 2 corresponds to the shape of the SIM card 20 in ID-000 format. It can also be made smaller and must be designed at least in such a way that it can be attached with its contact connections 6, 7 above the contact surfaces C4, C8 of the contact field 22. In the illustrated embodiment, the antenna connection holder 2 is designed as an adhesive label so that it is firmly connected to the upper flat side of the SIM card 20 via an adhesive layer 9. The adhesive layer 9 is penetrated by the contact terminals 6, 7 so that they contact the contact surfaces C4, C8 of the SIM card 20. At the remaining contact surfaces C1 to C3 and C5 to C7, there are through-holes 10 in the antenna connection holder 2, so that contacting of the SIM card 20 with external interfaces remains possible. This means that the top of the film recreates the covered SIM contacts so that the SIM card in the mobile phone works properly. Gerstenberger at [0035] Fig. 3 shows a second embodiment of an antenna adapter 1 according to the invention. Here, the antenna connection holder 2 is designed like a pocket so that the SIM card 20 can be inserted. The adhesive connection 9 can then be dispensed with. This also makes it easier to replace the SIM card 20. The antenna connection holder 2 is again formed by a film which is sufficiently thin that the SIM card 20 with the pocket-shaped antenna connection holder 2 can be inserted into a mobile phone without having to modify the device. It may be expedient to make the pocket open on two sides and, if necessary, to insert the SIM card 20 crosswise instead of lengthwise, as in Fig. 3. Gerstenberger at [0040] For shielding purposes, the antenna adapter 1 of the described embodiments can be designed in multiple layers at least in the area of the antenna holder 3 and, for example, can first have a copper foil and then a ferrite foil on a side facing an interference influence at the installation location.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Such an antenna adapter is then particularly suitable for being folded around the battery of a mobile phone, for example. The SIM card 20 or the MiniPlugIn 30 are then located below the battery and the large antenna holder 3 is on the opposite side of the battery. If the battery and the SIM card 20 or the mini plug-in 30 are instead arranged next to one another within the mobile phone, depending on the situation as to whether the antenna holder 3 is to be located above or below the battery, it may be expedient to provide the aforementioned additional shielding layers on the other side of the antenna holder 3. Gerstenberger at [0043] Fig. 6 shows schematically the actively transmitting transponder unit 120. The transponder unit has a power supply 102, the antenna 5 and the electronic circuit 100. The circuit 100 essentially consists of three functional blocks: a receiver 104, a controller 105 and a transmitter 106. A switch 107 is used to switch the antenna 5 between the receiver 104 and the transmitter 106. The energy supply 102 is normally provided by the battery of the mobile phone into which the data carrier to be coupled with the antenna adapter is inserted. But a simple battery can also serve this purpose. Gerstenberger at [0050] An output signal is then available at the output of the ring modulator 109, which contains the two modulation sidebands and is combined with a signal generated by load modulation or The signal generated by the cross-section modulation matches (sufficiently accurately). The output signal generated by the ring modulator can then be amplified by means of an amplifier 110 if necessary and fed to the antenna 5 for sending the data to be sent via the switch 107, which is switched to transmission mode of the transponder unit 120 by a signal from the controller 105. Gerstenberger at [0055] Fig. 7 illustrates a further embodiment of the antenna adapter 1 . The antenna holder 3 and the data carrier holder 11 are integrally formed therein. The circuit 100 is again flat and arranged on the antenna holder 3. The receiving area 12 of the data carrier holder 11 is designed as a base for receiving a SIM card 30 in the size of a mini plug-in. It is also possible to design the receiving area 12 to accommodate card-shaped data carriers of other formats. A device connector 50, which is connected to the receiving area 12 of the data carrier holder 11 via flexible separate cables 14, is inserted into the mobile phone instead of the SIM card and has a corresponding SIM card format. The SIM card 30 receives the signals necessary for operation, such as, for example, the status, via the flexible cables 14. B. VCC, GND, I/O, RESET, CLK, from the device connector 50 . The circuit 100 is supplied with energy from the battery of the mobile phone via the device connection 50.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at claim 21 21. Antenna adapter (1) according to one of claims 1 to 20, characterized by a circuit (100) which is designed to form an actively transmitting transponder unit (120) together with the antenna (5) and an integrated circuit of the card-shaped data carrier (20; 30) to be coupled to the antenna adapter (1). Gerstenberger at claim 37 37. System comprising a mobile radio telephone, a SIM card (20; 30) with an integrated circuit, an antenna adapter (1) according to one of claims 1 to 20 and a circuit (100) which, together with the antenna (5) of the antenna adapter (1) and the integrated circuit of the SIM card (20; 30), forms an actively transmitting transponder unit (120), wherein the circuit (100) is arranged integrated in the card-shaped data carrier (20; 30). *See also* Gerstenberger at [0041], [0044], and [0051]. To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1c] at least one active circuit coupled between the smartcard controller and the antenna, wherein the at least one active circuit includes an amplifier coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller, and the at least one active circuit further includes a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one	Gerstenberger discloses or renders obvious "at least one active circuit coupled between the smartcard controller and the antenna, wherein the at least one active circuit includes an amplifier coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller, and the at least one active circuit further includes a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna." For example: Gerstenberger at Abstract The adapter (1) has a flexibly designed antenna holder (3) comprising an antenna (5) and an antenna connection connected with the antenna, where the antenna connection is arranged in an antenna connection holder (2). The connection holder is formed to cooperate with a flat side of a data carrier and formed as a foil. A data carrier holder is provided with an accommodation area for accommodating the data carrier, where the area is formed as a flat recess. An independent claim is also included for a system comprising a mobile phone and an antenna adapter. Gerstenberger at Figure 1

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
frequency sideband and wherein the signal drives the antenna.	 Gerstenberger at Figure 3  Gerstenberger at Figure 4  Gerstenberger at Figure 5

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	FIG 5  Gerstenberger at Figure 6 FIG 6 

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at Figure 7  Gerstenberger at [0001] The invention relates to the technical field of card-shaped data carriers with integrated circuits, which are equipped with an antenna for contactless functionalities. The invention further relates to a system comprising a mobile phone, a SIM card and such an antenna. Gerstenberger at [0002] Card-shaped data carriers with an integrated circuit, in particular chip cards or smart cards, which have an antenna for contactless communication with the integrated circuit of the data carrier, are known in a large number of different embodiments, for example as smart cards with contactless functionality for contactless payment transactions, for ski passes, for access controls or for the use of local public transport. Such functionalities can in principle also be implemented on SIM cards (subscriber identity module). SIM cards are chip cards in a smaller format, usually in the ID-000 format according to GSM11.11 and TS102.221 and are used in mobile phones to authenticate the mobile phone when logging into a mobile network. Since the SIM card is already present in the mobile phone, it makes sense to use the integrated circuit of the SIM card to implement additional contactless functionalities on the mobile phone. Gerstenberger at [0003] In addition to appropriate hardware and software adaptations, an antenna is required for the contactless functionality. Due to their small format, SIM cards do not offer enough space for an integrated antenna with the appropriate range. The location intended for the SIM card in the mobile phone may also be unfavorable

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	for the antenna, for example because of shielding by neighboring components, such as a battery. This problem can also occur in a similar way with electronic data storage devices of other types and forms that are used in other devices. Gerstenberger at [0004] In DE 10 2004 029 984 A1 it is proposed to design a portable data carrier, in particular a SIM card for mobile telephones, with an integrated antenna in such a way that the integrated circuit of the data carrier is arranged in a first flat-piece-like region and the antenna is arranged in a second flat-piece-like region, wherein the flat-piece-like antenna region is designed to be flexible. The first flat area has the usual dimensions of a standard SIM card and can be inserted into a mobile phone in the conventional way. The flat antenna area can be bent, for example around a cell phone battery, so that the antenna is not unnecessarily shielded by cell phone components. The surface of the flat-piece-like antenna region can accordingly be formed to be substantially larger than the first flat-piece-like region containing the integrated circuit. Gerstenberger at [0007] This object is achieved by an antenna adapter having the features of claim 1. A system comprising a mobile phone, a SIM card and such an antenna adapter is specified in claim 21. The dependent claims relate to advantageous developments and embodiments of the invention. Gerstenberger at [0008] With the aid of the antenna adapter according to the invention, conventional card-shaped data carriers with an integrated circuit, in particular SIM cards in the form of plug-ins or mini-plug-ins for mobile phones, can be equipped with an antenna for contactless data transfer over medium ranges (for example Near Field Communication NFC). The antenna adapter according to the invention comprises, in accordance with the prior art described above, an antenna which is arranged in a flat, flexible antenna holder, as well as an antenna connection connected to the antenna. Unlike in the prior art, however, the antenna connection is not designed as a plug connection, but is itself located in a flat antenna connection holder, which is connected to the antenna holder, for example, via a cable and which interacts with a flat side of the card-shaped data carrier in order to communicate with the integrated circuit of the data carrier. In this way, it is possible to use the interface device already present in the data carrier, via which the integrated circuit of the data carrier communicates with an external device, for communication with the antenna without any modification of the data carrier being necessary. Rather, conventional data storage devices can be upgraded for additional contactless functionality by appropriately placing the antenna adapter on one of its flat sides.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at [0009] As a rule, such data carriers have a contact field with six or eight contact surfaces for contact-based data transfer, which are standardized and designated C1 to C8 according to the ISO/IEC 7816-2 standard. Of these contact surfaces, contact surfaces C4 and C8, for example, can be used for antenna contacting. If the integrated circuit of the data carrier has an S2C interface (an interface for NFC devices defined by Philips), the SIGIN connections for the signal input and SIGOUT for the signal output can be addressed equally via the contact surfaces C4 and C8. In the same way, the antenna connections of a dual-interface chip equipped with a passive RFID (radio frequency identification) interface can be contacted via the contact surfaces C4 and C8. Accordingly, the antenna connection holder of the antenna adapter is placed above the contact field in such a way that a galvanic contact is established between the antenna connection and the contact surfaces C4 and C8. Gerstenberger at [0010] Other data carriers are only or additionally (dual interface card) equipped with a contactless interface for contactless data transfer, e.g. B. according to ISO/IEC. The antenna adapter can also communicate with such an interface, which usually works inductively or capacitively, if the antenna connection is designed accordingly for contactless data transfer and is placed in the reception/reading area of the data carrier's interface. Gerstenberger at [0011] The antenna connection holder can be easily designed as a film, for example made of polyimide. A film only adds insignificantly to the overall thickness of the card-shaped data carrier and will generally not hinder the use of the data carrier in the usual device-side data carrier holders. Preferably, the antenna connection holder is designed as an adhesive label, optionally covered by a removable adhesive protective film, so that the antenna connection holder can be easily applied to the flat side of the card-shaped data carrier above the data carrier interface after removing the protective film. Gerstenberger at [0012] In order to facilitate the exact positioning of the antenna connection holder, it is advantageous if the peripheral contour of the antenna connection holder corresponds to the dimensions of the data carrier. In the case of a SIM card, the peripheral contours have ID-000 format and in the case of a mini-plug-in, the size of the 3rd form factor. Gerstenberger at [0014]

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	According to a preferred embodiment of the invention, the antenna adapter has a flat-piece-like data carrier holder with a receiving area for receiving the data carrier. The flat piece-like data carrier holder and the flat piece-like antenna holder can also be realized as an integrally formed flat piece. In the latter case, if the contact surfaces of the data carrier are covered by the data carrier holder during use, the through-holes of the antenna connection used for external contacting are located in the receiving area of the data carrier holder used to hold the data carrier. Gerstenberger at [0017] If the antenna connection holder is not implemented together with the data carrier holder as an integrally formed flat piece, the antenna connection holder, for example in a foil design, is attached at a suitable location above a flat side of the data carrier arranged in the receiving area of the card carrier holder. The data carrier holder and the antenna connection holder can form a pocket for the data carrier. In particular, it is within the scope of the invention if the antenna connection holder is connected, for example glued, to the data carrier holder only after the data carrier has been inserted into the receptacle of the data carrier holder. Gerstenberger at [0018] The antenna holder carrying the antenna is significantly larger in area than the antenna connection holder and the data carrier holder. The antenna holder of an antenna adapter for a SIM card of a mobile phone is accordingly larger than the SIM card itself, but preferably smaller than the largest side surface of a battery of a mobile phone, so that the antenna holder can be placed on one side of the battery, while the SIM card is located, for example, under or next to the battery. Gerstenberger at [0021] However, due to the location intended for installation of an antenna for a SIM card between the battery of the mobile phone and the battery cover, in some cases there is not enough space for such a shield with sufficient thickness. Furthermore, the shape and/or material of the shielding layer must be selected differently depending on the type of mobile phone into which the antenna is to be inserted, which prevents cost-effective, uniform production. In order to take this circumstance into account, the antenna adapter can, according to a preferred embodiment of the invention, contain a circuit which, together with the antenna and the integrated circuit of the data carrier, forms an actively transmitting transponder unit in order to be usable even in cramped installation conditions. The circuit is coupled to the antenna and the antenna connector.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. In a preferred embodiment, the circuit is flat and arranged on the antenna holder of the antenna adapter. The circuit requires practically no additional space and can therefore be used advantageously. Gerstenberger at [0024] Fig. 1 shows a first embodiment of an antenna adapter according to the invention with SIM card schematically in plan view, Gerstenberger at [0028] Fig. 5 shows a fourth embodiment of an antenna adapter according to the invention, similar to that in Fig. 4, with a circuit for actively transmitting a signal, Gerstenberger at [0032] The antenna adapter 1 consists of the antenna connection holder 2, an antenna holder 3 and a web 4 connecting the antenna connection holder 2 to the antenna holder 3. B. are formed from a common polyimide film. The web 4 can also be wider and correspond, for example, to the width of the SIM card 2. The antenna holder 3 carries a coil antenna 5 with several turns, and the antenna connection holder 2 carries an antenna connection formed from two contacts 6 and 7, which is galvanically connected to the antenna 5 via a two-wire connecting cable 8. Gerstenberger at [0033] The peripheral contour of the antenna connection holder 2 corresponds to the shape of the SIM card 20 in ID-000 format. It can also be made smaller and must be designed at least in such a way that it can be attached with its contact connections 6, 7 above the contact surfaces C4, C8 of the contact field 22. In the illustrated embodiment, the antenna connection holder 2 is designed as an adhesive label so that it is firmly connected to the upper flat side of the SIM card 20 via an adhesive layer 9. The adhesive layer 9 is penetrated by the contact terminals 6, 7 so that they contact the contact surfaces C4, C8 of the SIM card 20. At the remaining contact surfaces C1 to C3 and C5 to C7, there are through-holes 10 in the antenna connection holder 2, so that contacting of the SIM card 20 with external interfaces remains possible. This means that the top of the film recreates the covered SIM contacts so that the SIM card in the mobile phone works properly.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at [0035] Fig. 3 shows a second embodiment of an antenna adapter 1 according to the invention. Here, the antenna connection holder 2 is designed like a pocket so that the SIM card 20 can be inserted. The adhesive connection 9 can then be dispensed with. This also makes it easier to replace the SIM card 20. The antenna connection holder 2 is again formed by a film which is sufficiently thin that the SIM card 20 with the pocket-shaped antenna connection holder 2 can be inserted into a mobile phone without having to modify the device. It may be expedient to make the pocket open on two sides and, if necessary, to insert the SIM card 20 crosswise instead of lengthwise, as in Fig. 3. Gerstenberger at [0040] For shielding purposes, the antenna adapter 1 of the described embodiments can be designed in multiple layers at least in the area of the antenna holder 3 and, for example, can first have a copper foil and then a ferrite foil on a side facing an interference influence at the installation location. Such an antenna adapter is then particularly suitable for being folded around the battery of a mobile phone, for example. The SIM card 20 or the MiniPlugIn 30 are then located below the battery and the large antenna holder 3 is on the opposite side of the battery. If the battery and the SIM card 20 or the mini plug-in 30 are instead arranged next to one another within the mobile phone, depending on the situation as to whether the antenna holder 3 is to be located above or below the battery, it may be expedient to provide the aforementioned additional shielding layers on the other side of the antenna holder 3. Gerstenberger at [0041] A further embodiment, shown here on the basis of the embodiment according to Fig. 4, can be seen in Fig. 5 and comprises a circuit 100 which, together with the antenna 5 and the integrated circuit of the mini-plug-in 30, forms an actively transmitting transponder unit. The circuit 100 is flat and arranged on the antenna holder 3. It is also possible to integrate the circuit 100 into the plastic module of the data carrier (20; 30) to be coupled to the antenna adapter 1. In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. Gerstenberger at [0042] For data transmission, the transponder unit sends a signal to a reader, which the reader can evaluate as a signal from a transponder that performs a load modulation of the reader's field.

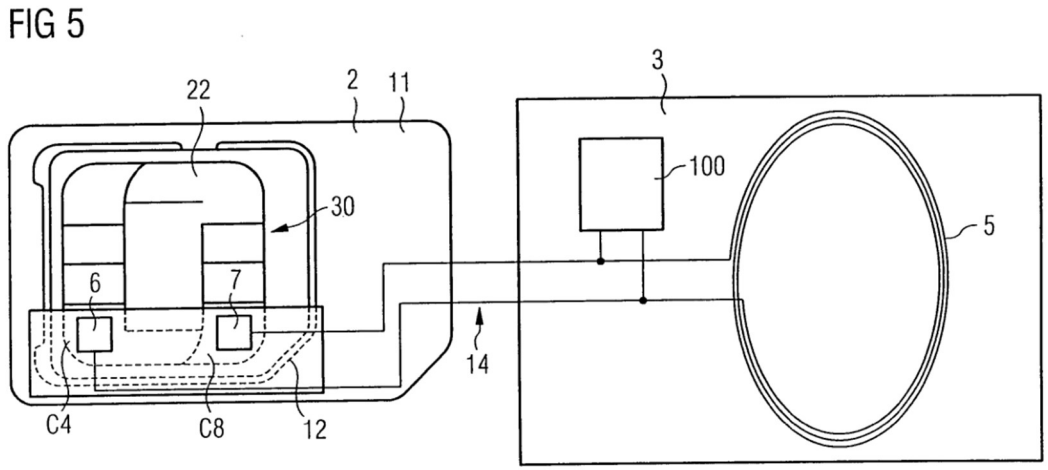
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	In contrast to conventional transponders, which modulate the reader field into a modulated reader field, the transponder unit generates and transmits its own modulated field as the data transmission signal. The transponder unit therefore uses its own energy for the purpose of data transmission. Gerstenberger at [0043] Fig. 6 shows schematically the actively transmitting transponder unit 120. The transponder unit has a power supply 102, the antenna 5 and the electronic circuit 100. The circuit 100 essentially consists of three functional blocks: a receiver 104, a controller 105 and a transmitter 106. A switch 107 is used to switch the antenna 5 between the receiver 104 and the transmitter 106. The energy supply 102 is normally provided by the battery of the mobile phone into which the data carrier to be coupled with the antenna adapter is inserted. But a simple battery can also serve this purpose. Gerstenberger at [0044] The receiver 104 is intended to demodulate a signal transmitted by the reader in order to extract data therefrom. The extracted data is forwarded to the controller 105, which processes it and generates data to be sent to the reader. Furthermore, the controller 105 transmits a control signal to the switch 107, which switches between receiving and transmitting operation of the transponder unit 120. However, a separate antenna can also be provided for transmitting instead. The controller 105 can, for example, be supported or replaced by a part of the operating system 105' of the SIM card 30. Gerstenberger at [0045] The transmitter 106 consists of an oscillator 108, a modulator 109 and a power amplifier 110. Furthermore, the transmitter 106 is extended by an electronic assembly 111 for generating and modulating a subcarrier signal in order to carry out the data transmission from the transponder unit 120 to the reading device by means of the subcarrier signal. Depending on the use of the transponder unit, the subcarrier signal may have different frequencies or may even be omitted entirely. Gerstenberger at [0046] In the transponder unit 120 shown in Fig. 6, it is provided that the assembly 111 divides the oscillator frequency by a certain factor by means of a frequency divider 112, for example by binary division. The subcarrier signal generated thereby is modulated with the data to be transmitted, which are supplied to the module 111 by the controller 105. Gerstenberger at [0047]

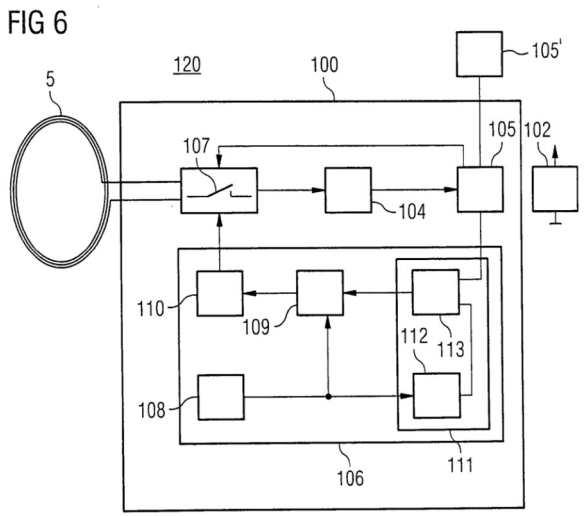
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	The modulation of the subcarrier in the module 111 is carried out, for example, in an AND gate 113 by a so-called 100% amplitude key shifting (ASK). The amplitude of the signal generated by frequency division is switched between two states ON and OFF based on the data to be sent. Alternatively, (B)PSK modulation (binary phase key shifting), for example according to ISO 14443 Type B, or FSK modulation (frequency key shifting) can be used. Gerstenberger at [0049] The ring modulator 109 has the special feature that it performs a special form of amplitude modulation. As with conventional amplitude modulation, two spectral lines are generated in the frequency spectrum at a distance of the frequency of the ASK-modulated signal around the frequency of the oscillator signal, the so-called carrier frequency. During amplitude modulation in the ring modulator 109, the carrier frequency of the strong and high-energy oscillator signal is largely suppressed. The data to be transmitted contained in the ASK-modulated signal are located in sidebands around the two spectral lines of the auxiliary frequency after the amplitude modulation in the ring modulator 109. Such modulation is called double-side band (DSB) modulation. Called double-side band suppressed carrier (DSSC) modulation. No data is transmitted using the carrier frequency. Rather, by using the ring modulator 109, which suppresses the carrier frequency, the goal of being able to send data to the reader either with low transmission power or with a significantly greater range is achieved. The increased range is especially possible when the entire transmission power is put into the sidebands in which the data to be transmitted is located. The carrier frequency is basically required for demodulating the signal in order to extract the data transmitted by the transponder unit 120 in the reader. However, since the carrier frequency is present in the reader anyway, it is not necessary for the transponder signal itself to contain this frequency. Gerstenberger at [0050] An output signal is then available at the output of the ring modulator 109, which contains the two modulation sidebands and is combined with a signal generated by load modulation or The signal generated by the cross-section modulation matches (sufficiently accurately). The output signal generated by the ring modulator can then be amplified by means of an amplifier 110 if necessary and fed to the antenna 5 for sending the data to be sent via the switch 107, which is switched to transmission mode of the transponder unit 120 by a signal from the controller 105. Gerstenberger at [0051] The transponder unit 120 is operated in a first (active) operating mode as an actively transmitting transponder unit.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	In a second (passive) operating mode, the transponder unit works like a normal passive transponder, performing load modulation on the field of the reader. For example, the receiver 104 can additionally be designed as a conventional load modulator controlled by the controller 105. The controller then either switches the transmitter 106 on and the load modulator off or switches the transmitter 106 off and the load modulator on. The switch 107 is switched accordingly. The criteria for switching from a passive to an active operating state can be, for example, the received signal strength, the presence and/or sufficiency of an external power supply or the sufficiency of an internal power supply. It is thus possible, for example, to initially operate a transponder unit 120 passively and to switch to an active operating mode if, for example, the distance to the reader unintentionally increases. It can also be provided that the switching is carried out depending on the level of a voltage induced at the antenna 5, e.g. B. automatically when the induced voltage exceeds or falls below a certain value. Gerstenberger at [0055] Fig. 7 illustrates a further embodiment of the antenna adapter 1 . The antenna holder 3 and the data carrier holder 11 are integrally formed therein. The circuit 100 is again flat and arranged on the antenna holder 3. The receiving area 12 of the data carrier holder 11 is designed as a base for receiving a SIM card 30 in the size of a mini plug-in. It is also possible to design the receiving area 12 to accommodate card-shaped data carriers of other formats. A device connector 50, which is connected to the receiving area 12 of the data carrier holder 11 via flexible separate cables 14, is inserted into the mobile phone instead of the SIM card and has a corresponding SIM card format. The SIM card 30 receives the signals necessary for operation, such as, for example, the status, via the flexible cables 14. B. VCC, GND, I/O, RESET, CLK, from the device connector 50 . The circuit 100 is supplied with energy from the battery of the mobile phone via the device connection 50. Gerstenberger at claim 21 21. Antenna adapter (1) according to one of claims 1 to 20, characterized by a circuit (100) which is designed to form an actively transmitting transponder unit (120) together with the antenna (5) and an integrated circuit of the card-shaped data carrier (20; 30) to be coupled to the antenna adapter (1). Gerstenberger at claim 22 22. Antenna adapter (1) according to claim 21, characterized in that the circuit (100) is designed to transmit a signal which can be evaluated by an external reading device as a modulation by a transponder in order to transmit data to the reading device in a first operating mode. Gerstenberger at claim 23

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	23. Antenna adapter (1) according to claim 21 or 22, characterized in that the circuit (100) is arranged to modulate the field of an external reader in order to transmit data to the reader in a second operating mode. Gerstenberger at claim 30 30. Antenna adapter according to claim 29, characterized in that the circuit (100) comprises an electronic assembly (111) for modulating a subcarrier signal with a specific frequency by means of data to be transmitted generated in the controller (105) in order to supply the data to be transmitted to the modulator (109) as a modulated subcarrier signal. Gerstenberger at claim 37 37. System comprising a mobile radio telephone, a SIM card (20; 30) with an integrated circuit, an antenna adapter (1) according to one of claims 1 to 20 and a circuit (100) which, together with the antenna (5) of the antenna adapter (1) and the integrated circuit of the SIM card (20; 30), forms an actively transmitting transponder unit (120), wherein the circuit (100) is arranged integrated in the card-shaped data carrier (20; 30). To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
2. The mobile device of claim 1 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Gerstenberger discloses or renders obvious "[t]he mobile device of claim 1 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." For example: Gerstenberger at [0003] In addition to appropriate hardware and software adaptations, an antenna is required for the contactless functionality. Due to their small format, SIM cards do not offer enough space for an integrated antenna with the appropriate range. The location intended for the SIM card in the mobile phone may also be unfavorable for the antenna, for example because of shielding by neighboring components, such as a battery. This problem can also occur in a similar way with electronic data storage devices of other types and forms that are used in other devices. Gerstenberger at [0006]

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	The present invention therefore addresses the problem of equipping card-shaped data carriers having an integrated circuit with an antenna in the simplest and most cost-effective manner possible. Gerstenberger at [0021] However, due to the location intended for installation of an antenna for a SIM card between the battery of the mobile phone and the battery cover, in some cases there is not enough space for such a shield with sufficient thickness. Furthermore, the shape and/or material of the shielding layer must be selected differently depending on the type of mobile phone into which the antenna is to be inserted, which prevents cost-effective, uniform production. In order to take this circumstance into account, the antenna adapter can, according to a preferred embodiment of the invention, contain a circuit which, together with the antenna and the integrated circuit of the data carrier, forms an actively transmitting transponder unit in order to be usable even in cramped installation conditions. The circuit is coupled to the antenna and the antenna connector. In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. In a preferred embodiment, the circuit is flat and arranged on the antenna holder of the antenna adapter. The circuit requires practically no additional space and can therefore be used advantageously. Gerstenberger at [0041] A further embodiment, shown here on the basis of the embodiment according to Fig. 4, can be seen in Fig. 5 and comprises a circuit 100 which, together with the antenna 5 and the integrated circuit of the mini-plug-in 30, forms an actively transmitting transponder unit. The circuit 100 is flat and arranged on the antenna holder 3. It is also possible to integrate the circuit 100 into the plastic module of the data carrier (20; 30) to be coupled to the antenna adapter 1. In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. *See also* Gerstenberger at [0049] and [0051]. To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
3. The mobile device of claim 1 wherein the smartcard controller is coupled to be powered by the mobile device.	Gerstenberger discloses or renders obvious "[t]he mobile device of claim 1 wherein the smartcard controller is coupled to be powered by the mobile device." For example: Gerstenberger at Figure 5  Gerstenberger at Figure 6

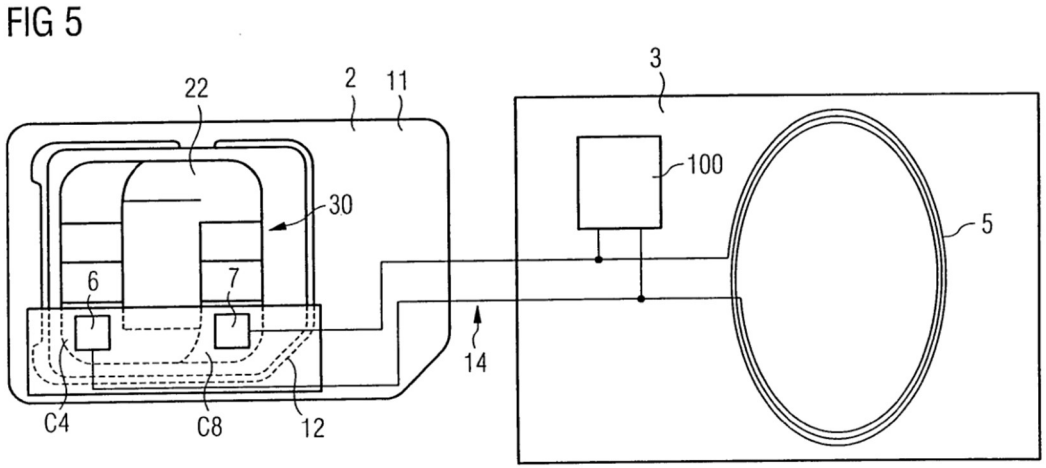
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	 Gerstenberger at [0043] Fig. 6 shows schematically the actively transmitting transponder unit 120. The transponder unit has a power supply 102, the antenna 5 and the electronic circuit 100. The circuit 100 essentially consists of three functional blocks: a receiver 104, a controller 105 and a transmitter 106. A switch 107 is used to switch the antenna 5 between the receiver 104 and the transmitter 106. The energy supply 102 is normally provided by the battery of the mobile phone into which the data carrier to be coupled with the antenna adapter is inserted. But a simple battery can also serve this purpose. Gerstenberger at [0051] The transponder unit 120 is operated in a first (active) operating mode as an actively transmitting transponder unit. In a second (passive) operating mode, the transponder unit works like a normal passive transponder, performing load modulation on the field of the reader. For example, the receiver 104 can additionally be designed as a conventional load modulator controlled by the controller 105. The controller then either switches the transmitter 106 on and the load modulator off or switches the transmitter 106 off and the load modulator on. The switch 107 is switched accordingly. The criteria for switching from a passive to an active operating state can be, for example, the received signal strength, the presence and/or sufficiency of

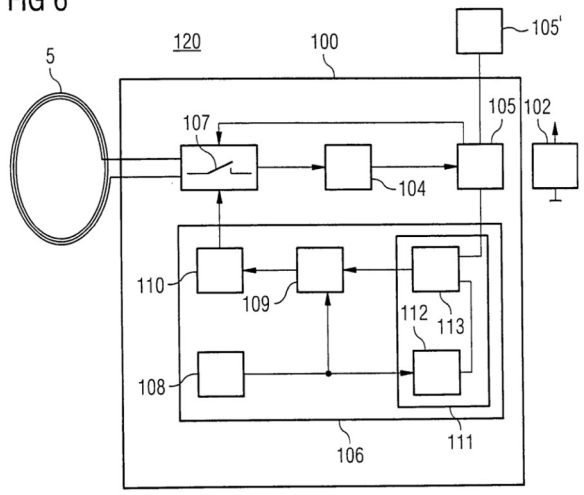
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	an external power supply or the sufficiency of an internal power supply. It is thus possible, for example, to initially operate a transponder unit 120 passively and to switch to an active operating mode if, for example, the distance to the reader unintentionally increases. It can also be provided that the switching is carried out depending on the level of a voltage induced at the antenna 5, e.g. B. automatically when the induced voltage exceeds or falls below a certain value. Gerstenberger at [0055] Fig. 7 illustrates a further embodiment of the antenna adapter 1 . The antenna holder 3 and the data carrier holder 11 are integrally formed therein. The circuit 100 is again flat and arranged on the antenna holder 3. The receiving area 12 of the data carrier holder 11 is designed as a base for receiving a SIM card 30 in the size of a mini plug-in. It is also possible to design the receiving area 12 to accommodate card-shaped data carriers of other formats. A device connector 50, which is connected to the receiving area 12 of the data carrier holder 11 via flexible separate cables 14, is inserted into the mobile phone instead of the SIM card and has a corresponding SIM card format. The SIM card 30 receives the signals necessary for operation, such as, for example, the status, via the flexible cables 14. B. VCC, GND, I/O, RESET, CLK, from the device connector 50 . The circuit 100 is supplied with energy from the battery of the mobile phone via the device connection 50. *See also* Gerstenberger at [0042]. To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
4. The mobile device of claim 1 wherein the mobile device comprises a mobile phone.	Gerstenberger discloses or renders obvious "[t]he mobile device of claim 1 wherein the mobile device comprises a mobile phone." For example: Gerstenberger at Abstract The adapter (1) has a flexibly designed antenna holder (3) comprising an antenna (5) and an antenna connection connected with the antenna, where the antenna connection is arranged in an antenna connection holder (2). The connection holder is formed to cooperate with a flat side of a data carrier and formed as a foil. A data carrier holder is provided with an accommodation area for accommodating the data carrier, where the area is formed as a flat recess. An independent claim is also included for a system comprising a mobile phone and an antenna adapter.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at [0001] The invention relates to the technical field of card-shaped data carriers with integrated circuits, which are equipped with an antenna for contactless functionalities. The invention further relates to a system comprising a mobile phone, a SIM card and such an antenna. Gerstenberger at [0002] Card-shaped data carriers with an integrated circuit, in particular chip cards or smart cards, which have an antenna for contactless communication with the integrated circuit of the data carrier, are known in a large number of different embodiments, for example as smart cards with contactless functionality for contactless payment transactions, for ski passes, for access controls or for the use of local public transport. Such functionalities can in principle also be implemented on SIM cards (subscriber identity module). SIM cards are chip cards in a smaller format, usually in the ID-000 format according to GSM11.11 and TS102.221 and are used in mobile phones to authenticate the mobile phone when logging into a mobile network. Since the SIM card is already present in the mobile phone, it makes sense to use the integrated circuit of the SIM card to implement additional contactless functionalities on the mobile phone. Gerstenberger at [0004] In DE 10 2004 029 984 A1 it is proposed to design a portable data carrier, in particular a SIM card for mobile telephones, with an integrated antenna in such a way that the integrated circuit of the data carrier is arranged in a first flat-piece-like region and the antenna is arranged in a second flat-piece-like region, wherein the flat-piece-like antenna region is designed to be flexible. The first flat area has the usual dimensions of a standard SIM card and can be inserted into a mobile phone in the conventional way. The flat antenna area can be bent, for example around a cell phone battery, so that the antenna is not unnecessarily shielded by cell phone components. The surface of the flat-piece-like antenna region can accordingly be formed to be substantially larger than the first flat-piece-like region containing the integrated circuit. Gerstenberger at [0007] This object is achieved by an antenna adapter having the features of claim 1. A system comprising a mobile phone, a SIM card and such an antenna adapter is specified in claim 21. The dependent claims relate to advantageous developments and embodiments of the invention. Gerstenberger at [0008]

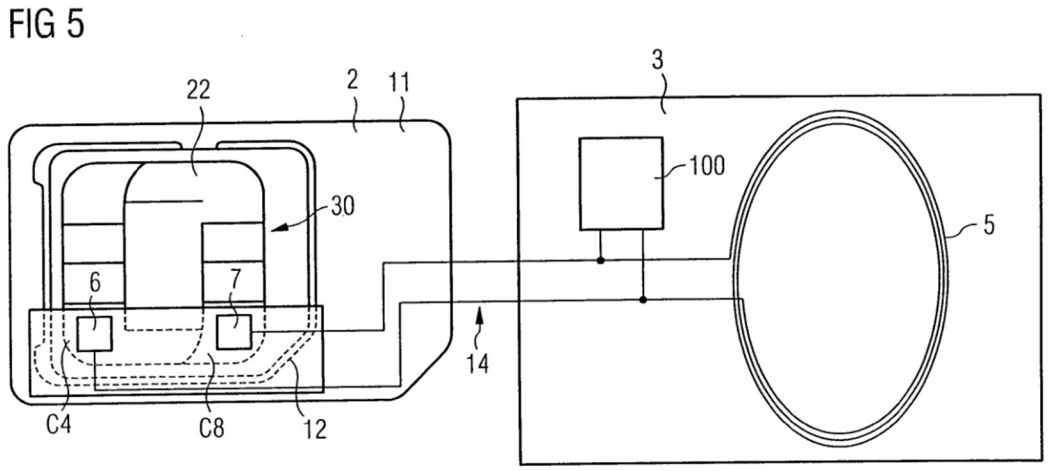
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	With the aid of the antenna adapter according to the invention, conventional card-shaped data carriers with an integrated circuit, in particular SIM cards in the form of plug-ins or mini-plug-ins for mobile phones, can be equipped with an antenna for contactless data transfer over medium ranges (for example Near Field Communication NFC). The antenna adapter according to the invention comprises, in accordance with the prior art described above, an antenna which is arranged in a flat, flexible antenna holder, as well as an antenna connection connected to the antenna. Unlike in the prior art, however, the antenna connection is not designed as a plug connection, but is itself located in a flat antenna connection holder, which is connected to the antenna holder, for example, via a cable and which interacts with a flat side of the card-shaped data carrier in order to communicate with the integrated circuit of the data carrier. In this way, it is possible to use the interface device already present in the data carrier, via which the integrated circuit of the data carrier communicates with an external device, for communication with the antenna without any modification of the data carrier being necessary. Rather, conventional data storage devices can be upgraded for additional contactless functionality by appropriately placing the antenna adapter on one of its flat sides. Gerstenberger at [0018] The antenna holder carrying the antenna is significantly larger in area than the antenna connection holder and the data carrier holder. The antenna holder of an antenna adapter for a SIM card of a mobile phone is accordingly larger than the SIM card itself, but preferably smaller than the largest side surface of a battery of a mobile phone, so that the antenna holder can be placed on one side of the battery, while the SIM card is located, for example, under or next to the battery. Gerstenberger at [0035] Fig. 3 shows a second embodiment of an antenna adapter 1 according to the invention. Here, the antenna connection holder 2 is designed like a pocket so that the SIM card 20 can be inserted. The adhesive connection 9 can then be dispensed with. This also makes it easier to replace the SIM card 20. The antenna connection holder 2 is again formed by a film which is sufficiently thin that the SIM card 20 with the pocket-shaped antenna connection holder 2 can be inserted into a mobile phone without having to modify the device. It may be expedient to make the pocket open on two sides and, if necessary, to insert the SIM card 20 crosswise instead of lengthwise, as in Fig. 3. Gerstenberger at [0040]

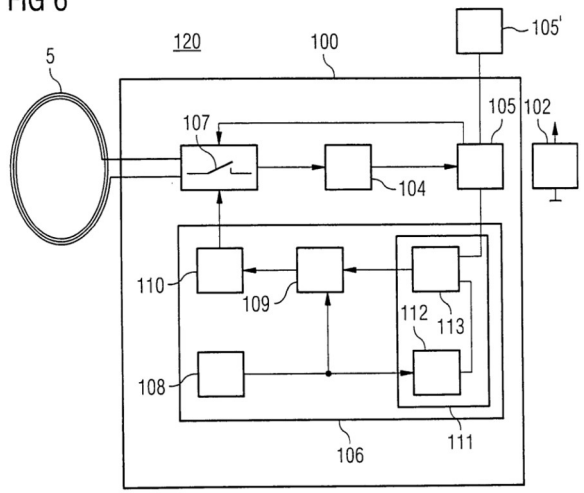
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	For shielding purposes, the antenna adapter 1 of the described embodiments can be designed in multiple layers at least in the area of the antenna holder 3 and, for example, can first have a copper foil and then a ferrite foil on a side facing an interference influence at the installation location. Such an antenna adapter is then particularly suitable for being folded around the battery of a mobile phone, for example. The SIM card 20 or the MiniPlugIn 30 are then located below the battery and the large antenna holder 3 is on the opposite side of the battery. If the battery and the SIM card 20 or the mini plug-in 30 are instead arranged next to one another within the mobile phone, depending on the situation as to whether the antenna holder 3 is to be located above or below the battery, it may be expedient to provide the aforementioned additional shielding layers on the other side of the antenna holder 3. Gerstenberger at [0055] Fig. 7 illustrates a further embodiment of the antenna adapter 1 . The antenna holder 3 and the data carrier holder 11 are integrally formed therein. The circuit 100 is again flat and arranged on the antenna holder 3. The receiving area 12 of the data carrier holder 11 is designed as a base for receiving a SIM card 30 in the size of a mini plug-in. It is also possible to design the receiving area 12 to accommodate card-shaped data carriers of other formats. A device connector 50, which is connected to the receiving area 12 of the data carrier holder 11 via flexible separate cables 14, is inserted into the mobile phone instead of the SIM card and has a corresponding SIM card format. The SIM card 30 receives the signals necessary for operation, such as, for example, the status, via the flexible cables 14. B. VCC, GND, I/O, RESET, CLK, from the device connector 50 . The circuit 100 is supplied with energy from the battery of the mobile phone via the device connection 50. *See also* Gerstenberger at [0003] and [0043]. To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
5[pre]. A mobile device comprising:	Gerstenberger discloses or renders obvious "[a] mobile device." *See* 1[pre] above.
[5a] a smartcard controller that includes load modulation circuitry for half duplex communication by	Gerstenberger discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field."

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	*See* [1a] above.
[5b] an antenna tuned to operate at 13.56 MHz;	Gerstenberger discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." *See* [1b] above.
[5c] an amplifier coupled between the smartcard controller and the antenna, wherein the amplifier is coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller; and	Gerstenberger discloses or renders obvious "an amplifier coupled between the smartcard controller and the antenna, wherein the amplifier is coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller." For example: Gerstenberger at Figure 5  Gerstenberger at Figure 6

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	FIG 6  Gerstenberger at [0043] Fig. 6 shows schematically the actively transmitting transponder unit 120. The transponder unit has a power supply 102, the antenna 5 and the electronic circuit 100. The circuit 100 essentially consists of three functional blocks: a receiver 104, a controller 105 and a transmitter 106. A switch 107 is used to switch the antenna 5 between the receiver 104 and the transmitter 106. The energy supply 102 is normally provided by the battery of the mobile phone into which the data carrier to be coupled with the antenna adapter is inserted. But a simple battery can also serve this purpose. Gerstenberger at [0045] The transmitter 106 consists of an oscillator 108, a modulator 109 and a power amplifier 110. Furthermore, the transmitter 106 is extended by an electronic assembly 111 for generating and modulating a subcarrier signal in order to carry out the data transmission from the transponder unit 120 to the reading device by means of the subcarrier signal. Depending on the use of the transponder unit, the subcarrier signal may have different frequencies or may even be omitted entirely. Gerstenberger at [0050]

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	An output signal is then available at the output of the ring modulator 109, which contains the two modulation sidebands and is combined with a signal generated by load modulation or The signal generated by the cross-section modulation matches (sufficiently accurately). The output signal generated by the ring modulator can then be amplified by means of an amplifier 110 if necessary and fed to the antenna 5 for sending the data to be sent via the switch 107, which is switched to transmission mode of the transponder unit 120 by a signal from the controller 105. Gerstenberger at [0051] The transponder unit 120 is operated in a first (active) operating mode as an actively transmitting transponder unit. In a second (passive) operating mode, the transponder unit works like a normal passive transponder, performing load modulation on the field of the reader. For example, the receiver 104 can additionally be designed as a conventional load modulator controlled by the controller 105. The controller then either switches the transmitter 106 on and the load modulator off or switches the transmitter 106 off and the load modulator on. The switch 107 is switched accordingly. The criteria for switching from a passive to an active operating state can be, for example, the received signal strength, the presence and/or sufficiency of an external power supply or the sufficiency of an internal power supply. It is thus possible, for example, to initially operate a transponder unit 120 passively and to switch to an active operating mode if, for example, the distance to the reader unintentionally increases. It can also be provided that the switching is carried out depending on the level of a voltage induced at the antenna 5, e.g. B. automatically when the induced voltage exceeds or falls below a certain value. Gerstenberger at [0055] Fig. 7 illustrates a further embodiment of the antenna adapter 1 . The antenna holder 3 and the data carrier holder 11 are integrally formed therein. The circuit 100 is again flat and arranged on the antenna holder 3. The receiving area 12 of the data carrier holder 11 is designed as a base for receiving a SIM card 30 in the size of a mini plug-in. It is also possible to design the receiving area 12 to accommodate card-shaped data carriers of other formats. A device connector 50, which is connected to the receiving area 12 of the data carrier holder 11 via flexible separate cables 14, is inserted into the mobile phone instead of the SIM card and has a corresponding SIM card format. The SIM card 30 receives the signals necessary for operation, such as, for example, the status, via the flexible cables 14. B. VCC, GND, I/O, RESET, CLK, from the device connector 50 . The circuit 100 is supplied with energy from the battery of the mobile phone via the device connection 50. *See also* [1c] above.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	See also Gerstenberger at [0042]. To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[5d] a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna.	Gerstenberger discloses or renders obvious "a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna." For example: Gerstenberger at Figure 5  Gerstenberger at Figure 6

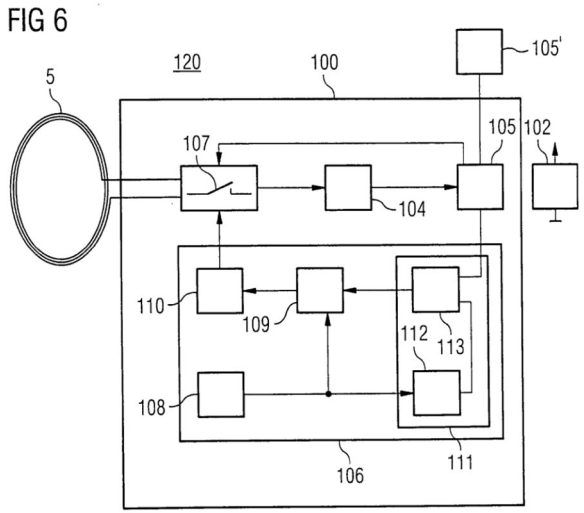
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	FIG 6  Gerstenberger at [0021] However, due to the location intended for installation of an antenna for a SIM card between the battery of the mobile phone and the battery cover, in some cases there is not enough space for such a shield with sufficient thickness. Furthermore, the shape and/or material of the shielding layer must be selected differently depending on the type of mobile phone into which the antenna is to be inserted, which prevents cost-effective, uniform production. In order to take this circumstance into account, the antenna adapter can, according to a preferred embodiment of the invention, contain a circuit which, together with the antenna and the integrated circuit of the data carrier, forms an actively transmitting transponder unit in order to be usable even in cramped installation conditions. The circuit is coupled to the antenna and the antenna connector. In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. In a preferred embodiment, the circuit is flat and arranged on the antenna holder of the antenna adapter. The circuit requires practically no additional space and can therefore be used advantageously. Gerstenberger at [0028]

Claim Element	Exemplary Citations to D.E. 102007019272 (“Gerstenberger”)
	Fig. 5 shows a fourth embodiment of an antenna adapter according to the invention, similar to that in Fig. 4, with a circuit for actively transmitting a signal, Gerstenberger at [0041] A further embodiment, shown here on the basis of the embodiment according to Fig. 4, can be seen in Fig. 5 and comprises a circuit 100 which, together with the antenna 5 and the integrated circuit of the mini-plug-in 30, forms an actively transmitting transponder unit. The circuit 100 is flat and arranged on the antenna holder 3. It is also possible to integrate the circuit 100 into the plastic module of the data carrier (20; 30) to be coupled to the antenna adapter 1. In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. Gerstenberger at [0042] For data transmission, the transponder unit sends a signal to a reader, which the reader can evaluate as a signal from a transponder that performs a load modulation of the reader's field. In contrast to conventional transponders, which modulate the reader field into a modulated reader field, the transponder unit generates and transmits its own modulated field as the data transmission signal. The transponder unit therefore uses its own energy for the purpose of data transmission. Gerstenberger at [0043] Fig. 6 shows schematically the actively transmitting transponder unit 120. The transponder unit has a power supply 102, the antenna 5 and the electronic circuit 100. The circuit 100 essentially consists of three functional blocks: a receiver 104, a controller 105 and a transmitter 106. A switch 107 is used to switch the antenna 5 between the receiver 104 and the transmitter 106. The energy supply 102 is normally provided by the battery of the mobile phone into which the data carrier to be coupled with the antenna adapter is inserted. But a simple battery can also serve this purpose. Gerstenberger at [0044] The receiver 104 is intended to demodulate a signal transmitted by the reader in order to extract data therefrom. The extracted data is forwarded to the controller 105, which processes it and generates data to be sent to the reader. Furthermore, the controller 105 transmits a control signal to the switch 107, which switches between receiving and transmitting operation of the transponder unit 120. However, a separate antenna can also be provided for transmitting instead. The controller 105 can, for example, be supported or replaced by a part of the operating system 105' of the SIM card 30.

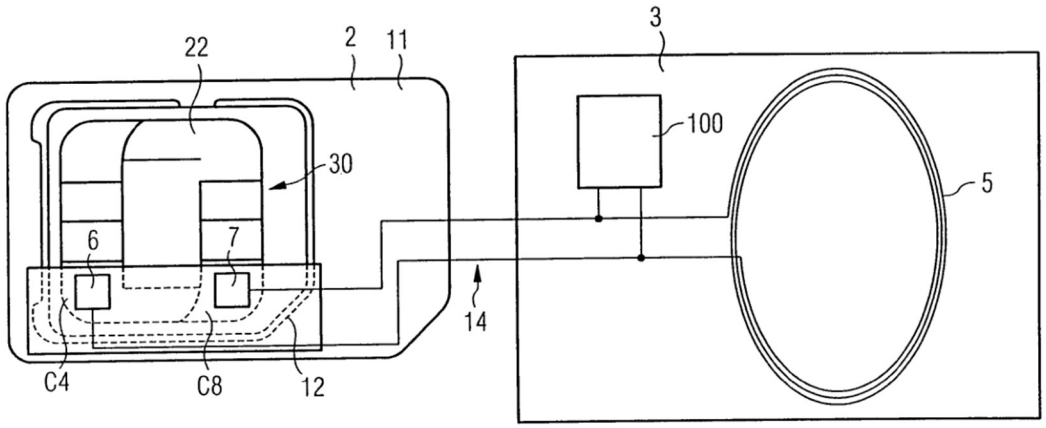
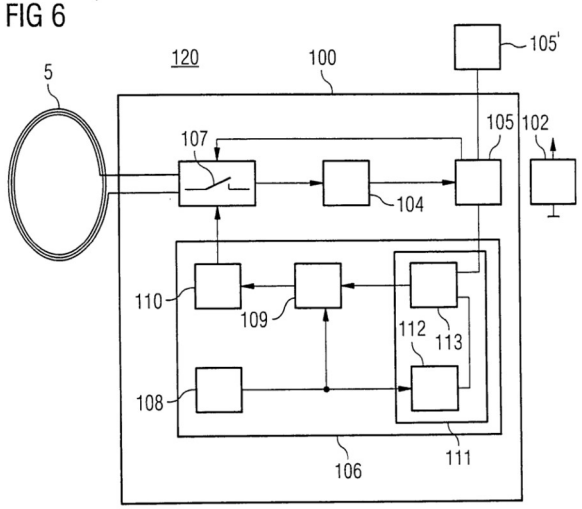
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at [0045] The transmitter 106 consists of an oscillator 108, a modulator 109 and a power amplifier 110. Furthermore, the transmitter 106 is extended by an electronic assembly 111 for generating and modulating a subcarrier signal in order to carry out the data transmission from the transponder unit 120 to the reading device by means of the subcarrier signal. Depending on the use of the transponder unit, the subcarrier signal may have different frequencies or may even be omitted entirely. Gerstenberger at [0046] In the transponder unit 120 shown in Fig. 6, it is provided that the assembly 111 divides the oscillator frequency by a certain factor by means of a frequency divider 112, for example by binary division. The subcarrier signal generated thereby is modulated with the data to be transmitted, which are supplied to the module 111 by the controller 105. Gerstenberger at [0047] The modulation of the subcarrier in the module 111 is carried out, for example, in an AND gate 113 by a so-called 100% amplitude key shifting (ASK). The amplitude of the signal generated by frequency division is switched between two states ON and OFF based on the data to be sent. Alternatively, (B)PSK modulation (binary phase key shifting), for example according to ISO 14443 Type B, or FSK modulation (frequency key shifting) can be used. Gerstenberger at [0049] The ring modulator 109 has the special feature that it performs a special form of amplitude modulation. As with conventional amplitude modulation, two spectral lines are generated in the frequency spectrum at a distance of the frequency of the ASK-modulated signal around the frequency of the oscillator signal, the so-called carrier frequency. During amplitude modulation in the ring modulator 109, the carrier frequency of the strong and high-energy oscillator signal is largely suppressed. The data to be transmitted contained in the ASK-modulated signal are located in sidebands around the two spectral lines of the auxiliary frequency after the amplitude modulation in the ring modulator 109. Such modulation is called double-side band (DSB) modulation. Called double-side band suppressed carrier (DSSC) modulation. No data is transmitted using the carrier frequency. Rather, by using the ring modulator 109, which suppresses the carrier frequency, the goal of being able to send data to the reader either with low transmission power or with a significantly greater range is achieved. The increased range is especially possible when the entire transmission power is put into the sidebands in which the data to be transmitted is located.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	The carrier frequency is basically required for demodulating the signal in order to extract the data transmitted by the transponder unit 120 in the reader. However, since the carrier frequency is present in the reader anyway, it is not necessary for the transponder signal itself to contain this frequency. Gerstenberger at [0050] An output signal is then available at the output of the ring modulator 109, which contains the two modulation sidebands and is combined with a signal generated by load modulation or The signal generated by the cross-section modulation matches (sufficiently accurately). The output signal generated by the ring modulator can then be amplified by means of an amplifier 110 if necessary and fed to the antenna 5 for sending the data to be sent via the switch 107, which is switched to transmission mode of the transponder unit 120 by a signal from the controller 105. Gerstenberger at [0051] The transponder unit 120 is operated in a first (active) operating mode as an actively transmitting transponder unit. In a second (passive) operating mode, the transponder unit works like a normal passive transponder, performing load modulation on the field of the reader. For example, the receiver 104 can additionally be designed as a conventional load modulator controlled by the controller 105. The controller then either switches the transmitter 106 on and the load modulator off or switches the transmitter 106 off and the load modulator on. The switch 107 is switched accordingly. The criteria for switching from a passive to an active operating state can be, for example, the received signal strength, the presence and/or sufficiency of an external power supply or the sufficiency of an internal power supply. It is thus possible, for example, to initially operate a transponder unit 120 passively and to switch to an active operating mode if, for example, the distance to the reader unintentionally increases. It can also be provided that the switching is carried out depending on the level of a voltage induced at the antenna 5, e.g. B. automatically when the induced voltage exceeds or falls below a certain value. Gerstenberger at [0055] Fig. 7 illustrates a further embodiment of the antenna adapter 1 . The antenna holder 3 and the data carrier holder 11 are integrally formed therein. The circuit 100 is again flat and arranged on the antenna holder 3. The receiving area 12 of the data carrier holder 11 is designed as a base for receiving a SIM card 30 in the size of a mini plug-in. It is also possible to design the receiving area 12 to accommodate card-shaped data carriers of other formats. A device connector 50, which is connected to the receiving area 12 of the data carrier holder 11 via flexible separate cables 14, is inserted into the mobile phone instead of the SIM card and has a corresponding SIM card format. The

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	SIM card 30 receives the signals necessary for operation, such as, for example, the status, via the flexible cables 14. B. VCC, GND, I/O, RESET, CLK, from the device connector 50 . The circuit 100 is supplied with energy from the battery of the mobile phone via the device connection 50. Gerstenberger at claim 21 21. Antenna adapter (1) according to one of claims 1 to 20, characterized by a circuit (100) which is designed to form an actively transmitting transponder unit (120) together with the antenna (5) and an integrated circuit of the card-shaped data carrier (20; 30) to be coupled to the antenna adapter (1). Gerstenberger at claim 22 22. Antenna adapter (1) according to claim 21, characterized in that the circuit (100) is designed to transmit a signal which can be evaluated by an external reading device as a modulation by a transponder in order to transmit data to the reading device in a first operating mode. Gerstenberger at claim 23 23. Antenna adapter (1) according to claim 21 or 22, characterized in that the circuit (100) is arranged to modulate the field of an external reader in order to transmit data to the reader in a second operating mode. Gerstenberger at claim 30 30. Antenna adapter according to claim 29, characterized in that the circuit (100) comprises an electronic assembly (111) for modulating a subcarrier signal with a specific frequency by means of data to be transmitted generated in the controller (105) in order to supply the data to be transmitted to the modulator (109) as a modulated subcarrier signal. Gerstenberger at claim 37 37. System comprising a mobile radio telephone, a SIM card (20; 30) with an integrated circuit, an antenna adapter (1) according to one of claims 1 to 20 and a circuit (100) which, together with the antenna (5) of the antenna adapter (1) and the integrated circuit of the SIM card (20; 30), forms an actively transmitting transponder unit (120), wherein the circuit (100) is arranged integrated in the card-shaped data carrier (20; 30). *See also* [1c] above. To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
6. The mobile device of claim 5 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Gerstenberger discloses or renders obvious "[t]he mobile device of claim 5 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." *See* claim 2 above. *See also* claim 5 above.
7. The mobile device of claim 5 wherein the smartcard controller is coupled to be powered by the mobile device.	Gerstenberger discloses or renders obvious "[t]he mobile device of claim 5 wherein the smartcard controller is coupled to be powered by the mobile device." *See* claim 3 above. *See also* claim 5 above.
8. The mobile device of claim 5 wherein the transmit circuit comprises a load modulation circuit.	Gerstenberger discloses or renders obvious "[t]he mobile device of claim 5 wherein the transmit circuit comprises a load modulation circuit." For example: Gerstenberger at Figure 6 

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at [0050] An output signal is then available at the output of the ring modulator 109, which contains the two modulation sidebands and is combined with a signal generated by load modulation or The signal generated by the cross-section modulation matches (sufficiently accurately). The output signal generated by the ring modulator can then be amplified by means of an amplifier 110 if necessary and fed to the antenna 5 for sending the data to be sent via the switch 107, which is switched to transmission mode of the transponder unit 120 by a signal from the controller 105. Gerstenberger at [0051] The transponder unit 120 is operated in a first (active) operating mode as an actively transmitting transponder unit. In a second (passive) operating mode, the transponder unit works like a normal passive transponder, performing load modulation on the field of the reader. For example, the receiver 104 can additionally be designed as a conventional load modulator controlled by the controller 105. The controller then either switches the transmitter 106 on and the load modulator off or switches the transmitter 106 off and the load modulator on. The switch 107 is switched accordingly. The criteria for switching from a passive to an active operating state can be, for example, the received signal strength, the presence and/or sufficiency of an external power supply or the sufficiency of an internal power supply. It is thus possible, for example, to initially operate a transponder unit 120 passively and to switch to an active operating mode if, for example, the distance to the reader unintentionally increases. It can also be provided that the switching is carried out depending on the level of a voltage induced at the antenna 5, e.g. B. automatically when the induced voltage exceeds or falls below a certain value. To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 5 above.
9. The mobile device of claim 5 wherein the transmit circuit comprises an active transmit driver.	Gerstenberger discloses or renders obvious "[t]he mobile device of claim 5 wherein the transmit circuit comprises an active transmit driver." For example: Gerstenberger at Figure 5

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	FIG 5  Gerstenberger at Figure 6 FIG 6 

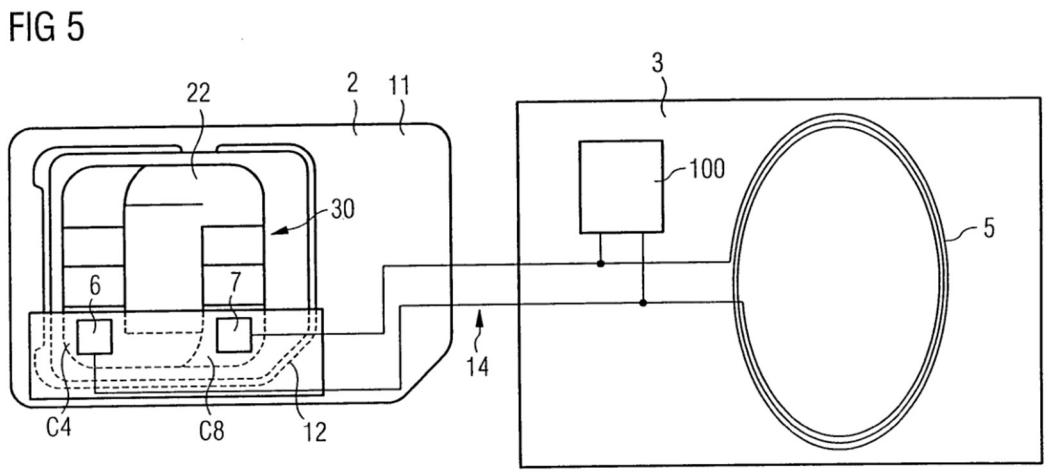
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at [0021] However, due to the location intended for installation of an antenna for a SIM card between the battery of the mobile phone and the battery cover, in some cases there is not enough space for such a shield with sufficient thickness. Furthermore, the shape and/or material of the shielding layer must be selected differently depending on the type of mobile phone into which the antenna is to be inserted, which prevents cost-effective, uniform production. In order to take this circumstance into account, the antenna adapter can, according to a preferred embodiment of the invention, contain a circuit which, together with the antenna and the integrated circuit of the data carrier, forms an actively transmitting transponder unit in order to be usable even in cramped installation conditions. The circuit is coupled to the antenna and the antenna connector. In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. In a preferred embodiment, the circuit is flat and arranged on the antenna holder of the antenna adapter. The circuit requires practically no additional space and can therefore be used advantageously. Gerstenberger at [0028] Fig. 5 shows a fourth embodiment of an antenna adapter according to the invention, similar to that in Fig. 4, with a circuit for actively transmitting a signal, Gerstenberger at [0041] A further embodiment, shown here on the basis of the embodiment according to Fig. 4, can be seen in Fig. 5 and comprises a circuit 100 which, together with the antenna 5 and the integrated circuit of the mini-plug-in 30, forms an actively transmitting transponder unit. The circuit 100 is flat and arranged on the antenna holder 3. It is also possible to integrate the circuit 100 into the plastic module of the data carrier (20; 30) to be coupled to the antenna adapter 1. In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. Gerstenberger at [0042] For data transmission, the transponder unit sends a signal to a reader, which the reader can evaluate as a signal from a transponder that performs a load modulation of the reader's field. In contrast to conventional transponders, which modulate the reader field into a modulated reader field, the transponder unit generates and transmits its own modulated field as the data transmission signal. The transponder unit therefore uses its own energy for the purpose of data transmission.

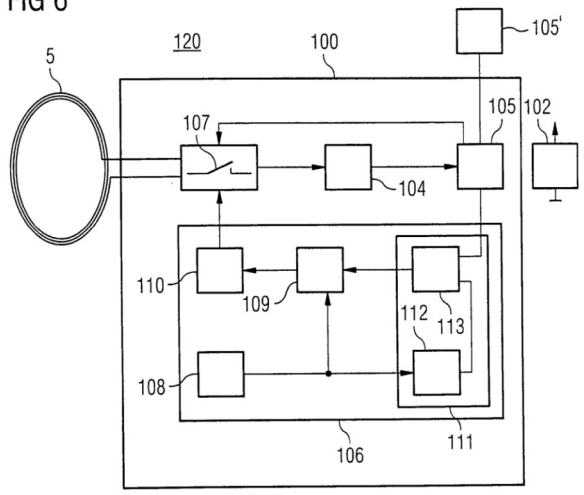
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at [0043] Fig. 6 shows schematically the actively transmitting transponder unit 120. The transponder unit has a power supply 102, the antenna 5 and the electronic circuit 100. The circuit 100 essentially consists of three functional blocks: a receiver 104, a controller 105 and a transmitter 106. A switch 107 is used to switch the antenna 5 between the receiver 104 and the transmitter 106. The energy supply 102 is normally provided by the battery of the mobile phone into which the data carrier to be coupled with the antenna adapter is inserted. But a simple battery can also serve this purpose. Gerstenberger at [0044] The receiver 104 is intended to demodulate a signal transmitted by the reader in order to extract data therefrom. The extracted data is forwarded to the controller 105, which processes it and generates data to be sent to the reader. Furthermore, the controller 105 transmits a control signal to the switch 107, which switches between receiving and transmitting operation of the transponder unit 120. However, a separate antenna can also be provided for transmitting instead. The controller 105 can, for example, be supported or replaced by a part of the operating system 105' of the SIM card 30. Gerstenberger at [0045] The transmitter 106 consists of an oscillator 108, a modulator 109 and a power amplifier 110. Furthermore, the transmitter 106 is extended by an electronic assembly 111 for generating and modulating a subcarrier signal in order to carry out the data transmission from the transponder unit 120 to the reading device by means of the subcarrier signal. Depending on the use of the transponder unit, the subcarrier signal may have different frequencies or may even be omitted entirely. Gerstenberger at [0046] In the transponder unit 120 shown in Fig. 6, it is provided that the assembly 111 divides the oscillator frequency by a certain factor by means of a frequency divider 112, for example by binary division. The subcarrier signal generated thereby is modulated with the data to be transmitted, which are supplied to the module 111 by the controller 105. Gerstenberger at [0047] The modulation of the subcarrier in the module 111 is carried out, for example, in an AND gate 113 by a so-called 100% amplitude key shifting (ASK).

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	The amplitude of the signal generated by frequency division is switched between two states ON and OFF based on the data to be sent. Alternatively, (B)PSK modulation (binary phase key shifting), for example according to ISO 14443 Type B, or FSK modulation (frequency key shifting) can be used. Gerstenberger at [0049] The ring modulator 109 has the special feature that it performs a special form of amplitude modulation. As with conventional amplitude modulation, two spectral lines are generated in the frequency spectrum at a distance of the frequency of the ASK-modulated signal around the frequency of the oscillator signal, the so-called carrier frequency. During amplitude modulation in the ring modulator 109, the carrier frequency of the strong and high-energy oscillator signal is largely suppressed. The data to be transmitted contained in the ASK-modulated signal are located in sidebands around the two spectral lines of the auxiliary frequency after the amplitude modulation in the ring modulator 109. Such modulation is called double-side band (DSB) modulation. Called double-side band suppressed carrier (DSSC) modulation. No data is transmitted using the carrier frequency. Rather, by using the ring modulator 109, which suppresses the carrier frequency, the goal of being able to send data to the reader either with low transmission power or with a significantly greater range is achieved. The increased range is especially possible when the entire transmission power is put into the sidebands in which the data to be transmitted is located. The carrier frequency is basically required for demodulating the signal in order to extract the data transmitted by the transponder unit 120 in the reader. However, since the carrier frequency is present in the reader anyway, it is not necessary for the transponder signal itself to contain this frequency. Gerstenberger at [0050] An output signal is then available at the output of the ring modulator 109, which contains the two modulation sidebands and is combined with a signal generated by load modulation or The signal generated by the cross-section modulation matches (sufficiently accurately). The output signal generated by the ring modulator can then be amplified by means of an amplifier 110 if necessary and fed to the antenna 5 for sending the data to be sent via the switch 107, which is switched to transmission mode of the transponder unit 120 by a signal from the controller 105. Gerstenberger at [0051] The transponder unit 120 is operated in a first (active) operating mode as an actively transmitting transponder unit. In a second (passive) operating mode, the transponder unit works like a normal passive transponder, performing load modulation on the field of the reader. For example, the receiver 104 can additionally be designed as a conventional load modulator controlled by the controller 105. The controller then either

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	switches the transmitter 106 on and the load modulator off or switches the transmitter 106 off and the load modulator on. The switch 107 is switched accordingly. The criteria for switching from a passive to an active operating state can be, for example, the received signal strength, the presence and/or sufficiency of an external power supply or the sufficiency of an internal power supply. It is thus possible, for example, to initially operate a transponder unit 120 passively and to switch to an active operating mode if, for example, the distance to the reader unintentionally increases. It can also be provided that the switching is carried out depending on the level of a voltage induced at the antenna 5, e.g. B. automatically when the induced voltage exceeds or falls below a certain value. Gerstenberger at [0055] Fig. 7 illustrates a further embodiment of the antenna adapter 1 . The antenna holder 3 and the data carrier holder 11 are integrally formed therein. The circuit 100 is again flat and arranged on the antenna holder 3. The receiving area 12 of the data carrier holder 11 is designed as a base for receiving a SIM card 30 in the size of a mini plug-in. It is also possible to design the receiving area 12 to accommodate card-shaped data carriers of other formats. A device connector 50, which is connected to the receiving area 12 of the data carrier holder 11 via flexible separate cables 14, is inserted into the mobile phone instead of the SIM card and has a corresponding SIM card format. The SIM card 30 receives the signals necessary for operation, such as, for example, the status, via the flexible cables 14. B. VCC, GND, I/O, RESET, CLK, from the device connector 50 . The circuit 100 is supplied with energy from the battery of the mobile phone via the device connection 50. Gerstenberger at claim 21 21. Antenna adapter (1) according to one of claims 1 to 20, characterized by a circuit (100) which is designed to form an actively transmitting transponder unit (120) together with the antenna (5) and an integrated circuit of the card-shaped data carrier (20; 30) to be coupled to the antenna adapter (1). Gerstenberger at claim 37 37. System comprising a mobile radio telephone, a SIM card (20; 30) with an integrated circuit, an antenna adapter (1) according to one of claims 1 to 20 and a circuit (100) which, together with the antenna (5) of the antenna adapter (1) and the integrated circuit of the SIM card (20; 30), forms an actively transmitting transponder unit (120), wherein the circuit (100) is arranged integrated in the card-shaped data carrier (20; 30).

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 5 above.
10. The mobile device of claim 5 wherein the mobile device comprises a mobile phone.	Gerstenberger discloses or renders obvious "[t]he mobile device of claim 5 wherein the mobile device comprises a mobile phone." *See* claim 4 above. *See also* claim 5 above.
11[pre]. A mobile device comprising:	By providing this disclosure, Defendants does not take a position on whether the preamble is a claim limitation. Gerstenberger discloses or renders obvious "[a] mobile device." *See* 1[pre] above.
[11a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Gerstenberger discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." *See* [1a] above. To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[11b] an antenna tuned to operate at 13.56 MHz;	Gerstenberger discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." *See* [1b] above.
[11c] an amplifier coupled to be powered by the mobile device, wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller; and	Gerstenberger discloses or renders obvious "an amplifier coupled to be powered by the mobile device, wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller." *See* [5c] above.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
[11d] an active transmit driver circuit coupled between the smartcard controller and the antenna, wherein the active transmit driver circuit is coupled to be powered by the mobile device.	Gerstenberger discloses or renders obvious "an active transmit driver circuit coupled between the smartcard controller and the antenna, wherein the active transmit driver circuit is coupled to be powered by the mobile device." For example: Gerstenberger at Figure 5  Gerstenberger at Figure 6

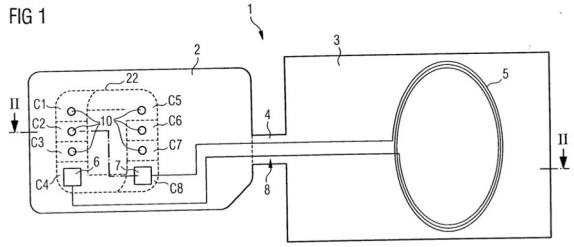
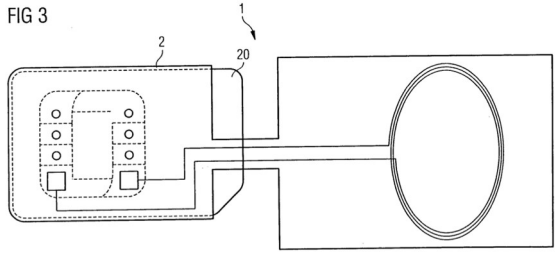
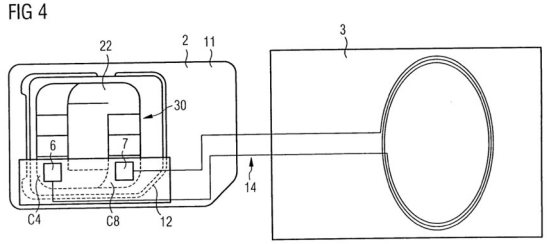
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	FIG 6  Gerstenberger at [0021] However, due to the location intended for installation of an antenna for a SIM card between the battery of the mobile phone and the battery cover, in some cases there is not enough space for such a shield with sufficient thickness. Furthermore, the shape and/or material of the shielding layer must be selected differently depending on the type of mobile phone into which the antenna is to be inserted, which prevents cost-effective, uniform production. In order to take this circumstance into account, the antenna adapter can, according to a preferred embodiment of the invention, contain a circuit which, together with the antenna and the integrated circuit of the data carrier, forms an actively transmitting transponder unit in order to be usable even in cramped installation conditions. The circuit is coupled to the antenna and the antenna connector. In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. In a preferred embodiment, the circuit is flat and arranged on the antenna holder of the antenna adapter. The circuit requires practically no additional space and can therefore be used advantageously. Gerstenberger at [0028]

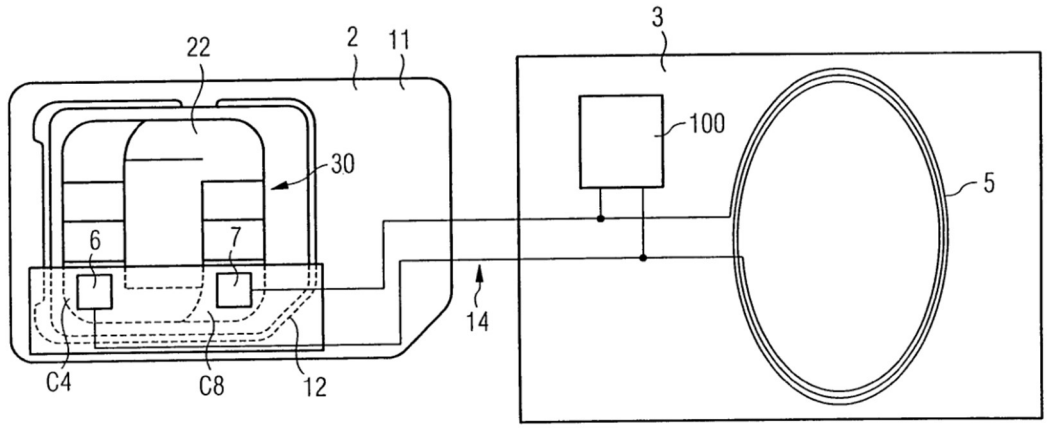
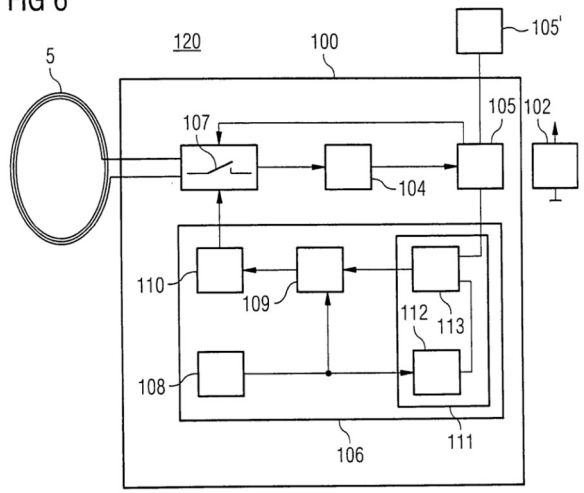
Claim Element	Exemplary Citations to D.E. 102007019272 (“Gerstenberger”)
	Fig. 5 shows a fourth embodiment of an antenna adapter according to the invention, similar to that in Fig. 4, with a circuit for actively transmitting a signal, Gerstenberger at [0041] A further embodiment, shown here on the basis of the embodiment according to Fig. 4, can be seen in Fig. 5 and comprises a circuit 100 which, together with the antenna 5 and the integrated circuit of the mini-plug-in 30, forms an actively transmitting transponder unit. The circuit 100 is flat and arranged on the antenna holder 3. It is also possible to integrate the circuit 100 into the plastic module of the data carrier (20; 30) to be coupled to the antenna adapter 1. In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. Gerstenberger at [0042] For data transmission, the transponder unit sends a signal to a reader, which the reader can evaluate as a signal from a transponder that performs a load modulation of the reader's field. In contrast to conventional transponders, which modulate the reader field into a modulated reader field, the transponder unit generates and transmits its own modulated field as the data transmission signal. The transponder unit therefore uses its own energy for the purpose of data transmission. Gerstenberger at [0043] Fig. 6 shows schematically the actively transmitting transponder unit 120. The transponder unit has a power supply 102, the antenna 5 and the electronic circuit 100. The circuit 100 essentially consists of three functional blocks: a receiver 104, a controller 105 and a transmitter 106. A switch 107 is used to switch the antenna 5 between the receiver 104 and the transmitter 106. The energy supply 102 is normally provided by the battery of the mobile phone into which the data carrier to be coupled with the antenna adapter is inserted. But a simple battery can also serve this purpose. Gerstenberger at [0044] The receiver 104 is intended to demodulate a signal transmitted by the reader in order to extract data therefrom. The extracted data is forwarded to the controller 105, which processes it and generates data to be sent to the reader. Furthermore, the controller 105 transmits a control signal to the switch 107, which switches between receiving and transmitting operation of the transponder unit 120. However, a separate antenna can also be provided for transmitting instead. The controller 105 can, for example, be supported or replaced by a part of the operating system 105' of the SIM card 30.

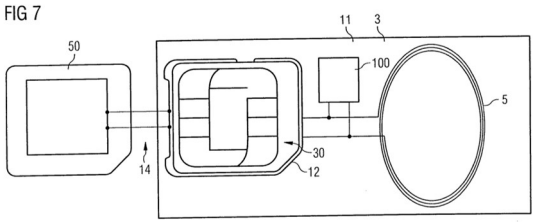
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at [0045] The transmitter 106 consists of an oscillator 108, a modulator 109 and a power amplifier 110. Furthermore, the transmitter 106 is extended by an electronic assembly 111 for generating and modulating a subcarrier signal in order to carry out the data transmission from the transponder unit 120 to the reading device by means of the subcarrier signal. Depending on the use of the transponder unit, the subcarrier signal may have different frequencies or may even be omitted entirely. Gerstenberger at [0046] In the transponder unit 120 shown in Fig. 6, it is provided that the assembly 111 divides the oscillator frequency by a certain factor by means of a frequency divider 112, for example by binary division. The subcarrier signal generated thereby is modulated with the data to be transmitted, which are supplied to the module 111 by the controller 105. Gerstenberger at [0047] The modulation of the subcarrier in the module 111 is carried out, for example, in an AND gate 113 by a so-called 100% amplitude key shifting (ASK). The amplitude of the signal generated by frequency division is switched between two states ON and OFF based on the data to be sent. Alternatively, (B)PSK modulation (binary phase key shifting), for example according to ISO 14443 Type B, or FSK modulation (frequency key shifting) can be used. Gerstenberger at [0049] The ring modulator 109 has the special feature that it performs a special form of amplitude modulation. As with conventional amplitude modulation, two spectral lines are generated in the frequency spectrum at a distance of the frequency of the ASK-modulated signal around the frequency of the oscillator signal, the so-called carrier frequency. During amplitude modulation in the ring modulator 109, the carrier frequency of the strong and high-energy oscillator signal is largely suppressed. The data to be transmitted contained in the ASK-modulated signal are located in sidebands around the two spectral lines of the auxiliary frequency after the amplitude modulation in the ring modulator 109. Such modulation is called double-side band (DSB) modulation. Called double-side band suppressed carrier (DSSC) modulation. No data is transmitted using the carrier frequency. Rather, by using the ring modulator 109, which suppresses the carrier frequency, the goal of being able to send data to the reader either with low transmission power or with a significantly greater range is achieved. The increased range is especially possible when the entire transmission power is put into the sidebands in which the data to be transmitted is located.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	The carrier frequency is basically required for demodulating the signal in order to extract the data transmitted by the transponder unit 120 in the reader. However, since the carrier frequency is present in the reader anyway, it is not necessary for the transponder signal itself to contain this frequency. Gerstenberger at [0050] An output signal is then available at the output of the ring modulator 109, which contains the two modulation sidebands and is combined with a signal generated by load modulation or The signal generated by the cross-section modulation matches (sufficiently accurately). The output signal generated by the ring modulator can then be amplified by means of an amplifier 110 if necessary and fed to the antenna 5 for sending the data to be sent via the switch 107, which is switched to transmission mode of the transponder unit 120 by a signal from the controller 105. Gerstenberger at [0051] The transponder unit 120 is operated in a first (active) operating mode as an actively transmitting transponder unit. In a second (passive) operating mode, the transponder unit works like a normal passive transponder, performing load modulation on the field of the reader. For example, the receiver 104 can additionally be designed as a conventional load modulator controlled by the controller 105. The controller then either switches the transmitter 106 on and the load modulator off or switches the transmitter 106 off and the load modulator on. The switch 107 is switched accordingly. The criteria for switching from a passive to an active operating state can be, for example, the received signal strength, the presence and/or sufficiency of an external power supply or the sufficiency of an internal power supply. It is thus possible, for example, to initially operate a transponder unit 120 passively and to switch to an active operating mode if, for example, the distance to the reader unintentionally increases. It can also be provided that the switching is carried out depending on the level of a voltage induced at the antenna 5, e.g. B. automatically when the induced voltage exceeds or falls below a certain value. Gerstenberger at [0055] Fig. 7 illustrates a further embodiment of the antenna adapter 1 . The antenna holder 3 and the data carrier holder 11 are integrally formed therein. The circuit 100 is again flat and arranged on the antenna holder 3. The receiving area 12 of the data carrier holder 11 is designed as a base for receiving a SIM card 30 in the size of a mini plug-in. It is also possible to design the receiving area 12 to accommodate card-shaped data carriers of other formats. A device connector 50, which is connected to the receiving area 12 of the data carrier holder 11 via flexible separate cables 14, is inserted into the mobile phone instead of the SIM card and has a corresponding SIM card format. The

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	SIM card 30 receives the signals necessary for operation, such as, for example, the status, via the flexible cables 14. B. VCC, GND, I/O, RESET, CLK, from the device connector 50 . The circuit 100 is supplied with energy from the battery of the mobile phone via the device connection 50. Gerstenberger at claim 21 21. Antenna adapter (1) according to one of claims 1 to 20, characterized by a circuit (100) which is designed to form an actively transmitting transponder unit (120) together with the antenna (5) and an integrated circuit of the card-shaped data carrier (20; 30) to be coupled to the antenna adapter (1). Gerstenberger at claim 37 37. System comprising a mobile radio telephone, a SIM card (20; 30) with an integrated circuit, an antenna adapter (1) according to one of claims 1 to 20 and a circuit (100) which, together with the antenna (5) of the antenna adapter (1) and the integrated circuit of the SIM card (20; 30), forms an actively transmitting transponder unit (120), wherein the circuit (100) is arranged integrated in the card-shaped data carrier (20; 30). *See also* [5d] and claim 9. To the extent this limitation is not disclosed by Gerstenberger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Gerstenberger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
12. The mobile device of claim 11 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Gerstenberger discloses or renders obvious "[t]he mobile device of claim 11 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." Gerstenberger at Abstract The adapter (1) has a flexibly designed antenna holder (3) comprising an antenna (5) and an antenna connection connected with the antenna, where the antenna connection is arranged in an antenna connection holder (2). The connection holder is formed to cooperate with a flat side of a data carrier and formed as a foil. A data carrier holder is provided with an accommodation area for accommodating the data carrier, where the area is formed as a flat recess. An independent claim is also included for a system comprising a mobile phone and an antenna adapter. Gerstenberger at Figure 1

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	 Gerstenberger at Figure 3  Gerstenberger at Figure 4  Gerstenberger at Figure 5

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	FIG 5  Gerstenberger at Figure 6 FIG 6 

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at Figure 7  Gerstenberger at [0001] The invention relates to the technical field of card-shaped data carriers with integrated circuits, which are equipped with an antenna for contactless functionalities. The invention further relates to a system comprising a mobile phone, a SIM card and such an antenna. Gerstenberger at [0002] Card-shaped data carriers with an integrated circuit, in particular chip cards or smart cards, which have an antenna for contactless communication with the integrated circuit of the data carrier, are known in a large number of different embodiments, for example as smart cards with contactless functionality for contactless payment transactions, for ski passes, for access controls or for the use of local public transport. Such functionalities can in principle also be implemented on SIM cards (subscriber identity module). SIM cards are chip cards in a smaller format, usually in the ID-000 format according to GSM11.11 and TS102.221 and are used in mobile phones to authenticate the mobile phone when logging into a mobile network. Since the SIM card is already present in the mobile phone, it makes sense to use the integrated circuit of the SIM card to implement additional contactless functionalities on the mobile phone. Gerstenberger at [0003] In addition to appropriate hardware and software adaptations, an antenna is required for the contactless functionality. Due to their small format, SIM cards do not offer enough space for an integrated antenna with the appropriate range. The location intended for the SIM card in the mobile phone may also be unfavorable

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	for the antenna, for example because of shielding by neighboring components, such as a battery. This problem can also occur in a similar way with electronic data storage devices of other types and forms that are used in other devices. Gerstenberger at [0004] In DE 10 2004 029 984 A1 it is proposed to design a portable data carrier, in particular a SIM card for mobile telephones, with an integrated antenna in such a way that the integrated circuit of the data carrier is arranged in a first flat-piece-like region and the antenna is arranged in a second flat-piece-like region, wherein the flat-piece-like antenna region is designed to be flexible. The first flat area has the usual dimensions of a standard SIM card and can be inserted into a mobile phone in the conventional way. The flat antenna area can be bent, for example around a cell phone battery, so that the antenna is not unnecessarily shielded by cell phone components. The surface of the flat-piece-like antenna region can accordingly be formed to be substantially larger than the first flat-piece-like region containing the integrated circuit. Gerstenberger at [0006] The present invention therefore addresses the problem of equipping card-shaped data carriers having an integrated circuit with an antenna in the simplest and most cost-effective manner possible. Gerstenberger at [0007] This object is achieved by an antenna adapter having the features of claim 1. A system comprising a mobile phone, a SIM card and such an antenna adapter is specified in claim 21. The dependent claims relate to advantageous developments and embodiments of the invention. Gerstenberger at [0008] With the aid of the antenna adapter according to the invention, conventional card-shaped data carriers with an integrated circuit, in particular SIM cards in the form of plug-ins or mini-plug-ins for mobile phones, can be equipped with an antenna for contactless data transfer over medium ranges (for example Near Field Communication NFC). The antenna adapter according to the invention comprises, in accordance with the prior art described above, an antenna which is arranged in a flat, flexible antenna holder, as well as an antenna connection connected to the antenna. Unlike in the prior art, however, the antenna connection is not designed as a plug connection, but is itself located in a flat antenna connection holder, which is connected to the antenna holder, for example, via a cable and which interacts with a flat side of the card-shaped data carrier in order to communicate with the integrated circuit of the data carrier. In this way, it is possible to use the interface

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	device already present in the data carrier, via which the integrated circuit of the data carrier communicates with an external device, for communication with the antenna without any modification of the data carrier being necessary. Rather, conventional data storage devices can be upgraded for additional contactless functionality by appropriately placing the antenna adapter on one of its flat sides. Gerstenberger at [0009] As a rule, such data carriers have a contact field with six or eight contact surfaces for contact-based data transfer, which are standardized and designated C1 to C8 according to the ISO/IEC 7816-2 standard. Of these contact surfaces, contact surfaces C4 and C8, for example, can be used for antenna contacting. If the integrated circuit of the data carrier has an S2C interface (an interface for NFC devices defined by Philips), the SIGIN connections for the signal input and SIGOUT for the signal output can be addressed equally via the contact surfaces C4 and C8. In the same way, the antenna connections of a dual-interface chip equipped with a passive RFID (radio frequency identification) interface can be contacted via the contact surfaces C4 and C8. Accordingly, the antenna connection holder of the antenna adapter is placed above the contact field in such a way that a galvanic contact is established between the antenna connection and the contact surfaces C4 and C8. Gerstenberger at [0010] Other data carriers are only or additionally (dual interface card) equipped with a contactless interface for contactless data transfer, e.g. B. according to ISO/IEC. The antenna adapter can also communicate with such an interface, which usually works inductively or capacitively, if the antenna connection is designed accordingly for contactless data transfer and is placed in the reception/reading area of the data carrier's interface. Gerstenberger at [0011] The antenna connection holder can be easily designed as a film, for example made of polyimide. A film only adds insignificantly to the overall thickness of the card-shaped data carrier and will generally not hinder the use of the data carrier in the usual device-side data carrier holders. Preferably, the antenna connection holder is designed as an adhesive label, optionally covered by a removable adhesive protective film, so that the antenna connection holder can be easily applied to the flat side of the card-shaped data carrier above the data carrier interface after removing the protective film. Gerstenberger at [0012] In order to facilitate the exact positioning of the antenna connection holder, it is advantageous if the peripheral contour of the antenna connection holder corresponds to the dimensions of the data carrier.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	In the case of a SIM card, the peripheral contours have ID-000 format and in the case of a mini-plug-in, the size of the 3rd form factor. Gerstenberger at [0014] According to a preferred embodiment of the invention, the antenna adapter has a flat-piece-like data carrier holder with a receiving area for receiving the data carrier. The flat piece-like data carrier holder and the flat piece-like antenna holder can also be realized as an integrally formed flat piece. In the latter case, if the contact surfaces of the data carrier are covered by the data carrier holder during use, the through-holes of the antenna connection used for external contacting are located in the receiving area of the data carrier holder used to hold the data carrier. Gerstenberger at [0017] If the antenna connection holder is not implemented together with the data carrier holder as an integrally formed flat piece, the antenna connection holder, for example in a foil design, is attached at a suitable location above a flat side of the data carrier arranged in the receiving area of the card carrier holder. The data carrier holder and the antenna connection holder can form a pocket for the data carrier. In particular, it is within the scope of the invention if the antenna connection holder is connected, for example glued, to the data carrier holder only after the data carrier has been inserted into the receptacle of the data carrier holder. Gerstenberger at [0018] The antenna holder carrying the antenna is significantly larger in area than the antenna connection holder and the data carrier holder. The antenna holder of an antenna adapter for a SIM card of a mobile phone is accordingly larger than the SIM card itself, but preferably smaller than the largest side surface of a battery of a mobile phone, so that the antenna holder can be placed on one side of the battery, while the SIM card is located, for example, under or next to the battery. Gerstenberger at [0021] However, due to the location intended for installation of an antenna for a SIM card between the battery of the mobile phone and the battery cover, in some cases there is not enough space for such a shield with sufficient thickness. Furthermore, the shape and/or material of the shielding layer must be selected differently depending on the type of mobile phone into which the antenna is to be inserted, which prevents cost-effective, uniform

Claim Element	Exemplary Citations to D.E. 102007019272 (“Gerstenberger”)
	production. In order to take this circumstance into account, the antenna adapter can, according to a preferred embodiment of the invention, contain a circuit which, together with the antenna and the integrated circuit of the data carrier, forms an actively transmitting transponder unit in order to be usable even in cramped installation conditions. The circuit is coupled to the antenna and the antenna connector. In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. In a preferred embodiment, the circuit is flat and arranged on the antenna holder of the antenna adapter. The circuit requires practically no additional space and can therefore be used advantageously. Gerstenberger at [0024] Fig. 1 shows a first embodiment of an antenna adapter according to the invention with SIM card schematically in plan view, Gerstenberger at [0028] Fig. 5 shows a fourth embodiment of an antenna adapter according to the invention, similar to that in Fig. 4, with a circuit for actively transmitting a signal, Gerstenberger at [0032] The antenna adapter 1 consists of the antenna connection holder 2, an antenna holder 3 and a web 4 connecting the antenna connection holder 2 to the antenna holder 3. B. are formed from a common polyimide film. The web 4 can also be wider and correspond, for example, to the width of the SIM card 2. The antenna holder 3 carries a coil antenna 5 with several turns, and the antenna connection holder 2 carries an antenna connection formed from two contacts 6 and 7, which is galvanically connected to the antenna 5 via a two-wire connecting cable 8. Gerstenberger at [0033] The peripheral contour of the antenna connection holder 2 corresponds to the shape of the SIM card 20 in ID-000 format. It can also be made smaller and must be designed at least in such a way that it can be attached with its contact connections 6, 7 above the contact surfaces C4, C8 of the contact field 22. In the illustrated embodiment, the antenna connection holder 2 is designed as an adhesive label so that it is firmly connected to the upper flat side of the SIM card 20 via an adhesive layer 9. The adhesive layer 9 is penetrated by the contact terminals 6, 7 so that they contact the contact surfaces C4, C8 of the SIM card 20.

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	At the remaining contact surfaces C1 to C3 and C5 to C7, there are through-holes 10 in the antenna connection holder 2, so that contacting of the SIM card 20 with external interfaces remains possible. This means that the top of the film recreates the covered SIM contacts so that the SIM card in the mobile phone works properly. Gerstenberger at [0035] Fig. 3 shows a second embodiment of an antenna adapter 1 according to the invention. Here, the antenna connection holder 2 is designed like a pocket so that the SIM card 20 can be inserted. The adhesive connection 9 can then be dispensed with. This also makes it easier to replace the SIM card 20. The antenna connection holder 2 is again formed by a film which is sufficiently thin that the SIM card 20 with the pocket-shaped antenna connection holder 2 can be inserted into a mobile phone without having to modify the device. It may be expedient to make the pocket open on two sides and, if necessary, to insert the SIM card 20 crosswise instead of lengthwise, as in Fig. 3. Gerstenberger at [0040] For shielding purposes, the antenna adapter 1 of the described embodiments can be designed in multiple layers at least in the area of the antenna holder 3 and, for example, can first have a copper foil and then a ferrite foil on a side facing an interference influence at the installation location. Such an antenna adapter is then particularly suitable for being folded around the battery of a mobile phone, for example. The SIM card 20 or the MiniPlugIn 30 are then located below the battery and the large antenna holder 3 is on the opposite side of the battery. If the battery and the SIM card 20 or the mini plug-in 30 are instead arranged next to one another within the mobile phone, depending on the situation as to whether the antenna holder 3 is to be located above or below the battery, it may be expedient to provide the aforementioned additional shielding layers on the other side of the antenna holder 3. Gerstenberger at [0041] A further embodiment, shown here on the basis of the embodiment according to Fig. 4, can be seen in Fig. 5 and comprises a circuit 100 which, together with the antenna 5 and the integrated circuit of the mini-plug-in 30, forms an actively transmitting transponder unit. The circuit 100 is flat and arranged on the antenna holder 3. It is also possible to integrate the circuit 100 into the plastic module of the data carrier (20; 30) to be coupled to the antenna adapter 1. In this way, as an alternative and/or in addition to the shielding layer, a limitation of the antenna's range caused by possible interference can be counteracted. Gerstenberger at [0043]

Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Fig. 6 shows schematically the actively transmitting transponder unit 120. The transponder unit has a power supply 102, the antenna 5 and the electronic circuit 100. The circuit 100 essentially consists of three functional blocks: a receiver 104, a controller 105 and a transmitter 106. A switch 107 is used to switch the antenna 5 between the receiver 104 and the transmitter 106. The energy supply 102 is normally provided by the battery of the mobile phone into which the data carrier to be coupled with the antenna adapter is inserted. But a simple battery can also serve this purpose. Gerstenberger at [0050] An output signal is then available at the output of the ring modulator 109, which contains the two modulation sidebands and is combined with a signal generated by load modulation or The signal generated by the cross-section modulation matches (sufficiently accurately). The output signal generated by the ring modulator can then be amplified by means of an amplifier 110 if necessary and fed to the antenna 5 for sending the data to be sent via the switch 107, which is switched to transmission mode of the transponder unit 120 by a signal from the controller 105. Gerstenberger at [0055] Fig. 7 illustrates a further embodiment of the antenna adapter 1 . The antenna holder 3 and the data carrier holder 11 are integrally formed therein. The circuit 100 is again flat and arranged on the antenna holder 3. The receiving area 12 of the data carrier holder 11 is designed as a base for receiving a SIM card 30 in the size of a mini plug-in. It is also possible to design the receiving area 12 to accommodate card-shaped data carriers of other formats. A device connector 50, which is connected to the receiving area 12 of the data carrier holder 11 via flexible separate cables 14, is inserted into the mobile phone instead of the SIM card and has a corresponding SIM card format. The SIM card 30 receives the signals necessary for operation, such as, for example, the status, via the flexible cables 14. B. VCC, GND, I/O, RESET, CLK, from the device connector 50 . The circuit 100 is supplied with energy from the battery of the mobile phone via the device connection 50. Gerstenberger at claim 19 19. Antenna adapter (1) according to one of claims 1 to 18, characterized in that the antenna (5) comprises several antenna turns. Gerstenberger at claim 21 21. Antenna adapter (1) according to one of claims 1 to 20, characterized by a circuit (100) which is designed to form an actively transmitting transponder unit (120) together with the antenna (5) and an integrated circuit of the card-shaped data carrier (20; 30) to be coupled to the antenna adapter (1).

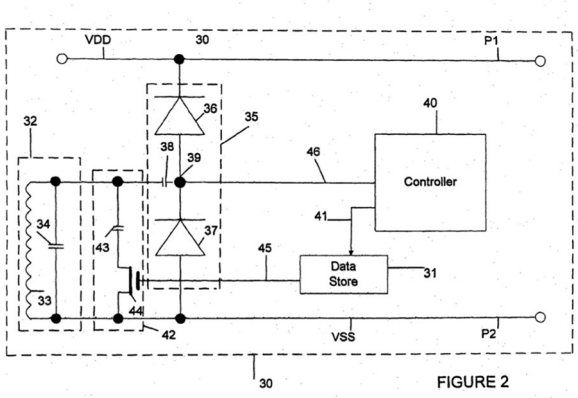
Claim Element	Exemplary Citations to D.E. 102007019272 ("Gerstenberger")
	Gerstenberger at claim 37 37. System comprising a mobile radio telephone, a SIM card (20; 30) with an integrated circuit, an antenna adapter (1) according to one of claims 1 to 20 and a circuit (100) which, together with the antenna (5) of the antenna adapter (1) and the integrated circuit of the SIM card (20; 30), forms an actively transmitting transponder unit (120), wherein the circuit (100) is arranged integrated in the card-shaped data carrier (20; 30). *See also* Gerstenberger at [0044], [0049], and [0051]. *See* claim 2 above. *See also* claim 11 above.
13. The mobile device of claim 11 wherein the smartcard controller is coupled to be powered by the mobile device.	Gerstenberger discloses or renders obvious "[t]he mobile device of claim 11 wherein the smartcard controller is coupled to be powered by the mobile device." *See* claim 3 above. *See also* claim 11 above.
14. The mobile device of claim 11 wherein the mobile device comprises a mobile phone.	Gerstenberger discloses or renders obvious "[t]he mobile device of claim 11 wherein the mobile device comprises a mobile phone." *See* claim 4 above. *See also* claim 11 above.

HDEFENDANTS' INVALIDITY CONTENTIONS FOR U.S. PAT. 9,483,722

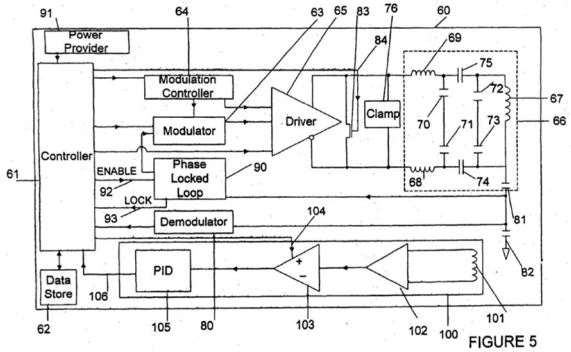
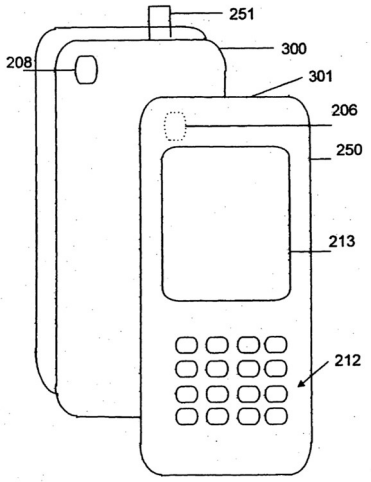
EXHIBIT B03: U.S. Patent Pub. No. 2008/0194200 ("Keen")

As demonstrated in the claim charts below, the claims of U.S. Patent No. 9,483,722 ("the '722 patent") are invalid (a) under one or more sections of 35 U.S.C. § 102 as anticipated by Keen and (b) under 35 U.S.C. § 103(a) as obvious over Keen standing alone and as set forth herein, and/or combined with the knowledge of a person of ordinary skill in the art, Applicant's Admitted Prior Art, and/or the additional prior art references discussed in Exhibit B and Exhibits B01–B05, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '722 patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

Defendants have conducted the invalidity analysis herein based at least in part and in some instance entirely upon Plaintiff's apparent application of the claims of the '722 patent. By charting the prior art against the claims and limitations herein, Defendants are not admitting or agreeing to Plaintiff's application of the claims at issue in this case, and these charts should not be interpreted as an admission or concession by Defendants that any particular construction or application of any claim limitation by Plaintiff is correct or proper. Additionally, these charts provide representative examples of portions of the charted references that disclose the indicated limitations of the claims; additional portions of these references other than the representative examples provided herein may also disclose the indicated limitation(s) and Defendants contend that the asserted claims are invalid in light of the charted reference(s) as a whole in its or their entirety. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well.

Claim Element	**Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")**
1[pre]. A mobile device comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is a claim limitation. Keen discloses or renders obvious "[a] mobile device." For example: Keen at Figure 2  FIGURE 2

Patent Owner's Ex. 2017
Page 210

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at Figure 5  FIGURE 5 Keen at Figure 7 FIGURE 7  Keen at [0003]

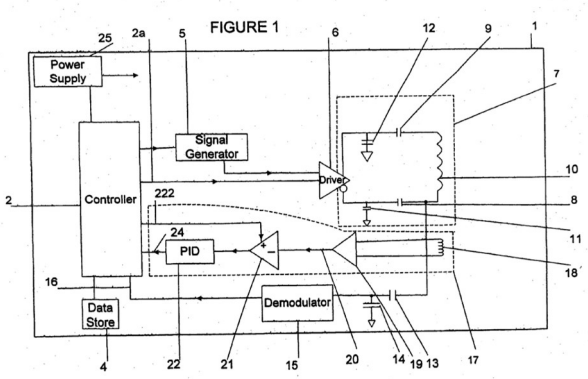
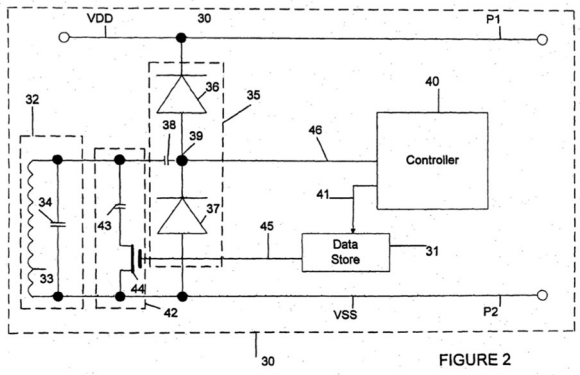
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Examples of near field communicators are RFID (Radio Frequency Identification) transceivers ("readers") or transponders ("tags") that operate under the RFID ISO/IEC 14443A protocol or ISO/IEC 15693 protocol or NFC (Near Field Communication) communicators operating under the NFCIP-1 (ISO/IEC 18092) or NFCIP-2 (ISO/IEC 21481) protocol. The phrase "near field communicator" will be used herein for any communicator that communicates using radio frequency in the near field (that is the H-field). The phrase "RFID tag" will be used herein for any near field communicator which is operable to respond to a received RF signal by transmission of its own RF signal or through modulation of or interference with the received RF signal. The phrase "RFID reader" will be used herein for any near field communicator which initiates the transmission of an RF signal and which is operable to wait for a response from any near field communicators within the near field of the RF signal. The phrase "NFC communicator" will be reserved for communicators operable to both initiate transmission of an RF signal and to respond to a received RF signal initiated by a second near field communicator. NFC communicators are therefore able to communicate with other NFC communicators, RFID readers and RFID tags. Keen at [0004] Such near field communicators may be discrete standalone devices, systems or apparatus or may be incorporated into or provided as part of the functionality of larger host devices, systems or apparatus, for example a consumer product such as a portable communications device having telecommunications capability (for example a mobile telephone (cellphone) or a telecommunications-enabled personal digital assistant or other computing device). Keen at [0007] Generally, the functionality of such a near field communicator is provided as a semiconductor integrated circuit to which a number of passive components and the antenna are added. The internal metal components of any host device, system or apparatus will as far as possible be located as far away as possible from the near field communicator's antenna. Compensation for the effects of any such metallic components or elements is normally effected by adjusting the capacitance value of a discrete "trimming" capacitor or by selecting a "select-on-test" type fixed capacitor or number of capacitor values during production testing of the host device, system or apparatus. However, this increases unit costs because of the cost of additional component(s), the impact on the printed circuit board costs and the costs involved in the testing and trimming or selecting operations. Further, the addition of such components may adversely affect the life and reliability of the communicator. Also, there may be circumstances in which it is not possible for the antenna circuitry to be adapted to the host device, system or apparatus or the configuration of the host device, system or apparatus may change (for example parts may be removed and

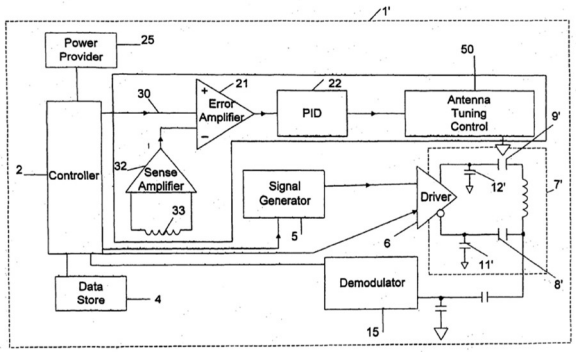
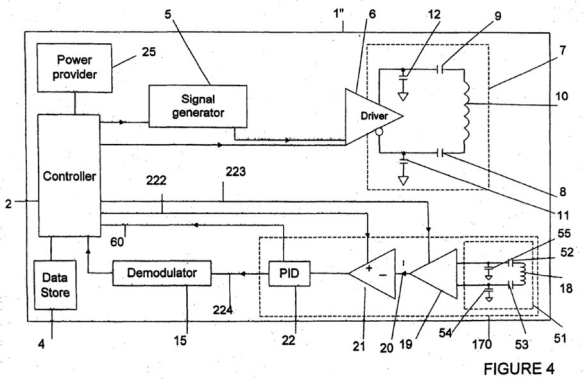
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	new sections added) throughout its life. Furthermore, if a common near field communicator circuit design is produced for a number of different host applications, those host applications will almost certainly have different antenna spatial envelopes, different dimensions, shapes, footprints or sizes (form factors) and differently located or distributed metallic material components or elements, so requiring different compensation component values for each different host application in order to achieve and maintain optimum performance. This results in a large overhead (both in terms of costs and resources) for a company supplying or using near field communicators in a range of host devices, systems or apparatus. Keen at [0010] In addition during normal operation of near field communicators, such communicators will communicate with all kinds of different near field communicators each of which has different antenna sizes and form factors and each of which will operate at differing distances from the antenna of the transmitting communicator. All of these factors will have an effect on the H-field and therefore the signal strength of the RF signal produced by the near field communicator. Keen at [0013] In one aspect, the present invention provides a near field communicator comprising a driver operable to drive an antenna or coil to produce a magnetic field; a magnetic field sensor operable to sense the magnetic field produced by the antenna or coil; a comparator operable to compare, directly or indirectly, the sensed magnetic field strength with a desired parameter, and a controller operable to control the driver to compensate for a difference between the sensed magnetic field strength and the desired parameter. Keen at [0026] FIG. 7 shows a simplified view of a mobile telephone incorporating a near field communicator embodying the invention. Keen at [0048] To assist the explanation of the operation of the RFID reader 1, FIG. 2 shows a functional block diagram of an RFID data storage tag 30 that may be read by the reader 1 when the tag 30 is in the read range (H field) of the reader 1. In this example, the RFID tag or transponder is a passive device, where "passive" in this context means that the RFID tag derives power from the RF signal supplied by the reader (it is not self-powered). As another possibility, the RFID tag may be an active device having a power provider (similar to that shown for an RFID reader in FIG. 1 as 25) for example at least one of a battery or a coupling to a power source of host device, system or apparatus containing or associated with the RFID tag.

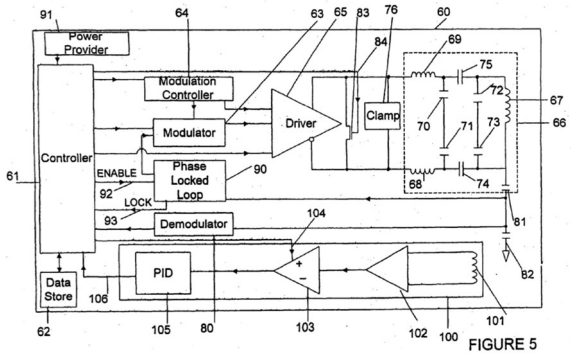
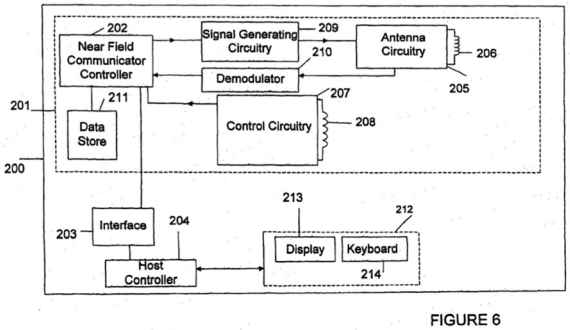
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at [0067] FIG. 3 may also be implemented as an active RFID tag rather than an RFID reader if the controller 2 is configured not to initiate but to respond, that is if the controller 2 is configured to allow RF signal generation and any modulation only in response to an RF signal (H field) from an RFID reader or an NFC communicator in initiator mode. Keen at [0083] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator 60 in accordance with the invention. Unlike the RFID readers described with reference to FIGS. 1, 3 and 4, an NFC communicator is capable of communicating with transponders or tags, RFID transceivers or readers and other NFC communicators. Examples of such NFC communicators are described in ISO/IEC 18092 and ISO/IEC 21481. Thus, an NFC communicator can operate: 1) in an initiator mode in which the NFC communicator functions in a similar fashion to an RFID reader and will transmit an RF signal; and 2) in a target mode in which the NFC communicator waits for receipt of an RF signal from another NFC communicator operating in initiator mode or an RFID reader, that is it functions like a tag or transponder. NFC communicators may communicate with each other using an active or passive protocol. When using the active protocol, an initiator mode NFC communicator transmits an RF signal and then ceases RF signal transmission and a target mode NFC communicator responds by transmitting its own RF signal and then ceasing RF signal transmission. When using the passive protocol, an initiator mode NFC communicator transmits its RF signal and maintains that RF signal throughout the duration of the communication cycle and a target mode NFC communicator responds by causing modulation of the transmitted RF signal. Keen at [0084] As shown in FIG. 5, the NFC communicator 60 includes a controller 61 for controlling overall operation of the NFC communicator in accordance with control data and/or instructions and other data stored by an internal memory of the controller 61 and/or a data store 62 coupled to the controller. The controller 61 may comprise a microcontroller, RISC computer or state machine, for example. Keen at [0088] The NFC communicator 60 shown in FIG. 5 has two mechanisms for enabling communication of data when the NFC communicator is in the target mode. One mechanism is a load modulation mechanism as described above with reference to FIG. 2 and the other is an interference mechanism which simulates load modulation.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at [0091] The NFC communicator 60 of course also has a power provider 91. For convenience the connections of the power provider to the remainder of the NFC communicator 91 are not shown. The power provider 91 may comprise at least one of a power supply such as a battery provided within the NFC communicator 60 and or a connection to a power supply of a host device, apparatus or system. The power provider could also comprise a power deriver for deriving a power supply from an RF signal inductively coupled to the antenna circuit 66 when the NFC communicator is in target mode. Keen at [0093] The NFC communicator 60 may use a combination of load modulation or carrier interference or may alternatively use only one or the other form of communication. As another possibility, the NFC communicator 60 may comprise multiple antennas, one being used for response to a received RF signal and the other being used for transmission of an RF signal with the antennas being switched on according to need, under the control of the controller of the NFC communicator. Thus, where the NFC communicator is acting in initiator mode, the antenna selected for transmission of an RF signal will be used while where the NFC communicator is, for example, acting as a passive target (i.e. similar to an RFID transponder) the controller 61 will switch the antennas, thereby utilising an antenna more suited to load modulation of an incoming RF signal. Keen at [0101] The near field communicator may be a stand-alone device or may be comprised within a host device, apparatus or system such as a consumer product, for example a mobile telephone, personal digital assistant, digital camera, or a laptop, notebook, or other computer. Also near field communicators in accordance with the invention may be used in other electrical or electronic products, for example consumer products such as domestic appliance or personal care products, and other electrical or electronic devices, apparatus or systems. Other areas of application are ticketing systems, for example in tickets (for example parking tickets, bus tickets, train tickets or entrance permits or tickets) or in ticket checking systems, toys, games, posters, packaging, advertising material, product inventory checking systems and so on. Keen at [0102] Where comprised within a host device, apparatus or system, the functionality or at least some of the functionality of the near field communicator may be provided by the host device, apparatus or system and an interface provided between the host system controller and the other components of the near field

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	communicator. FIG. 6 shows a functional block diagram of a host device, apparatus or system 200 comprising a near field communicator 201 in which the near field communicator controller 202 is coupled via an interface 203 to a host controller 204 which controls operations of the host device, apparatus or system which may be, for example, a mobile telephone. As shown, the near field communicator 201 has the functional elements discussed above discretely located within the host device, apparatus or system, namely antenna circuitry 205 having an antenna coil 206, control circuitry 207 for controlling operation of the near field communicator in accordance with the magnetic field strength sensed by a sense coil 208, signal providing circuitry 209 for providing the RF signal modulated in accordance with control data and/or other data from the near field communicator controller 202, a demodulator 210 for extracting modulation from an RF signal coupled to the near field communicator 201, and a data store 211. The functionality of the near field communicator 201 may, however, be dispersed throughout the host device, apparatus or system 200. In addition the data storage or at least part of the data storage may be provided by the host device, apparatus or system and at least some instructions, control data and/or other data may be provided by the host device, apparatus or system or input by a user via a user interface 212 of the host device, apparatus or system which may comprise a display 213 and a keyboard 214, for example. Keen at [0103] FIG. 7 shows a simplified view of a mobile telephone 250 forming such a host device with the main body 300 of the mobile telephone 250 shown separated from its fascia 301 to show that, as one possibility, the main and sense antennas or coils 206 and 208 of the near field communicator may be located opposite one another within each part of the mobile phone so that their coil axes are coincident. *See also* Keen at Abstract, [0025], [0028], [0046], [0050], [0051], [0053], [0054], [0055], [0056], [0058], [0087], [0090], [0092], [0095], and [0098]. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Keen discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." For example: Keen at Abstract A near field communicator has a driver (6) to supply a drive signal to drive an antenna (10) to generate a magnetic field. A magnetic field sensor (18) is located so as to be within a magnetic field generated by the

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	antenna (6) to sense a magnetic field characteristic. A controller (17) provides a control signal to control the operation of the driver (6) to compensate for any difference between the magnetic field characteristic sensed by the magnetic field sensor (18) and a predetermined parameter. Keen at Figure 1  Keen at Figure 2  Keen at Figure 3

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 3 Keen at Figure 4  FIGURE 4 Keen at Figure 5

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 5 Keen at Figure 6  FIGURE 6 Keen at [0013] In one aspect, the present invention provides a near field communicator comprising a driver operable to drive an antenna or coil to produce a magnetic field; a magnetic field sensor operable to sense the magnetic field produced by the antenna or coil; a comparator operable to compare, directly or indirectly, the sensed magnetic field strength with a desired parameter, and a controller operable to control the driver to compensate for a difference between the sensed magnetic field strength and the desired parameter. Keen at [0015] In an embodiment, the controller is operable to control the driver to control the magnetic signal strength produced by the antenna.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at [0018] In an embodiment, the controller is operable to control the driver using proportional, integral and differential (PID) techniques or algorithms. Keen at [0024] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator in accordance with the invention; Keen at [0028] FIG. 1 shows a functional block diagram of an embodiment of an RFID reader 1 in accordance with the invention which is operable to transmit a radio frequency signal and to detect and demodulate modulation of the transmitted radio frequency signal. The RFID reader 1 may be compatible with a variety of standards or communications protocols, for example ISO/IEC 14443 or ISO/IEC 15693. Keen at [0029] The RFID reader 1 comprises a controller 2 for controlling operation of the RFID reader 1 including controlling the communication protocol under which the RFID reader operates, the data supplied to any receiving near field communicator and the modulation of any generated magnetic field. The controller 2 may be, for example, a microprocessor, a microcontroller (for example a reduced instruction set computer) or state machine. The choice will depend on the design of the reader and operational requirements. The controller 2 is coupled to a data store 4 which may be of, for example EEPROM, ROM, RAM or other memory format. Keen at [0030] The controller 2 is also coupled to a signal generator 5 for generating a radio frequency signal (for example a 13.56 Mega Hertz RF signal). The generated RF signal may be unmodulated or modulated with control or other data supplied by the controller 2. The signal generator 5 may generate the RF signal in a variety of ways. For example the RF signal may be a digital signal generated by sine synthesis in which case any required modulation will generally be effected by pulse-width modulation (PWM), pulse code modulation or pulse-density modulation (PDM) techniques. As another possibility, the RF signal may be a digital signal generated by use of a pre-configured algorithm or direct digital synthesis. Where sine synthesis is not used additional filtering circuitry may be required (not shown) to meet electromagnetic energy emissions regulations. Other possible modulation schemes that may be used include amplitude shift key (ASK) modulation and load modulation.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at [0031] The output of the signal generator 5 is coupled to one input of a differential driver 6. The other input of differential driver 6 is coupled to a driver control signal output 2a of the controller 2. Keen at [0051] The tag 30 also has a controller 40 for controlling (via control line 41) reading of data from the data store 31 and supply of that data to a modulator 42 coupled to the antenna circuit 32. In the example shown, the modulator 42 comprises a series-connection of a capacitor 43 and an FET 44 coupled across the capacitor 34 of the antenna circuit 32 with the gate electrode of the FET 44 coupled to an output 45 of the data store 31 so that output of data from the data store 31 modulates the load on the antenna circuit 32 and thus on any antenna circuit 7 (FIG. 1) inductively coupled to the antenna circuit 32. Keen at [0052] The tag 30 may be a synchronous tag in which case the tag controller 40 will have a clock deriver input 46 coupled to receive an RF signal coupled to the antenna circuit 32 so that the tag controller 40 can derive a clock signal directly from the received RF signal or from periodic interruption by the reader controller 2 (FIG. 1) of the RF signal. Alternatively, the tag 30 may be an asynchronous tag in which the tag controller 40 will have its own clock. Keen at [0053] The tag controller 40 may simply control reading of data from the data store 31 when the tag is powered or may be more sophisticated and may allow data and/or control instructions to be retrieved from a modulated RF signal supplied by a reader 1. An example of the former simple type of tag is shown in FIG. 6 of WO02/093881 while an example of a tag that can receive and store data and/or instructions is shown in FIG. 7 of WO02/093881, the whole contents of which are hereby incorporated by reference. The tag controller 40 may be, for example, a microprocessor, a microcontroller, a controller (for example a reduced instruction set computer) or state machine. The choice will depend on the design of tag used and operational requirements. Keen at [0054] As will be appreciated from the above, the controller 2 of the reader 1 shown in FIG. 1 is configured to control communication with a tag. The actual nature of this control will depend upon the reader and tag configuration or type. Thus, the reader control 2 will control the generation of an RF signal by the signal generator 5, the interruption, where required, of that signal to enable a tag to generate a clock signal, the

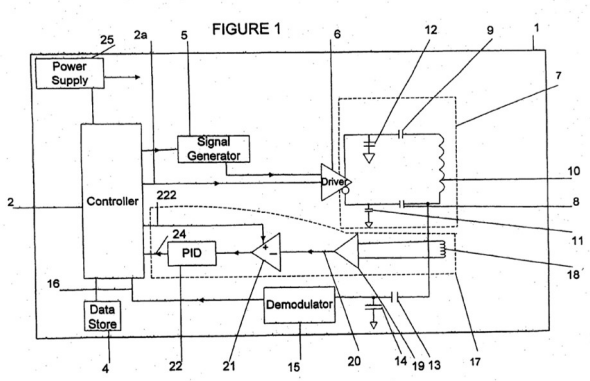
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	protocols under which the RFID communicator 1 operates, any modulation of the RF signal and any response to any received modulation of the generated RF signal. As will be appreciated, the pattern of any modulation will represent a series of digital ones and zeros determined by the binary data being transmitted. Keen at [0055] In operation of the RFID reader 1 shown in FIG. 1, the controller 2 controls at least one of the signal generator 5 and differential driver 6 to affect both generation of the RF signal as required and modulation of that RF signal. Keen at [0056] In the case of a simple tag, the tag controller 40 may cause data to be read from the tag data store 31 upon powering up of the tag, that is once the power deriver 35 of the tag 30 derives a power supply for the tag 30 from the inductively coupled RF signal. Where the tag 30 is more sophisticated, then the communications protocol under which the tag and the reader operate may require some form of communication or handshaking to occur before the tag controller 40 causes data to be read from the tag data store. The reading of data from the data store 31 causes the modulator 42 to modulate the load on the antenna circuit 32 (and thus on the antenna circuit 7 inductively coupled thereto) in accordance with the data read from the data store 31. The modulation by the tag 30 of the RF signal is extracted by the reader demodulator 15 and supplied to the controller 2. The capacitors 13 and 14 limit the amplitude of the signal input to the demodulator 15 and so avoid over-voltage damage to the demodulator 15. Keen at [0058] When the controller 2 causes the signal generator 5 to generate an RF signal, the digital signal generated by the signal generator 5 is fed into the differential driver 6 which outputs complementary pulses to the antenna circuit 7. The resulting oscillating magnetic H field produced by the antenna circuit 7 is inductively coupled to the antenna circuit of any tag 30 (FIG. 2) within the H field, that is within the read range of the reader 1. The designed read range (that is the distance over which the tag antenna coil 33 is intended to be able to couple inductively to the magnetic field (H field) of the reader 1 antenna coil 10) will depend upon the actual reader and tag antenna circuit design and constraints, in particular upon the size and configuration of the antenna coils and the strength of the RF signal supplied by the reader 1. For example, the H field or read range may be designed to lie in a range up to 1 metre. Keen at [0067]

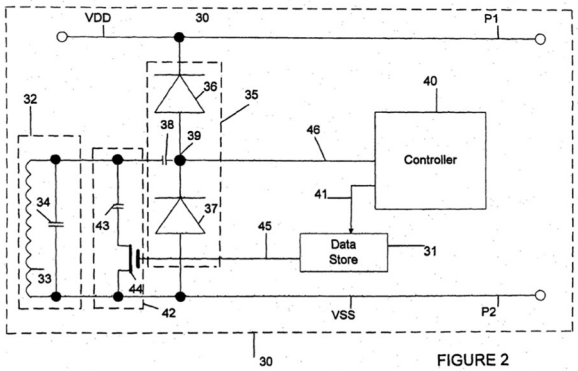
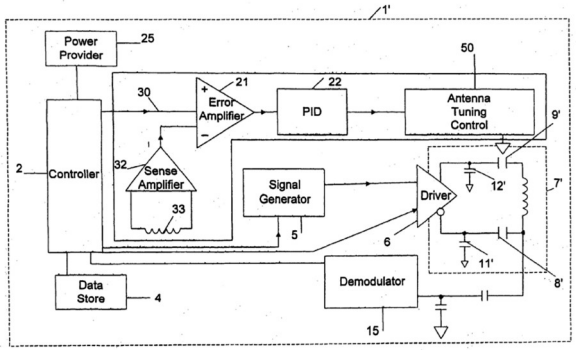
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	FIG. 3 may also be implemented as an active RFID tag rather than an RFID reader if the controller 2 is configured not to initiate but to respond, that is if the controller 2 is configured to allow RF signal generation and any modulation only in response to an RF signal (H field) from an RFID reader or an NFC communicator in initiator mode. Keen at [0069] The controller 2, signal generator 5, differential driver 6 and main antenna circuit 7 (comprising the main antenna coil 10 and associated capacitors 8, 911 and 12), and data store 4 correspond to the same components described above with reference to FIG. 1 and operate in the same way as described for the equivalent components in FIG. 1 Likewise the control loop stabiliser 220 operates in the same way as the control loop stabiliser 22 in FIG. 1 as regards the strength of the magnetic field generated by the RFID reader 1″. In this embodiment, however, the control loop stabiliser 220 is also used by the RFID reader 1″ to detect modulation of the magnetic field by an external near field communicator. Keen at [0074] During operation of the RFID reader 1″ shown in FIG. 4, when the controller 2 causes the signal generator 5 to generate an RF signal, the digital signal generated by the signal generator 5 is fed into the differential driver 6 which outputs complementary pulses to the antenna circuit 7. The resulting oscillating magnetic H field produced by the antenna circuit 7 is inductively coupled to the antenna circuit of any tag (for example the tag 30 shown in FIG. 2) within the H field, that is within the read range of the reader 1″. Keen at [0081] As described above the sense amplifier 19 filters out modulation in accordance with instructions from the controller 2. The modulation filtering may be carried out anywhere in the control circuit 170 before the control loop stabiliser. For example a separate filter may be provided or the error amplifier 21 may incorporate an initial filtering stage. As another possibility, there may be no filtering out of the modulation. In this latter case, the control loop stabiliser 220 (or controller 2 where the signal processing functionality is provided by the controller) will be configured to track any modulation, and to ignore any modulation where the controller 2 indicates that the modulation was effected by the RFID reader 1″ but to detect and process any modulation where the controller 2 indicates that the RFID reader 1″ is waiting for a response. Keen at [0083] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator 60 in accordance with the invention. Unlike the RFID readers described with reference to FIGS. 1, 3 and 4, an NFC

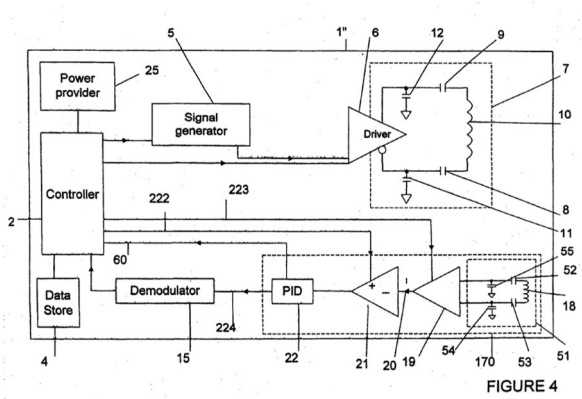
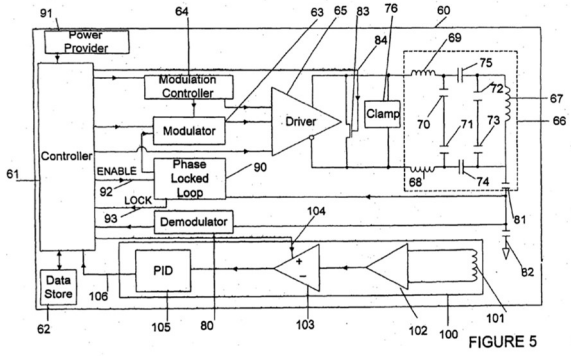
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	communicator is capable of communicating with transponders or tags, RFID transceivers or readers and other NFC communicators. Examples of such NFC communicators are described in ISO/IEC 18092 and ISO/IEC 21481. Thus, an NFC communicator can operate: 1) in an initiator mode in which the NFC communicator functions in a similar fashion to an RFID reader and will transmit an RF signal; and 2) in a target mode in which the NFC communicator waits for receipt of an RF signal from another NFC communicator operating in initiator mode or an RFID reader, that is it functions like a tag or transponder. NFC communicators may communicate with each other using an active or passive protocol. When using the active protocol, an initiator mode NFC communicator transmits an RF signal and then ceases RF signal transmission and a target mode NFC communicator responds by transmitting its own RF signal and then ceasing RF signal transmission. When using the passive protocol, an initiator mode NFC communicator transmits its RF signal and maintains that RF signal throughout the duration of the communication cycle and a target mode NFC communicator responds by causing modulation of the transmitted RF signal. Keen at [0084] As shown in FIG. 5, the NFC communicator 60 includes a controller 61 for controlling overall operation of the NFC communicator in accordance with control data and/or instructions and other data stored by an internal memory of the controller 61 and/or a data store 62 coupled to the controller. The controller 61 may comprise a microcontroller, RISC computer or state machine, for example. Keen at [0085] The controller 61 is coupled to a signal modulator 63 for modulating an RF signal in accordance with data provided by the controller 61, to a modulation controller 64 and to a differential driver 65 which is also coupled to the outputs of the signal modulator 63 and the modulation controller 64. The modulation controller 64 may control the amplitude of the signal supplied by the modulator 63. As shown, the modulation controller 64 is separate from the controller 61. The functionality of the modulation controller may however be provided by the controller 61. Keen at [0088] The NFC communicator 60 shown in FIG. 5 has two mechanisms for enabling communication of data when the NFC communicator is in the target mode. One mechanism is a load modulation mechanism as described above with reference to FIG. 2 and the other is an interference mechanism which simulates load modulation. Keen at [0089]

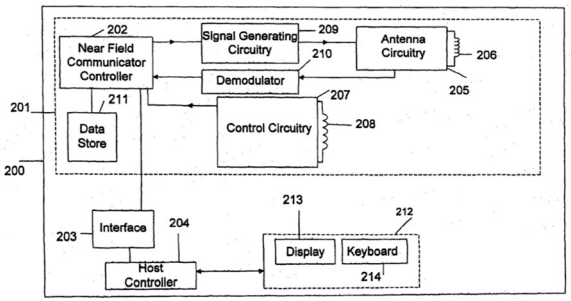
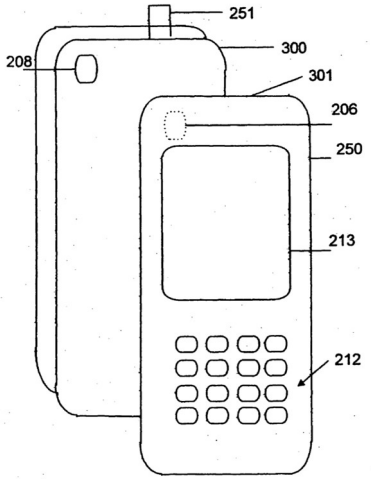
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	The load modulation mechanism is provided by a transistor 83 (as shown a FET) coupled across the antenna coil 67. The controller 61 has a data output 84 coupled to the gate or control electrode of the transistor 83 and, when this mechanism is operational, the transistor 83 is switched on and off in accordance with the data supplied by the controller 61, thereby modulating the load on the antenna circuit 66 and thus an RF signal supplied by the initiator NFC communicator or RFID reader. Keen at [0090] The interference or simulated load modulation mechanism is provided by a phase-locked loop 90 comprising, in this example, a voltage controlled oscillator (VCO), a phase detector, a loop filter and preferably a sample and hold circuit). The phase-locked loop 90 is coupled, as shown via capacitor 81, to the antenna circuit 66. The phase-locked loop 90 generates an internal RF signal which is supplied to the modulator 63 when the NFC communicator 60 is in initiator mode. When, however, the NFC communicator 60 is in target mode, the phase-locked loop 90 is controlled by an enable signal output 92 of the controller 61 to bring the internally generated RF signal into phase ("lock") with an external RF signal coupled to the antenna circuit 66 (that is an RF signal from an initiator mode NFC communicator or RFID reader) so that the internally generated RF signal has a fixed phase relationship to the external RF signal. The phase-locked loop 90 provides a signal to an input 93 of the controller 61 when phase lock has been achieved. This ensures that the target mode NFC communicator can communicate with the initiator mode NFC communicator or RFID reader by modulating its internally generated RF signal. Keen at [0092] The controller 61 controls RF signal generation, modulation characteristics of any transmitted RF signal, response to any received RF signal, interpretation of any received demodulated signal, mode of operation (for example initiator or target or active or passive mode) and the communication protocol under which the NFC communicator 60 operates. In responding to a received signal when in target mode, the NFC communicator will respond in a manner dependent upon whether the NFC communicator 60 is operating under the active or passive protocol. Where the NFC communicator is operating under the active protocol, the controller 61 will cause the NFC communicator to respond by generation of a phase-locked modulated signal using the phase-locked loop mechanism whereas in the event the NFC communicator is operating under the passive protocol, the controller 61 may cause the received RF signal to be directly modulated by switching the transistor 83 in accordance with the data to be communicated or may use the phase-locked loop 90 mechanism to effect modulation by interference with the received RF signal (simulated load modulation). Keen at [0093]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	The NFC communicator 60 may use a combination of load modulation or carrier interference or may alternatively use only one or the other form of communication. As another possibility, the NFC communicator 60 may comprise multiple antennas, one being used for response to a received RF signal and the other being used for transmission of an RF signal with the antennas being switched on according to need, under the control of the controller of the NFC communicator. Thus, where the NFC communicator is acting in initiator mode, the antenna selected for transmission of an RF signal will be used while where the NFC communicator is, for example, acting as a passive target (i.e. similar to an RFID transponder) the controller 61 will switch the antennas, thereby utilising an antenna more suited to load modulation of an incoming RF signal. Keen at [0095] As with the RFID reader 1 shown in FIG. 1, the NFC communicator 60 has a control circuit 100 for controlling operation of the NFC communicator 60 in accordance with the strength of the magnetic field generated by the antenna circuit coil 66. As shown in FIG. 5, the control circuit 100 comprises a sense coil 101 positioned so as to be able to sense or detect at least part of the magnetic field (H field) produced by the antenna circuit coil 67, that is so that the sense coil 101 lies within the H field of the antenna circuit coil 67. The sense coil 101 is coupled to a sense amplifier 102 having its output coupled to one input (as shown the negative input) of a differential or error amplifier 103. The other input of the error amplifier 103 is coupled to a required magnetic field strength output 104 of the controller 61 which provides a signal indicating the magnetic field strength required to be produced by the antenna circuit 66. Keen at [0102] Where comprised within a host device, apparatus or system, the functionality or at least some of the functionality of the near field communicator may be provided by the host device, apparatus or system and an interface provided between the host system controller and the other components of the near field communicator. FIG. 6 shows a functional block diagram of a host device, apparatus or system 200 comprising a near field communicator 201 in which the near field communicator controller 202 is coupled via an interface 203 to a host controller 204 which controls operations of the host device, apparatus or system which may be, for example, a mobile telephone. As shown, the near field communicator 201 has the functional elements discussed above discretely located within the host device, apparatus or system, namely antenna circuitry 205 having an antenna coil 206, control circuitry 207 for controlling operation of the near field communicator in accordance with the magnetic field strength sensed by a sense coil 208, signal providing circuitry 209 for providing the RF signal modulated in accordance with control data and/or other data from the near field communicator controller 202, a demodulator 210 for extracting

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	modulation from an RF signal coupled to the near field communicator 201, and a data store 211. The functionality of the near field communicator 201 may, however, be dispersed throughout the host device, apparatus or system 200. In addition the data storage or at least part of the data storage may be provided by the host device, apparatus or system and at least some instructions, control data and/or other data may be provided by the host device, apparatus or system or input by a user via a user interface 212 of the host device, apparatus or system which may comprise a display 213 and a keyboard 214, for example. *See also* Keen at [0032], [0033], [0086], and [0098]. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1b] an antenna tuned to operate at 13.56 MHz; and	Keen discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." For example: Keen at Abstract A near field communicator has a driver (6) to supply a drive signal to drive an antenna (10) to generate a magnetic field. A magnetic field sensor (18) is located so as to be within a magnetic field generated by the antenna (6) to sense a magnetic field characteristic. A controller (17) provides a control signal to control the operation of the driver (6) to compensate for any difference between the magnetic field characteristic sensed by the magnetic field sensor (18) and a predetermined parameter. Keen at Figure 1  Keen at Figure 2

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 2 Keen at Figure 3  FIGURE 3 Keen at Figure 4

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 4 Keen at Figure 5  FIGURE 5 Keen at Figure 6

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 6 Keen at Figure 7 FIGURE 7  Keen at [0002] Near field communication requires the antenna of one near field communicator to be present within the alternating magnetic field (the H field) generated by the antenna of another near field communicator by transmission of an RF signal, for example a 13.56 Mega Hertz signal. The RF signal is thus inductively coupled between the communicators. The RF signal may be modulated to enable communication of

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	control instructions and/or data and/or may be used by the receiving communicator to derive a power supply. Keen at [0003] Examples of near field communicators are RFID (Radio Frequency Identification) transceivers ("readers") or transponders ("tags") that operate under the RFID ISO/IEC 14443A protocol or ISO/IEC 15693 protocol or NFC (Near Field Communication) communicators operating under the NFCIP-1 (ISO/IEC 18092) or NFCIP-2 (ISO/IEC 21481) protocol. The phrase "near field communicator" will be used herein for any communicator that communicates using radio frequency in the near field (that is the H-field). The phrase "RFID tag" will be used herein for any near field communicator which is operable to respond to a received RF signal by transmission of its own RF signal or through modulation of or interference with the received RF signal. The phrase "RFID reader" will be used herein for any near field communicator which initiates the transmission of an RF signal and which is operable to wait for a response from any near field communicators within the near field of the RF signal. The phrase "NFC communicator" will be reserved for communicators operable to both initiate transmission of an RF signal and to respond to a received RF signal initiated by a second near field communicator. NFC communicators are therefore able to communicate with other NFC communicators, RFID readers and RFID tags. Keen at [0007] Generally, the functionality of such a near field communicator is provided as a semiconductor integrated circuit to which a number of passive components and the antenna are added. The internal metal components of any host device, system or apparatus will as far as possible be located as far away as possible from the near field communicator's antenna. Compensation for the effects of any such metallic components or elements is normally effected by adjusting the capacitance value of a discrete "trimming" capacitor or by selecting a "select-on-test" type fixed capacitor or number of capacitor values during production testing of the host device, system or apparatus. However, this increases unit costs because of the cost of additional component(s), the impact on the printed circuit board costs and the costs involved in the testing and trimming or selecting operations. Further, the addition of such components may adversely affect the life and reliability of the communicator. Also, there may be circumstances in which it is not possible for the antenna circuitry to be adapted to the host device, system or apparatus or the configuration of the host device, system or apparatus may change (for example parts may be removed and new sections added) throughout its life. Furthermore, if a common near field communicator circuit design is produced for a number of different host applications, those host applications will almost certainly have different antenna spatial envelopes, different dimensions, shapes, footprints or sizes (form factors) and

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	differently located or distributed metallic material components or elements, so requiring different compensation component values for each different host application in order to achieve and maintain optimum performance. This results in a large overhead (both in terms of costs and resources) for a company supplying or using near field communicators in a range of host devices, systems or apparatus. Keen at [0009] A further issue is that, in order to create the strongest magnetic field for the lowest drive power, near field communicators generally use an antenna circuit tuned to have a resonant frequency coinciding with or very close to the operating carrier frequency of the near field communicator. One of the most influential parameters of a resonant circuit is its "Q" factor and to achieve optimum read range performance, especially when using small size (small form factor) antennas, relatively high Q factors are used. Although this achieves maximum read range it also makes the communicator very sensitive to the de-tuning effects of nearby metallic and/or magnetic materials. Indeed, the inventors have realised that these de-tuning effects can be more dominant than the unavoidable eddy current loses. Keen at [0010] In addition during normal operation of near field communicators, such communicators will communicate with all kinds of different near field communicators each of which has different antenna sizes and form factors and each of which will operate at differing distances from the antenna of the transmitting communicator. All of these factors will have an effect on the H-field and therefore the signal strength of the RF signal produced by the near field communicator. Keen at [0011] In one aspect, the present invention provides a near field communicator having a magnetic field strength determiner and an antenna drive adjuster operable to adjust the drive to an antenna of the communicator in accordance with the determined magnetic field strength to provide the communicator with the required read range performance. Keen at [0013] In one aspect, the present invention provides a near field communicator comprising a driver operable to drive an antenna or coil to produce a magnetic field; a magnetic field sensor operable to sense the magnetic field produced by the antenna or coil; a comparator operable to compare, directly or indirectly, the sensed magnetic field strength with a desired parameter, and a controller operable to control the driver to compensate for a difference between the sensed magnetic field strength and the desired parameter.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at [0028] FIG. 1 shows a functional block diagram of an embodiment of an RFID reader 1 in accordance with the invention which is operable to transmit a radio frequency signal and to detect and demodulate modulation of the transmitted radio frequency signal. The RFID reader 1 may be compatible with a variety of standards or communications protocols, for example ISO/IEC 14443 or ISO/IEC 15693. Keen at [0030] The controller 2 is also coupled to a signal generator 5 for generating a radio frequency signal (for example a 13.56 Mega Hertz RF signal). The generated RF signal may be unmodulated or modulated with control or other data supplied by the controller 2. The signal generator 5 may generate the RF signal in a variety of ways. For example the RF signal may be a digital signal generated by sine synthesis in which case any required modulation will generally be effected by pulse-width modulation (PWM), pulse code modulation or pulse-density modulation (PDM) techniques. As another possibility, the RF signal may be a digital signal generated by use of a pre-configured algorithm or direct digital synthesis. Where sine synthesis is not used additional filtering circuitry may be required (not shown) to meet electromagnetic energy emissions regulations. Other possible modulation schemes that may be used include amplitude shift key (ASK) modulation and load modulation. Keen at [0032] The differential driver 6 is coupled to supply the RF signal to an antenna circuit 7. In this example, the antenna circuit 7 is a tuned circuit comprising respective capacitors 8 and 9 in series with an antenna coil 10 and further capacitors 11 and 12 each coupled between a respective one of the capacitors 8 and 9 and ground (earth). The presence of all four capacitors serves to reduce unwanted carrier harmonics but it may be possible to omit some of the capacitors, for example capacitors 11 and 12, where the signal generated by the differential driver 6 does not exceed electromagnetic energy emissions regulations. Keen at [0033] One end of the antenna coil 10 is coupled to ground via a filter arrangement comprising a series connection of capacitors 13 and 14 for filtering out extraneous signals. The junction between the capacitors 13 and 14 is coupled to a demodulator 15 (which may be, for example, a simple diode demodulator or synchronous demodulator). The output of the demodulator 15 is coupled to a data input 16 of the controller 2. Keen at [0050]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	The tag 30 has an antenna circuit 32 comprising, in this example, an antenna coil 33 in parallel with a capacitor 34. The tag 30 also has a power deriver 35 for deriving a power supply for the tag 30 from an RF signal coupled to the antenna circuit 32. As shown in FIG. 2, the power deriver 35 comprises series-connected diodes 36 and 37 and a capacitor 38 coupled between the antenna circuit 32 and a junction 39 between the anode of the diode 36 and the cathode of the diode 37. The cathode of the first diode 36 is connected to a first power supply rail P1 (Vdd) while the anode of the second diode 37 is connected to a second power supply rail P2 (Vss). The capacitor 38 and the diodes 36 and 37 act effectively as a voltage doubler enabling the peak to peak voltage of a received RF signal inductively coupled to the tag 30 to be used to derive a power supply for the tag 30. It will, of course, be appreciated that, in the interests of simplicity, the power supply connections to the remaining components of the tag are not shown. Keen at [0052] The tag 30 may be a synchronous tag in which case the tag controller 40 will have a clock deriver input 46 coupled to receive an RF signal coupled to the antenna circuit 32 so that the tag controller 40 can derive a clock signal directly from the received RF signal or from periodic interruption by the reader controller 2 (FIG. 1) of the RF signal. Alternatively, the tag 30 may be an asynchronous tag in which the tag controller 40 will have its own clock. Keen at [0058] When the controller 2 causes the signal generator 5 to generate an RF signal, the digital signal generated by the signal generator 5 is fed into the differential driver 6 which outputs complementary pulses to the antenna circuit 7. The resulting oscillating magnetic H field produced by the antenna circuit 7 is inductively coupled to the antenna circuit of any tag 30 (FIG. 2) within the H field, that is within the read range of the reader 1. The designed read range (that is the distance over which the tag antenna coil 33 is intended to be able to couple inductively to the magnetic field (H field) of the reader 1 antenna coil 10) will depend upon the actual reader and tag antenna circuit design and constraints, in particular upon the size and configuration of the antenna coils and the strength of the RF signal supplied by the reader 1. For example, the H field or read range may be designed to lie in a range up to 1 metre. Keen at [0069] The controller 2, signal generator 5, differential driver 6 and main antenna circuit 7 (comprising the main antenna coil 10 and associated capacitors 8, 911 and 12), and data store 4 correspond to the same components described above with reference to FIG. 1 and operate in the same way as described for the equivalent components in FIG. 1 Likewise the control loop stabiliser 220 operates in the same way as the control loop stabiliser 22 in FIG. 1 as regards the strength of the magnetic field generated by the RFID

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	reader 1″. In this embodiment, however, the control loop stabiliser 220 is also used by the RFID reader 1″ to detect modulation of the magnetic field by an external near field communicator. Keen at [0074] During operation of the RFID reader 1″ shown in FIG. 4, when the controller 2 causes the signal generator 5 to generate an RF signal, the digital signal generated by the signal generator 5 is fed into the differential driver 6 which outputs complementary pulses to the antenna circuit 7. The resulting oscillating magnetic H field produced by the antenna circuit 7 is inductively coupled to the antenna circuit of any tag (for example the tag 30 shown in FIG. 2) within the H field, that is within the read range of the reader 1″. Keen at [0083] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator 60 in accordance with the invention. Unlike the RFID readers described with reference to FIGS. 1, 3 and 4, an NFC communicator is capable of communicating with transponders or tags, RFID transceivers or readers and other NFC communicators. Examples of such NFC communicators are described in ISO/IEC 18092 and ISO/IEC 21481. Thus, an NFC communicator can operate: 1) in an initiator mode in which the NFC communicator functions in a similar fashion to an RFID reader and will transmit an RF signal; and 2) in a target mode in which the NFC communicator waits for receipt of an RF signal from another NFC communicator operating in initiator mode or an RFID reader, that is it functions like a tag or transponder. NFC communicators may communicate with each other using an active or passive protocol. When using the active protocol, an initiator mode NFC communicator transmits an RF signal and then ceases RF signal transmission and a target mode NFC communicator responds by transmitting its own RF signal and then ceasing RF signal transmission. When using the passive protocol, an initiator mode NFC communicator transmits its RF signal and maintains that RF signal throughout the duration of the communication cycle and a target mode NFC communicator responds by causing modulation of the transmitted RF signal. Keen at [0086] The differential driver 65 is coupled to supply an RF signal modulated under the control of the controller 61 to an antenna circuit 66 comprising an antenna coil 67. In this example the RF signal fed to the antenna circuit 66 is of a digital square-wave form and so filtering components (as shown inductors 68 and 69 and capacitors 70 to 75) may be required to reduce harmonics of the carrier so that electromagnetic energy emissions regulations are met. A clamp 76 is provided across the antenna circuit 66 to divert current in the event of a high voltage occurring to reduce the risk of high voltages destroying chip functionality.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at [0087] The NFC communicator 60 also has a demodulator 80 coupled (as shown via capacitor 81 which is itself coupled to ground or earth via another capacitor 82) to the antenna circuit 66 for extracting the modulation from a received modulated RF signal. Keen at [0089] The load modulation mechanism is provided by a transistor 83 (as shown a FET) coupled across the antenna coil 67. The controller 61 has a data output 84 coupled to the gate or control electrode of the transistor 83 and, when this mechanism is operational, the transistor 83 is switched on and off in accordance with the data supplied by the controller 61, thereby modulating the load on the antenna circuit 66 and thus an RF signal supplied by the initiator NFC communicator or RFID reader. Keen at [0090] The interference or simulated load modulation mechanism is provided by a phase-locked loop 90 comprising, in this example, a voltage controlled oscillator (VCO), a phase detector, a loop filter and preferably a sample and hold circuit). The phase-locked loop 90 is coupled, as shown via capacitor 81, to the antenna circuit 66. The phase-locked loop 90 generates an internal RF signal which is supplied to the modulator 63 when the NFC communicator 60 is in initiator mode. When, however, the NFC communicator 60 is in target mode, the phase-locked loop 90 is controlled by an enable signal output 92 of the controller 61 to bring the internally generated RF signal into phase ("lock") with an external RF signal coupled to the antenna circuit 66 (that is an RF signal from an initiator mode NFC communicator or RFID reader) so that the internally generated RF signal has a fixed phase relationship to the external RF signal. The phase-locked loop 90 provides a signal to an input 93 of the controller 61 when phase lock has been achieved. This ensures that the target mode NFC communicator can communicate with the initiator mode NFC communicator or RFID reader by modulating its internally generated RF signal. Keen at [0095] As with the RFID reader 1 shown in FIG. 1, the NFC communicator 60 has a control circuit 100 for controlling operation of the NFC communicator 60 in accordance with the strength of the magnetic field generated by the antenna circuit coil 66. As shown in FIG. 5, the control circuit 100 comprises a sense coil 101 positioned so as to be able to sense or detect at least part of the magnetic field (H field) produced by the antenna circuit coil 67, that is so that the sense coil 101 lies within the H field of the antenna circuit coil 67. The sense coil 101 is coupled to a sense amplifier 102 having its output coupled to one input (as shown the negative input) of a differential or error amplifier 103. The other input of the error amplifier

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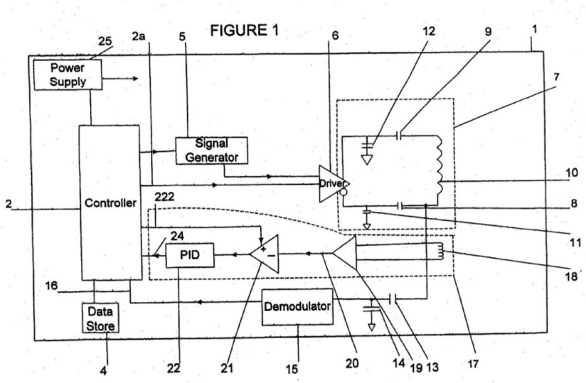
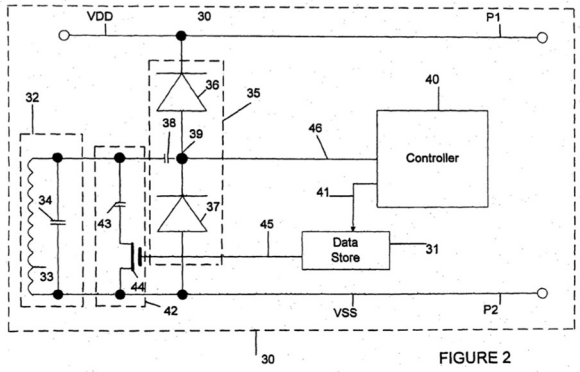
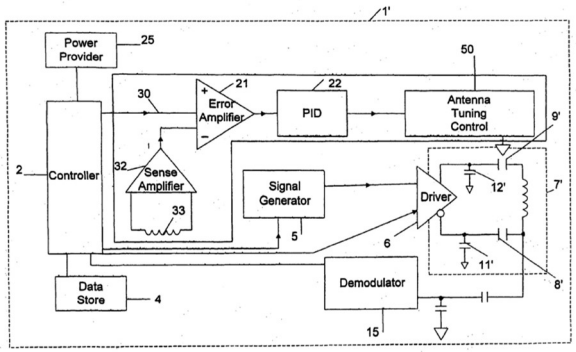
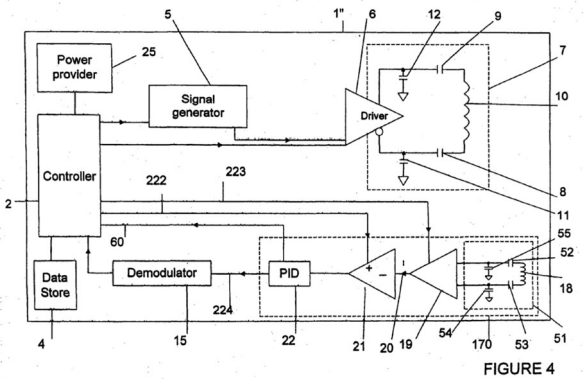
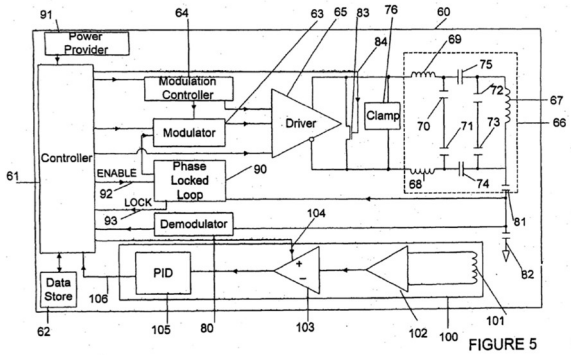
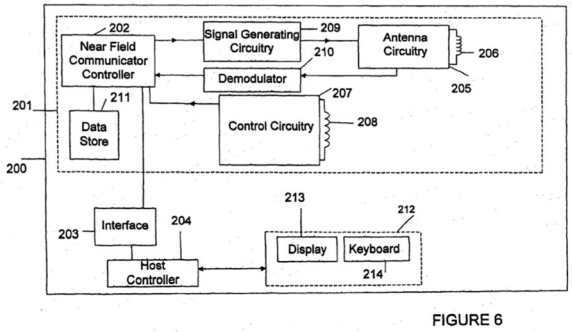
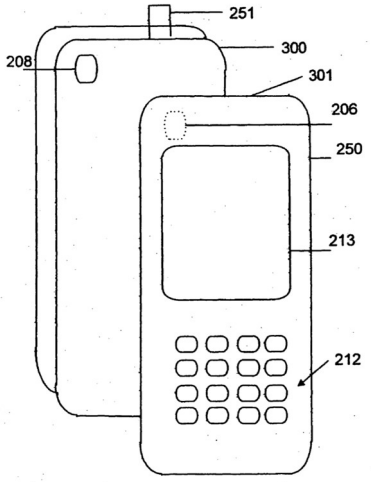
	103 is coupled to a required magnetic field strength output 104 of the controller 61 which provides a signal indicating the magnetic field strength required to be produced by the antenna circuit 66. Keen at [0098] In operation of the NFC communicator shown in FIG. 5, the sense coil 101 detects the magnetic field at the antenna circuit coil 67. The detected signal is amplified and filtered by the sense amplifier 102 and fed to the error amplifier 103 which compares the received signal against a pre-set desired signal level or threshold level output 104 representing the required magnetic field strength provided by the controller 61 and produces an error or difference signal. This error or difference signal is processed by the control loop stabiliser 105 using PID techniques to provide instruction data utilisable by the controller 61 to control the modulation controller 64 and differential driver 65 to adjust or modify the RF signal fed to the antenna circuit 66 by the driver 65 to compensate for the difference between the sensed magnetic field strength and the required magnetic field strength. Keen at [0102] Where comprised within a host device, apparatus or system, the functionality or at least some of the functionality of the near field communicator may be provided by the host device, apparatus or system and an interface provided between the host system controller and the other components of the near field communicator. FIG. 6 shows a functional block diagram of a host device, apparatus or system 200 comprising a near field communicator 201 in which the near field communicator controller 202 is coupled via an interface 203 to a host controller 204 which controls operations of the host device, apparatus or system which may be, for example, a mobile telephone. As shown, the near field communicator 201 has the functional elements discussed above discretely located within the host device, apparatus or system, namely antenna circuitry 205 having an antenna coil 206, control circuitry 207 for controlling operation of the near field communicator in accordance with the magnetic field strength sensed by a sense coil 208, signal providing circuitry 209 for providing the RF signal modulated in accordance with control data and/or other data from the near field communicator controller 202, a demodulator 210 for extracting modulation from an RF signal coupled to the near field communicator 201, and a data store 211. The functionality of the near field communicator 201 may, however, be dispersed throughout the host device, apparatus or system 200. In addition the data storage or at least part of the data storage may be provided by the host device, apparatus or system and at least some instructions, control data and/or other data may be provided by the host device, apparatus or system or input by a user via a user interface 212 of the host device, apparatus or system which may comprise a display 213 and a keyboard 214, for example. Keen at [0103]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	FIG. 7 shows a simplified view of a mobile telephone 250 forming such a host device with the main body 300 of the mobile telephone 250 shown separated from its fascia 301 to show that, as one possibility, the main and sense antennas or coils 206 and 208 of the near field communicator may be located opposite one another within each part of the mobile phone so that their coil axes are coincident. *See also* Keen at [0015], [0051], [0056], [0067], [0084], [0091], [0093], claim 8, and claim 14. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1c] at least one active circuit coupled between the smartcard controller and the antenna, wherein the at least one active circuit includes an amplifier coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller, and the at least one active circuit further includes a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna.	Keen discloses or renders obvious "at least one active circuit coupled between the smartcard controller and the antenna, wherein the at least one active circuit includes an amplifier coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller, and the at least one active circuit further includes a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna." For example: Keen at Abstract A near field communicator has a driver (6) to supply a drive signal to drive an antenna (10) to generate a magnetic field. A magnetic field sensor (18) is located so as to be within a magnetic field generated by the antenna (6) to sense a magnetic field characteristic. A controller (17) provides a control signal to control the operation of the driver (6) to compensate for any difference between the magnetic field characteristic sensed by the magnetic field sensor (18) and a predetermined parameter. Keen at Figure 1

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 Keen at Figure 2  Keen at Figure 3

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 3 Keen at Figure 4  FIGURE 4 Keen at Figure 5

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 5 Keen at Figure 6  FIGURE 6 Keen at Figure 7

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	FIGURE 7  Keen at [0002] Near field communication requires the antenna of one near field communicator to be present within the alternating magnetic field (the H field) generated by the antenna of another near field communicator by transmission of an RF signal, for example a 13.56 Mega Hertz signal. The RF signal is thus inductively coupled between the communicators. The RF signal may be modulated to enable communication of control instructions and/or data and/or may be used by the receiving communicator to derive a power supply. Keen at [0007] Generally, the functionality of such a near field communicator is provided as a semiconductor integrated circuit to which a number of passive components and the antenna are added. The internal metal components of any host device, system or apparatus will as far as possible be located as far away as possible from the near field communicator's antenna. Compensation for the effects of any such metallic components or elements is normally effected by adjusting the capacitance value of a discrete "trimming" capacitor or by selecting a "select-on-test" type fixed capacitor or number of capacitor values during production testing of the host device, system or apparatus. However, this increases unit costs because of the cost of additional component(s), the impact on the printed circuit board costs and the costs involved in

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	the testing and trimming or selecting operations. Further, the addition of such components may adversely affect the life and reliability of the communicator. Also, there may be circumstances in which it is not possible for the antenna circuitry to be adapted to the host device, system or apparatus or the configuration of the host device, system or apparatus may change (for example parts may be removed and new sections added) throughout its life. Furthermore, if a common near field communicator circuit design is produced for a number of different host applications, those host applications will almost certainly have different antenna spatial envelopes, different dimensions, shapes, footprints or sizes (form factors) and differently located or distributed metallic material components or elements, so requiring different compensation component values for each different host application in order to achieve and maintain optimum performance. This results in a large overhead (both in terms of costs and resources) for a company supplying or using near field communicators in a range of host devices, systems or apparatus. Keen at [0009] A further issue is that, in order to create the strongest magnetic field for the lowest drive power, near field communicators generally use an antenna circuit tuned to have a resonant frequency coinciding with or very close to the operating carrier frequency of the near field communicator. One of the most influential parameters of a resonant circuit is its "Q" factor and to achieve optimum read range performance, especially when using small size (small form factor) antennas, relatively high Q factors are used. Although this achieves maximum read range it also makes the communicator very sensitive to the de-tuning effects of nearby metallic and/or magnetic materials. Indeed, the inventors have realised that these de-tuning effects can be more dominant than the unavoidable eddy current loses. Keen at [0010] In addition during normal operation of near field communicators, such communicators will communicate with all kinds of different near field communicators each of which has different antenna sizes and form factors and each of which will operate at differing distances from the antenna of the transmitting communicator. All of these factors will have an effect on the H-field and therefore the signal strength of the RF signal produced by the near field communicator. Keen at [0011] In one aspect, the present invention provides a near field communicator having a magnetic field strength determiner and an antenna drive adjuster operable to adjust the drive to an antenna of the communicator in accordance with the determined magnetic field strength to provide the communicator with the required read range performance.

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	Keen at [0013] In one aspect, the present invention provides a near field communicator comprising a driver operable to drive an antenna or coil to produce a magnetic field; a magnetic field sensor operable to sense the magnetic field produced by the antenna or coil; a comparator operable to compare, directly or indirectly, the sensed magnetic field strength with a desired parameter, and a controller operable to control the driver to compensate for a difference between the sensed magnetic field strength and the desired parameter. Keen at [0015] In an embodiment, the controller is operable to control the driver to control the magnetic signal strength produced by the antenna. Keen at [0018] In an embodiment, the controller is operable to control the driver using proportional, integral and differential (PID) techniques or algorithms. Keen at [0024] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator in accordance with the invention; Keen at [0028] FIG. 1 shows a functional block diagram of an embodiment of an RFID reader 1 in accordance with the invention which is operable to transmit a radio frequency signal and to detect and demodulate modulation of the transmitted radio frequency signal. The RFID reader 1 may be compatible with a variety of standards or communications protocols, for example ISO/IEC 14443 or ISO/IEC 15693. Keen at [0031] The output of the signal generator 5 is coupled to one input of a differential driver 6. The other input of differential driver 6 is coupled to a driver control signal output 2a of the controller 2. Keen at [0032] The differential driver 6 is coupled to supply the RF signal to an antenna circuit 7. In this example, the antenna circuit 7 is a tuned circuit comprising respective capacitors 8 and 9 in series with an antenna coil 10 and further capacitors 11 and 12 each coupled between a respective one of the capacitors 8 and 9 and ground (earth). The presence of all four capacitors serves to reduce unwanted carrier harmonics but it may

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	be possible to omit some of the capacitors, for example capacitors 11 and 12, where the signal generated by the differential driver 6 does not exceed electromagnetic energy emissions regulations. Keen at [0033] One end of the antenna coil 10 is coupled to ground via a filter arrangement comprising a series connection of capacitors 13 and 14 for filtering out extraneous signals. The junction between the capacitors 13 and 14 is coupled to a demodulator 15 (which may be, for example, a simple diode demodulator or synchronous demodulator). The output of the demodulator 15 is coupled to a data input 16 of the controller 2. Keen at [0046] The RFID reader 1 will of course have or be associated with a power provider 25 for providing a power supply for the various components of the RFID reader 1. In the interests of simplicity, the couplings of most of the various components of the RFID reader 1 to the power provider 25 are omitted in FIG. 1. The power provider 25 may be, for example, an internal battery or may be a coupling to a power supply provided by any host apparatus, system or device of the RFID reader 1. Keen at [0048] To assist the explanation of the operation of the RFID reader 1, FIG. 2 shows a functional block diagram of an RFID data storage tag 30 that may be read by the reader 1 when the tag 30 is in the read range (H field) of the reader 1. In this example, the RFID tag or transponder is a passive device, where "passive" in this context means that the RFID tag derives power from the RF signal supplied by the reader (it is not self-powered). As another possibility, the RFID tag may be an active device having a power provider (similar to that shown for an RFID reader in FIG. 1 as 25) for example at least one of a battery or a coupling to a power source of host device, system or apparatus containing or associated with the RFID tag. Keen at [0050] The tag 30 has an antenna circuit 32 comprising, in this example, an antenna coil 33 in parallel with a capacitor 34. The tag 30 also has a power deriver 35 for deriving a power supply for the tag 30 from an RF signal coupled to the antenna circuit 32. As shown in FIG. 2, the power deriver 35 comprises series-connected diodes 36 and 37 and a capacitor 38 coupled between the antenna circuit 32 and a junction 39 between the anode of the diode 36 and the cathode of the diode 37. The cathode of the first diode 36 is connected to a first power supply rail P1 (Vdd) while the anode of the second diode 37 is connected to a second power supply rail P2 (Vss). The capacitor 38 and the diodes 36 and 37 act effectively as a voltage

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	doubler enabling the peak to peak voltage of a received RF signal inductively coupled to the tag 30 to be used to derive a power supply for the tag 30. It will, of course, be appreciated that, in the interests of simplicity, the power supply connections to the remaining components of the tag are not shown. Keen at [0051] The tag 30 also has a controller 40 for controlling (via control line 41) reading of data from the data store 31 and supply of that data to a modulator 42 coupled to the antenna circuit 32. In the example shown, the modulator 42 comprises a series-connection of a capacitor 43 and an FET 44 coupled across the capacitor 34 of the antenna circuit 32 with the gate electrode of the FET 44 coupled to an output 45 of the data store 31 so that output of data from the data store 31 modulates the load on the antenna circuit 32 and thus on any antenna circuit 7 (FIG. 1) inductively coupled to the antenna circuit 32. Keen at [0052] The tag 30 may be a synchronous tag in which case the tag controller 40 will have a clock deriver input 46 coupled to receive an RF signal coupled to the antenna circuit 32 so that the tag controller 40 can derive a clock signal directly from the received RF signal or from periodic interruption by the reader controller 2 (FIG. 1) of the RF signal. Alternatively, the tag 30 may be an asynchronous tag in which the tag controller 40 will have its own clock. Keen at [0055] In operation of the RFID reader 1 shown in FIG. 1, the controller 2 controls at least one of the signal generator 5 and differential driver 6 to affect both generation of the RF signal as required and modulation of that RF signal. Keen at [0056] In the case of a simple tag, the tag controller 40 may cause data to be read from the tag data store 31 upon powering up of the tag, that is once the power deriver 35 of the tag 30 derives a power supply for the tag 30 from the inductively coupled RF signal. Where the tag 30 is more sophisticated, then the communications protocol under which the tag and the reader operate may require some form of communication or handshaking to occur before the tag controller 40 causes data to be read from the tag data store. The reading of data from the data store 31 causes the modulator 42 to modulate the load on the antenna circuit 32 (and thus on the antenna circuit 7 inductively coupled thereto) in accordance with the data read from the data store 31. The modulation by the tag 30 of the RF signal is extracted by the reader demodulator 15 and supplied to the controller 2. The capacitors 13 and 14 limit the amplitude of the signal input to the demodulator 15 and so avoid over-voltage damage to the demodulator 15.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at [0058] When the controller 2 causes the signal generator 5 to generate an RF signal, the digital signal generated by the signal generator 5 is fed into the differential driver 6 which outputs complementary pulses to the antenna circuit 7. The resulting oscillating magnetic H field produced by the antenna circuit 7 is inductively coupled to the antenna circuit of any tag 30 (FIG. 2) within the H field, that is within the read range of the reader 1. The designed read range (that is the distance over which the tag antenna coil 33 is intended to be able to couple inductively to the magnetic field (H field) of the reader 1 antenna coil 10) will depend upon the actual reader and tag antenna circuit design and constraints, in particular upon the size and configuration of the antenna coils and the strength of the RF signal supplied by the reader 1. For example, the H field or read range may be designed to lie in a range up to 1 metre. Keen at [0067] FIG. 3 may also be implemented as an active RFID tag rather than an RFID reader if the controller 2 is configured not to initiate but to respond, that is if the controller 2 is configured to allow RF signal generation and any modulation only in response to an RF signal (H field) from an RFID reader or an NFC communicator in initiator mode. Keen at [0069] The controller 2, signal generator 5, differential driver 6 and main antenna circuit 7 (comprising the main antenna coil 10 and associated capacitors 8, 911 and 12), and data store 4 correspond to the same components described above with reference to FIG. 1 and operate in the same way as described for the equivalent components in FIG. 1 Likewise the control loop stabiliser 220 operates in the same way as the control loop stabiliser 22 in FIG. 1 as regards the strength of the magnetic field generated by the RFID reader 1″. In this embodiment, however, the control loop stabiliser 220 is also used by the RFID reader 1″ to detect modulation of the magnetic field by an external near field communicator. Keen at [0074] During operation of the RFID reader 1″ shown in FIG. 4, when the controller 2 causes the signal generator 5 to generate an RF signal, the digital signal generated by the signal generator 5 is fed into the differential driver 6 which outputs complementary pulses to the antenna circuit 7. The resulting oscillating magnetic H field produced by the antenna circuit 7 is inductively coupled to the antenna circuit of any tag (for example the tag 30 shown in FIG. 2) within the H field, that is within the read range of the reader 1″. Keen at [0083]

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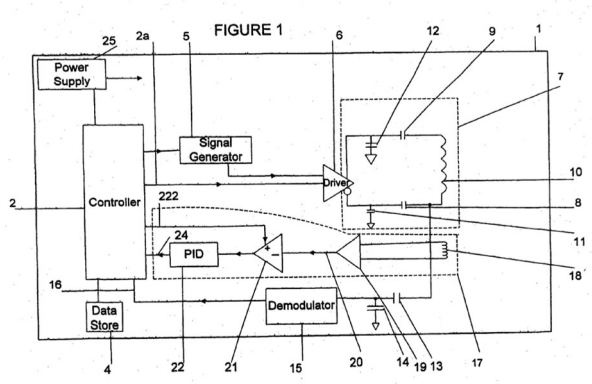
	FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator 60 in accordance with the invention. Unlike the RFID readers described with reference to FIGS. 1, 3 and 4, an NFC communicator is capable of communicating with transponders or tags, RFID transceivers or readers and other NFC communicators. Examples of such NFC communicators are described in ISO/IEC 18092 and ISO/IEC 21481. Thus, an NFC communicator can operate: 1) in an initiator mode in which the NFC communicator functions in a similar fashion to an RFID reader and will transmit an RF signal; and 2) in a target mode in which the NFC communicator waits for receipt of an RF signal from another NFC communicator operating in initiator mode or an RFID reader, that is it functions like a tag or transponder. NFC communicators may communicate with each other using an active or passive protocol. When using the active protocol, an initiator mode NFC communicator transmits an RF signal and then ceases RF signal transmission and a target mode NFC communicator responds by transmitting its own RF signal and then ceasing RF signal transmission. When using the passive protocol, an initiator mode NFC communicator transmits its RF signal and maintains that RF signal throughout the duration of the communication cycle and a target mode NFC communicator responds by causing modulation of the transmitted RF signal. Keen at [0084] As shown in FIG. 5, the NFC communicator 60 includes a controller 61 for controlling overall operation of the NFC communicator in accordance with control data and/or instructions and other data stored by an internal memory of the controller 61 and/or a data store 62 coupled to the controller. The controller 61 may comprise a microcontroller, RISC computer or state machine, for example. Keen at [0085] The controller 61 is coupled to a signal modulator 63 for modulating an RF signal in accordance with data provided by the controller 61, to a modulation controller 64 and to a differential driver 65 which is also coupled to the outputs of the signal modulator 63 and the modulation controller 64. The modulation controller 64 may control the amplitude of the signal supplied by the modulator 63. As shown, the modulation controller 64 is separate from the controller 61. The functionality of the modulation controller may however be provided by the controller 61. Keen at [0086] The differential driver 65 is coupled to supply an RF signal modulated under the control of the controller 61 to an antenna circuit 66 comprising an antenna coil 67. In this example the RF signal fed to the antenna circuit 66 is of a digital square-wave form and so filtering components (as shown inductors 68 and 69 and capacitors 70 to 75) may be required to reduce harmonics of the carrier so that electromagnetic energy

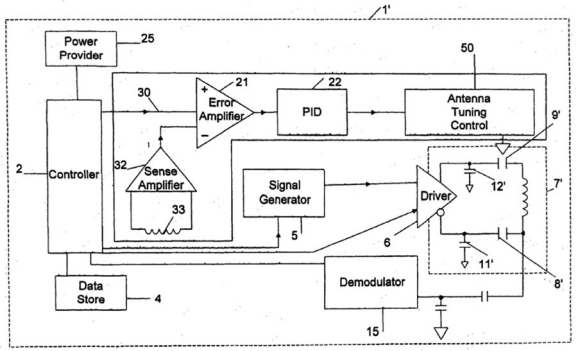
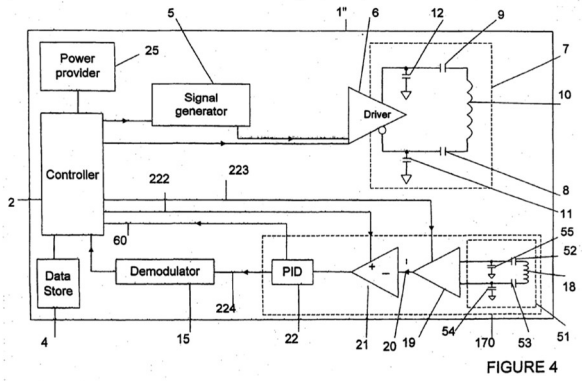
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	emissions regulations are met. A clamp 76 is provided across the antenna circuit 66 to divert current in the event of a high voltage occurring to reduce the risk of high voltages destroying chip functionality. Keen at [0087] The NFC communicator 60 also has a demodulator 80 coupled (as shown via capacitor 81 which is itself coupled to ground or earth via another capacitor 82) to the antenna circuit 66 for extracting the modulation from a received modulated RF signal. Keen at [0088] The NFC communicator 60 shown in FIG. 5 has two mechanisms for enabling communication of data when the NFC communicator is in the target mode. One mechanism is a load modulation mechanism as described above with reference to FIG. 2 and the other is an interference mechanism which simulates load modulation. Keen at [0089] The load modulation mechanism is provided by a transistor 83 (as shown a FET) coupled across the antenna coil 67. The controller 61 has a data output 84 coupled to the gate or control electrode of the transistor 83 and, when this mechanism is operational, the transistor 83 is switched on and off in accordance with the data supplied by the controller 61, thereby modulating the load on the antenna circuit 66 and thus an RF signal supplied by the initiator NFC communicator or RFID reader. Keen at [0090] The interference or simulated load modulation mechanism is provided by a phase-locked loop 90 comprising, in this example, a voltage controlled oscillator (VCO), a phase detector, a loop filter and preferably a sample and hold circuit). The phase-locked loop 90 is coupled, as shown via capacitor 81, to the antenna circuit 66. The phase-locked loop 90 generates an internal RF signal which is supplied to the modulator 63 when the NFC communicator 60 is in initiator mode. When, however, the NFC communicator 60 is in target mode, the phase-locked loop 90 is controlled by an enable signal output 92 of the controller 61 to bring the internally generated RF signal into phase ("lock") with an external RF signal coupled to the antenna circuit 66 (that is an RF signal from an initiator mode NFC communicator or RFID reader) so that the internally generated RF signal has a fixed phase relationship to the external RF signal. The phase-locked loop 90 provides a signal to an input 93 of the controller 61 when phase lock has been achieved. This ensures that the target mode NFC communicator can communicate with the initiator mode NFC communicator or RFID reader by modulating its internally generated RF signal.

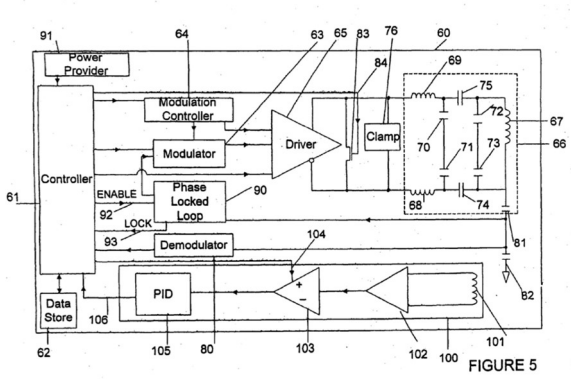
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at [0091] The NFC communicator 60 of course also has a power provider 91. For convenience the connections of the power provider to the remainder of the NFC communicator 91 are not shown. The power provider 91 may comprise at least one of a power supply such as a battery provided within the NFC communicator 60 and or a connection to a power supply of a host device, apparatus or system. The power provider could also comprise a power deriver for deriving a power supply from an RF signal inductively coupled to the antenna circuit 66 when the NFC communicator is in target mode. Keen at [0092] The controller 61 controls RF signal generation, modulation characteristics of any transmitted RF signal, response to any received RF signal, interpretation of any received demodulated signal, mode of operation (for example initiator or target or active or passive mode) and the communication protocol under which the NFC communicator 60 operates. In responding to a received signal when in target mode, the NFC communicator will respond in a manner dependent upon whether the NFC communicator 60 is operating under the active or passive protocol. Where the NFC communicator is operating under the active protocol, the controller 61 will cause the NFC communicator to respond by generation of a phase-locked modulated signal using the phase-locked loop mechanism whereas in the event the NFC communicator is operating under the passive protocol, the controller 61 may cause the received RF signal to be directly modulated by switching the transistor 83 in accordance with the data to be communicated or may use the phase-locked loop 90 mechanism to effect modulation by interference with the received RF signal (simulated load modulation). Keen at [0093] The NFC communicator 60 may use a combination of load modulation or carrier interference or may alternatively use only one or the other form of communication. As another possibility, the NFC communicator 60 may comprise multiple antennas, one being used for response to a received RF signal and the other being used for transmission of an RF signal with the antennas being switched on according to need, under the control of the controller of the NFC communicator. Thus, where the NFC communicator is acting in initiator mode, the antenna selected for transmission of an RF signal will be used while where the NFC communicator is, for example, acting as a passive target (i.e. similar to an RFID transponder) the controller 61 will switch the antennas, thereby utilising an antenna more suited to load modulation of an incoming RF signal. Keen at [0095]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	As with the RFID reader 1 shown in FIG. 1, the NFC communicator 60 has a control circuit 100 for controlling operation of the NFC communicator 60 in accordance with the strength of the magnetic field generated by the antenna circuit coil 66. As shown in FIG. 5, the control circuit 100 comprises a sense coil 101 positioned so as to be able to sense or detect at least part of the magnetic field (H field) produced by the antenna circuit coil 67, that is so that the sense coil 101 lies within the H field of the antenna circuit coil 67. The sense coil 101 is coupled to a sense amplifier 102 having its output coupled to one input (as shown the negative input) of a differential or error amplifier 103. The other input of the error amplifier 103 is coupled to a required magnetic field strength output 104 of the controller 61 which provides a signal indicating the magnetic field strength required to be produced by the antenna circuit 66. Keen at [0098] In operation of the NFC communicator shown in FIG. 5, the sense coil 101 detects the magnetic field at the antenna circuit coil 67. The detected signal is amplified and filtered by the sense amplifier 102 and fed to the error amplifier 103 which compares the received signal against a pre-set desired signal level or threshold level output 104 representing the required magnetic field strength provided by the controller 61 and produces an error or difference signal. This error or difference signal is processed by the control loop stabiliser 105 using PID techniques to provide instruction data utilisable by the controller 61 to control the modulation controller 64 and differential driver 65 to adjust or modify the RF signal fed to the antenna circuit 66 by the driver 65 to compensate for the difference between the sensed magnetic field strength and the required magnetic field strength. Keen at [0102] Where comprised within a host device, apparatus or system, the functionality or at least some of the functionality of the near field communicator may be provided by the host device, apparatus or system and an interface provided between the host system controller and the other components of the near field communicator. FIG. 6 shows a functional block diagram of a host device, apparatus or system 200 comprising a near field communicator 201 in which the near field communicator controller 202 is coupled via an interface 203 to a host controller 204 which controls operations of the host device, apparatus or system which may be, for example, a mobile telephone. As shown, the near field communicator 201 has the functional elements discussed above discretely located within the host device, apparatus or system, namely antenna circuitry 205 having an antenna coil 206, control circuitry 207 for controlling operation of the near field communicator in accordance with the magnetic field strength sensed by a sense coil 208, signal providing circuitry 209 for providing the RF signal modulated in accordance with control data and/or other data from the near field communicator controller 202, a demodulator 210 for extracting

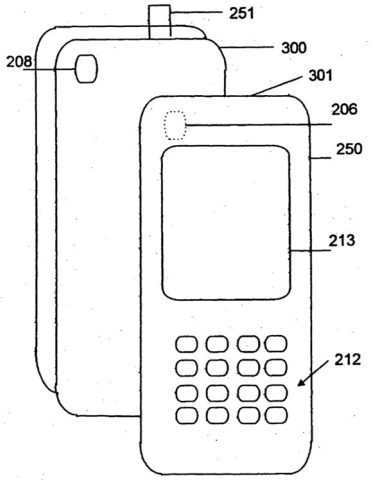
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	modulation from an RF signal coupled to the near field communicator 201, and a data store 211. The functionality of the near field communicator 201 may, however, be dispersed throughout the host device, apparatus or system 200. In addition the data storage or at least part of the data storage may be provided by the host device, apparatus or system and at least some instructions, control data and/or other data may be provided by the host device, apparatus or system or input by a user via a user interface 212 of the host device, apparatus or system which may comprise a display 213 and a keyboard 214, for example. Keen at [0103] FIG. 7 shows a simplified view of a mobile telephone 250 forming such a host device with the main body 300 of the mobile telephone 250 shown separated from its fascia 301 to show that, as one possibility, the main and sense antennas or coils 206 and 208 of the near field communicator may be located opposite one another within each part of the mobile phone so that their coil axes are coincident. Keen at claim 1 1. A near field communicator comprising: a driver operable to supply a drive signal to drive an antenna to generate a magnetic field; a magnetic field sensor located so as to be within a magnetic field generated by the antenna to sense a magnetic field characteristic; and a controller operable to provide a control signal to compensate for any difference between the magnetic field characteristic sensed by the magnetic field sensor and a predetermined parameter. Keen at claim 8 8. A near field communicator according to claim 1, wherein the driver is operable to supply an oscillating, for example RF, drive signal to drive the antenna. *See also* Keen at claim 14. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
2. The mobile device of claim 1 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller	Keen discloses or renders obvious "[t]he mobile device of claim 1 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." For example: Keen at [0010]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
from the interrogating radio frequency (RF) field.	In addition during normal operation of near field communicators, such communicators will communicate with all kinds of different near field communicators each of which has different antenna sizes and form factors and each of which will operate at differing distances from the antenna of the transmitting communicator. All of these factors will have an effect on the H-field and therefore the signal strength of the RF signal produced by the near field communicator. Keen at [0011] In one aspect, the present invention provides a near field communicator having a magnetic field strength determiner and an antenna drive adjuster operable to adjust the drive to an antenna of the communicator in accordance with the determined magnetic field strength to provide the communicator with the required read range performance. *See also* Keen at [0007] and [0058]. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
3. The mobile device of claim 1 wherein the smartcard controller is coupled to be powered by the mobile device.	Keen discloses or renders obvious "[t]he mobile device of claim 1 wherein the smartcard controller is coupled to be powered by the mobile device." For example: Keen at Figure 1 

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at Figure 3  FIGURE 3 Keen at Figure 4  FIGURE 4 Keen at Figure 5

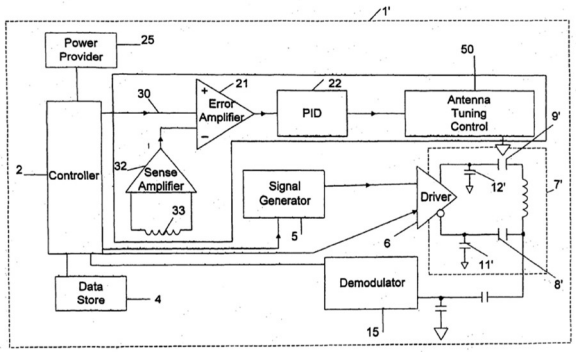
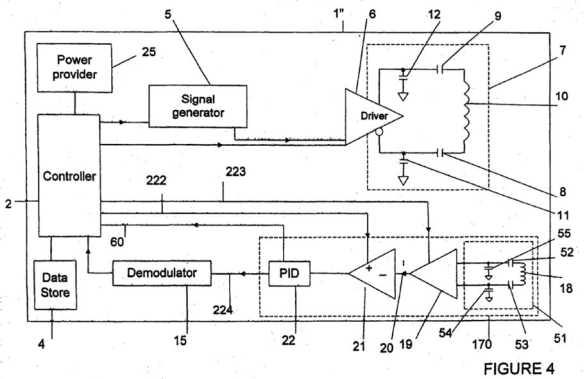
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 5 Keen at [0046] The RFID reader 1 will of course have or be associated with a power provider 25 for providing a power supply for the various components of the RFID reader 1. In the interests of simplicity, the couplings of most of the various components of the RFID reader 1 to the power provider 25 are omitted in FIG. 1. The power provider 25 may be, for example, an internal battery or may be a coupling to a power supply provided by any host apparatus, system or device of the RFID reader 1. Keen at [0048] To assist the explanation of the operation of the RFID reader 1, FIG. 2 shows a functional block diagram of an RFID data storage tag 30 that may be read by the reader 1 when the tag 30 is in the read range (H field) of the reader 1. In this example, the RFID tag or transponder is a passive device, where "passive" in this context means that the RFID tag derives power from the RF signal supplied by the reader (it is not self-powered). As another possibility, the RFID tag may be an active device having a power provider (similar to that shown for an RFID reader in FIG. 1 as 25) for example at least one of a battery or a coupling to a power source of host device, system or apparatus containing or associated with the RFID tag. Keen at [0091] The NFC communicator 60 of course also has a power provider 91. For convenience the connections of the power provider to the remainder of the NFC communicator 91 are not shown. The power provider 91 may comprise at least one of a power supply such as a battery provided within the NFC communicator 60 and or a connection to a power supply of a host device, apparatus or system. The power provider could

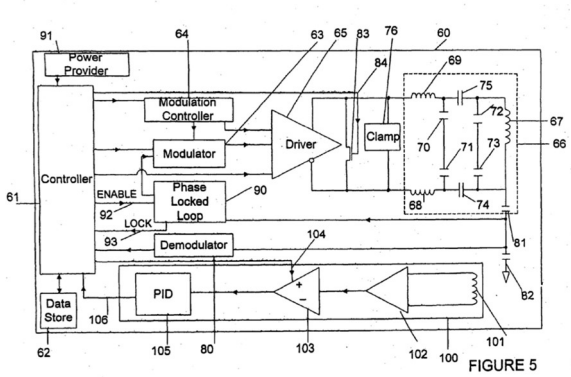
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	also comprise a power deriver for deriving a power supply from an RF signal inductively coupled to the antenna circuit 66 when the NFC communicator is in target mode. Keen at [0092] The controller 61 controls RF signal generation, modulation characteristics of any transmitted RF signal, response to any received RF signal, interpretation of any received demodulated signal, mode of operation (for example initiator or target or active or passive mode) and the communication protocol under which the NFC communicator 60 operates. In responding to a received signal when in target mode, the NFC communicator will respond in a manner dependent upon whether the NFC communicator 60 is operating under the active or passive protocol. Where the NFC communicator is operating under the active protocol, the controller 61 will cause the NFC communicator to respond by generation of a phase-locked modulated signal using the phase-locked loop mechanism whereas in the event the NFC communicator is operating under the passive protocol, the controller 61 may cause the received RF signal to be directly modulated by switching the transistor 83 in accordance with the data to be communicated or may use the phase-locked loop 90 mechanism to effect modulation by interference with the received RF signal (simulated load modulation). To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
4. The mobile device of claim 1 wherein the mobile device comprises a mobile phone.	Keen discloses or renders obvious "[t]he mobile device of claim 1 wherein the mobile device comprises a mobile phone." For example: Keen at Figure 7

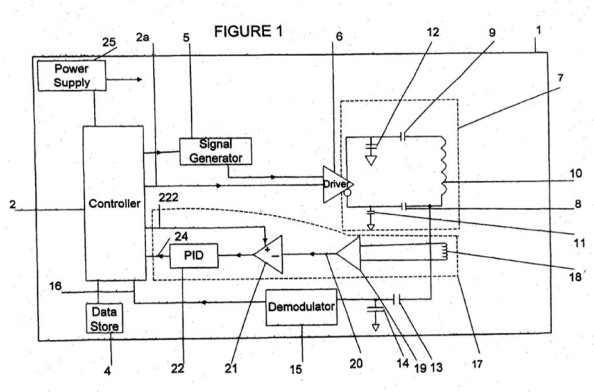
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	FIGURE 7  Keen at [0004] Such near field communicators may be discrete standalone devices, systems or apparatus or may be incorporated into or provided as part of the functionality of larger host devices, systems or apparatus, for example a consumer product such as a portable communications device having telecommunications capability (for example a mobile telephone (cellphone) or a telecommunications-enabled personal digital assistant or other computing device). Keen at [0026] FIG. 7 shows a simplified view of a mobile telephone incorporating a near field communicator embodying the invention. Keen at [0101] The near field communicator may be a stand-alone device or may be comprised within a host device, apparatus or system such as a consumer product, for example a mobile telephone, personal digital assistant, digital camera, or a laptop, notebook, or other computer. Also near field communicators in accordance with the invention may be used in other electrical or electronic products, for example consumer products such as domestic appliance or personal care products, and other electrical or electronic

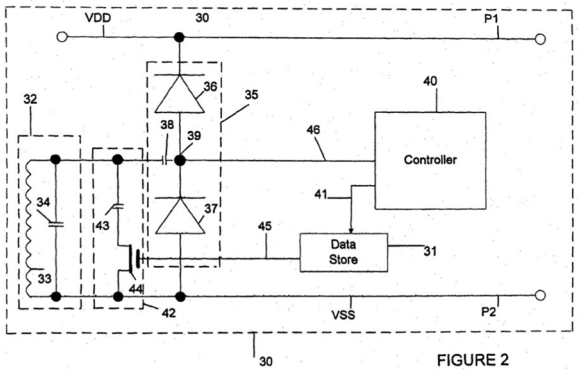
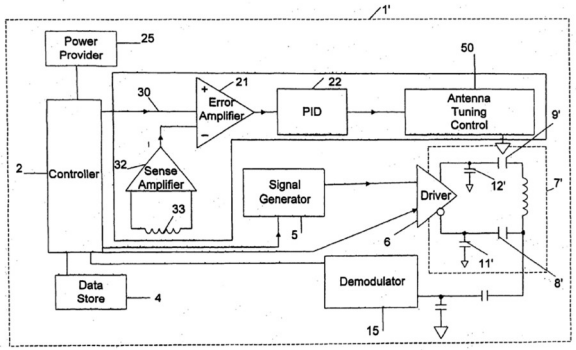
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	devices, apparatus or systems. Other areas of application are ticketing systems, for example in tickets (for example parking tickets, bus tickets, train tickets or entrance permits or tickets) or in ticket checking systems, toys, games, posters, packaging, advertising material, product inventory checking systems and so on. Keen at [0102] Where comprised within a host device, apparatus or system, the functionality or at least some of the functionality of the near field communicator may be provided by the host device, apparatus or system and an interface provided between the host system controller and the other components of the near field communicator. FIG. 6 shows a functional block diagram of a host device, apparatus or system 200 comprising a near field communicator 201 in which the near field communicator controller 202 is coupled via an interface 203 to a host controller 204 which controls operations of the host device, apparatus or system which may be, for example, a mobile telephone. As shown, the near field communicator 201 has the functional elements discussed above discretely located within the host device, apparatus or system, namely antenna circuitry 205 having an antenna coil 206, control circuitry 207 for controlling operation of the near field communicator in accordance with the magnetic field strength sensed by a sense coil 208, signal providing circuitry 209 for providing the RF signal modulated in accordance with control data and/or other data from the near field communicator controller 202, a demodulator 210 for extracting modulation from an RF signal coupled to the near field communicator 201, and a data store 211. The functionality of the near field communicator 201 may, however, be dispersed throughout the host device, apparatus or system 200. In addition the data storage or at least part of the data storage may be provided by the host device, apparatus or system and at least some instructions, control data and/or other data may be provided by the host device, apparatus or system or input by a user via a user interface 212 of the host device, apparatus or system which may comprise a display 213 and a keyboard 214, for example. Keen at [0103] FIG. 7 shows a simplified view of a mobile telephone 250 forming such a host device with the main body 300 of the mobile telephone 250 shown separated from its fascia 301 to show that, as one possibility, the main and sense antennas or coils 206 and 208 of the near field communicator may be located opposite one another within each part of the mobile phone so that their coil axes are coincident. *See also* Keen at [0001]. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

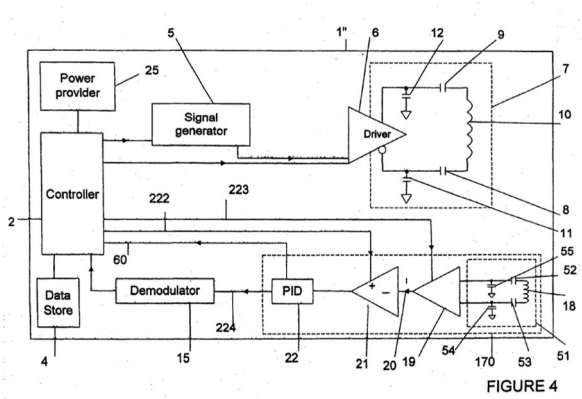
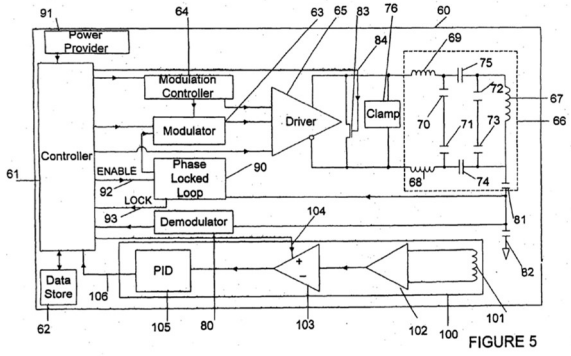
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	See also claim 1 above.
5[pre]. A mobile device comprising:	Keen discloses or renders obvious "[a] mobile device." *See* 1[pre] above.
[5a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Keen discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." *See* [1a] above.
[5b] an antenna tuned to operate at 13.56 MHz;	Keen discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." *See* [1b] above.
[5c] an amplifier coupled between the smartcard controller and the antenna, wherein the amplifier is coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller; and	Keen discloses or renders obvious "an amplifier coupled between the smartcard controller and the antenna, wherein the amplifier is coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller." For example: Keen at Figure 3

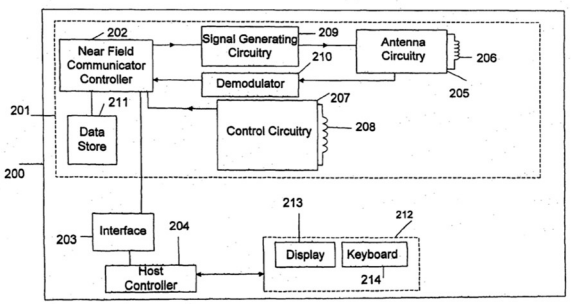
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 3 Keen at Figure 4  FIGURE 4 Keen at Figure 5

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 5 Keen at [0046] The RFID reader 1 will of course have or be associated with a power provider 25 for providing a power supply for the various components of the RFID reader 1. In the interests of simplicity, the couplings of most of the various components of the RFID reader 1 to the power provider 25 are omitted in FIG. 1. The power provider 25 may be, for example, an internal battery or may be a coupling to a power supply provided by any host apparatus, system or device of the RFID reader 1. Keen at [0091] The NFC communicator 60 of course also has a power provider 91. For convenience the connections of the power provider to the remainder of the NFC communicator 91 are not shown. The power provider 91 may comprise at least one of a power supply such as a battery provided within the NFC communicator 60 and or a connection to a power supply of a host device, apparatus or system. The power provider could also comprise a power deriver for deriving a power supply from an RF signal inductively coupled to the antenna circuit 66 when the NFC communicator is in target mode. Keen at [0098] In operation of the NFC communicator shown in FIG. 5, the sense coil 101 detects the magnetic field at the antenna circuit coil 67. The detected signal is amplified and filtered by the sense amplifier 102 and fed to the error amplifier 103 which compares the received signal against a pre-set desired signal level or threshold level output 104 representing the required magnetic field strength provided by the controller 61 and produces an error or difference signal. This error or difference signal is processed by the control loop stabiliser 105 using PID techniques to provide instruction data utilisable by the controller 61 to control the modulation controller 64 and differential driver 65 to adjust or modify the RF signal fed to the antenna

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	circuit 66 by the driver 65 to compensate for the difference between the sensed magnetic field strength and the required magnetic field strength. *See also* [1c] above. *See also* Keen at [0048]. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[5d] a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna.	Keen discloses or renders obvious "a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna." For example: Keen at Abstract A near field communicator has a driver (6) to supply a drive signal to drive an antenna (10) to generate a magnetic field. A magnetic field sensor (18) is located so as to be within a magnetic field generated by the antenna (6) to sense a magnetic field characteristic. A controller (17) provides a control signal to control the operation of the driver (6) to compensate for any difference between the magnetic field characteristic sensed by the magnetic field sensor (18) and a predetermined parameter. Keen at Figure 1  Keen at Figure 2

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 2 Keen at Figure 3  FIGURE 3 Keen at Figure 4

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 4 Keen at Figure 5  FIGURE 5 Keen at Figure 6

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 6 Keen at [0009] A further issue is that, in order to create the strongest magnetic field for the lowest drive power, near field communicators generally use an antenna circuit tuned to have a resonant frequency coinciding with or very close to the operating carrier frequency of the near field communicator. One of the most influential parameters of a resonant circuit is its "Q" factor and to achieve optimum read range performance, especially when using small size (small form factor) antennas, relatively high Q factors are used. Although this achieves maximum read range it also makes the communicator very sensitive to the de-tuning effects of nearby metallic and/or magnetic materials. Indeed, the inventors have realised that these de-tuning effects can be more dominant than the unavoidable eddy current loses. Keen at [0011] In one aspect, the present invention provides a near field communicator having a magnetic field strength determiner and an antenna drive adjuster operable to adjust the drive to an antenna of the communicator in accordance with the determined magnetic field strength to provide the communicator with the required read range performance. Keen at [0013] In one aspect, the present invention provides a near field communicator comprising a driver operable to drive an antenna or coil to produce a magnetic field; a magnetic field sensor operable to sense the magnetic field produced by the antenna or coil; a comparator operable to compare, directly or indirectly, the sensed magnetic field strength with a desired parameter, and a controller operable to control the driver to compensate for a difference between the sensed magnetic field strength and the desired parameter.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at [0015] In an embodiment, the controller is operable to control the driver to control the magnetic signal strength produced by the antenna. Keen at [0018] In an embodiment, the controller is operable to control the driver using proportional, integral and differential (PID) techniques or algorithms. Keen at [0024] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator in accordance with the invention; Keen at [0028] FIG. 1 shows a functional block diagram of an embodiment of an RFID reader 1 in accordance with the invention which is operable to transmit a radio frequency signal and to detect and demodulate modulation of the transmitted radio frequency signal. The RFID reader 1 may be compatible with a variety of standards or communications protocols, for example ISO/IEC 14443 or ISO/IEC 15693. Keen at [0031] The output of the signal generator 5 is coupled to one input of a differential driver 6. The other input of differential driver 6 is coupled to a driver control signal output 2a of the controller 2. Keen at [0032] The differential driver 6 is coupled to supply the RF signal to an antenna circuit 7. In this example, the antenna circuit 7 is a tuned circuit comprising respective capacitors 8 and 9 in series with an antenna coil 10 and further capacitors 11 and 12 each coupled between a respective one of the capacitors 8 and 9 and ground (earth). The presence of all four capacitors serves to reduce unwanted carrier harmonics but it may be possible to omit some of the capacitors, for example capacitors 11 and 12, where the signal generated by the differential driver 6 does not exceed electromagnetic energy emissions regulations. Keen at [0048] To assist the explanation of the operation of the RFID reader 1, FIG. 2 shows a functional block diagram of an RFID data storage tag 30 that may be read by the reader 1 when the tag 30 is in the read range (H field) of the reader 1. In this example, the RFID tag or transponder is a passive device, where "passive" in

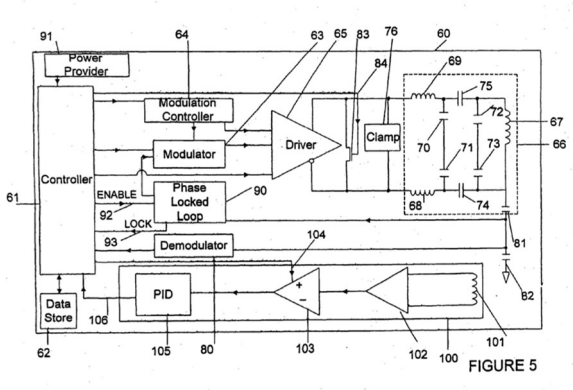
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	this context means that the RFID tag derives power from the RF signal supplied by the reader (it is not self-powered). As another possibility, the RFID tag may be an active device having a power provider (similar to that shown for an RFID reader in FIG. 1 as 25) for example at least one of a battery or a coupling to a power source of host device, system or apparatus containing or associated with the RFID tag. Keen at [0051] The tag 30 also has a controller 40 for controlling (via control line 41) reading of data from the data store 31 and supply of that data to a modulator 42 coupled to the antenna circuit 32. In the example shown, the modulator 42 comprises a series-connection of a capacitor 43 and an FET 44 coupled across the capacitor 34 of the antenna circuit 32 with the gate electrode of the FET 44 coupled to an output 45 of the data store 31 so that output of data from the data store 31 modulates the load on the antenna circuit 32 and thus on any antenna circuit 7 (FIG. 1) inductively coupled to the antenna circuit 32. Keen at [0055] In operation of the RFID reader 1 shown in FIG. 1, the controller 2 controls at least one of the signal generator 5 and differential driver 6 to affect both generation of the RF signal as required and modulation of that RF signal. Keen at [0056] In the case of a simple tag, the tag controller 40 may cause data to be read from the tag data store 31 upon powering up of the tag, that is once the power deriver 35 of the tag 30 derives a power supply for the tag 30 from the inductively coupled RF signal. Where the tag 30 is more sophisticated, then the communications protocol under which the tag and the reader operate may require some form of communication or handshaking to occur before the tag controller 40 causes data to be read from the tag data store. The reading of data from the data store 31 causes the modulator 42 to modulate the load on the antenna circuit 32 (and thus on the antenna circuit 7 inductively coupled thereto) in accordance with the data read from the data store 31. The modulation by the tag 30 of the RF signal is extracted by the reader demodulator 15 and supplied to the controller 2. The capacitors 13 and 14 limit the amplitude of the signal input to the demodulator 15 and so avoid over-voltage damage to the demodulator 15. Keen at [0067] FIG. 3 may also be implemented as an active RFID tag rather than an RFID reader if the controller 2 is configured not to initiate but to respond, that is if the controller 2 is configured to allow RF signal

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	generation and any modulation only in response to an RF signal (H field) from an RFID reader or an NFC communicator in initiator mode. Keen at [0074] During operation of the RFID reader 1″ shown in FIG. 4, when the controller 2 causes the signal generator 5 to generate an RF signal, the digital signal generated by the signal generator 5 is fed into the differential driver 6 which outputs complementary pulses to the antenna circuit 7. The resulting oscillating magnetic H field produced by the antenna circuit 7 is inductively coupled to the antenna circuit of any tag (for example the tag 30 shown in FIG. 2) within the H field, that is within the read range of the reader 1″. Keen at [0083] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator 60 in accordance with the invention. Unlike the RFID readers described with reference to FIGS. 1, 3 and 4, an NFC communicator is capable of communicating with transponders or tags, RFID transceivers or readers and other NFC communicators. Examples of such NFC communicators are described in ISO/IEC 18092 and ISO/IEC 21481. Thus, an NFC communicator can operate: 1) in an initiator mode in which the NFC communicator functions in a similar fashion to an RFID reader and will transmit an RF signal; and 2) in a target mode in which the NFC communicator waits for receipt of an RF signal from another NFC communicator operating in initiator mode or an RFID reader, that is it functions like a tag or transponder. NFC communicators may communicate with each other using an active or passive protocol. When using the active protocol, an initiator mode NFC communicator transmits an RF signal and then ceases RF signal transmission and a target mode NFC communicator responds by transmitting its own RF signal and then ceasing RF signal transmission. When using the passive protocol, an initiator mode NFC communicator transmits its RF signal and maintains that RF signal throughout the duration of the communication cycle and a target mode NFC communicator responds by causing modulation of the transmitted RF signal. Keen at [0084] As shown in FIG. 5, the NFC communicator 60 includes a controller 61 for controlling overall operation of the NFC communicator in accordance with control data and/or instructions and other data stored by an internal memory of the controller 61 and/or a data store 62 coupled to the controller. The controller 61 may comprise a microcontroller, RISC computer or state machine, for example. Keen at [0085]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	The controller 61 is coupled to a signal modulator 63 for modulating an RF signal in accordance with data provided by the controller 61, to a modulation controller 64 and to a differential driver 65 which is also coupled to the outputs of the signal modulator 63 and the modulation controller 64. The modulation controller 64 may control the amplitude of the signal supplied by the modulator 63. As shown, the modulation controller 64 is separate from the controller 61. The functionality of the modulation controller may however be provided by the controller 61. Keen at [0086] The differential driver 65 is coupled to supply an RF signal modulated under the control of the controller 61 to an antenna circuit 66 comprising an antenna coil 67. In this example the RF signal fed to the antenna circuit 66 is of a digital square-wave form and so filtering components (as shown inductors 68 and 69 and capacitors 70 to 75) may be required to reduce harmonics of the carrier so that electromagnetic energy emissions regulations are met. A clamp 76 is provided across the antenna circuit 66 to divert current in the event of a high voltage occurring to reduce the risk of high voltages destroying chip functionality. Keen at [0088] The NFC communicator 60 shown in FIG. 5 has two mechanisms for enabling communication of data when the NFC communicator is in the target mode. One mechanism is a load modulation mechanism as described above with reference to FIG. 2 and the other is an interference mechanism which simulates load modulation. Keen at [0089] The load modulation mechanism is provided by a transistor 83 (as shown a FET) coupled across the antenna coil 67. The controller 61 has a data output 84 coupled to the gate or control electrode of the transistor 83 and, when this mechanism is operational, the transistor 83 is switched on and off in accordance with the data supplied by the controller 61, thereby modulating the load on the antenna circuit 66 and thus an RF signal supplied by the initiator NFC communicator or RFID reader. Keen at [0090] The interference or simulated load modulation mechanism is provided by a phase-locked loop 90 comprising, in this example, a voltage controlled oscillator (VCO), a phase detector, a loop filter and preferably a sample and hold circuit). The phase-locked loop 90 is coupled, as shown via capacitor 81, to the antenna circuit 66. The phase-locked loop 90 generates an internal RF signal which is supplied to the modulator 63 when the NFC communicator 60 is in initiator mode. When, however, the NFC communicator 60 is in target mode, the phase-locked loop 90 is controlled by an enable signal output 92

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	of the controller 61 to bring the internally generated RF signal into phase ("lock") with an external RF signal coupled to the antenna circuit 66 (that is an RF signal from an initiator mode NFC communicator or RFID reader) so that the internally generated RF signal has a fixed phase relationship to the external RF signal. The phase-locked loop 90 provides a signal to an input 93 of the controller 61 when phase lock has been achieved. This ensures that the target mode NFC communicator can communicate with the initiator mode NFC communicator or RFID reader by modulating its internally generated RF signal. Keen at [0092] The controller 61 controls RF signal generation, modulation characteristics of any transmitted RF signal, response to any received RF signal, interpretation of any received demodulated signal, mode of operation (for example initiator or target or active or passive mode) and the communication protocol under which the NFC communicator 60 operates. In responding to a received signal when in target mode, the NFC communicator will respond in a manner dependent upon whether the NFC communicator 60 is operating under the active or passive protocol. Where the NFC communicator is operating under the active protocol, the controller 61 will cause the NFC communicator to respond by generation of a phase-locked modulated signal using the phase-locked loop mechanism whereas in the event the NFC communicator is operating under the passive protocol, the controller 61 may cause the received RF signal to be directly modulated by switching the transistor 83 in accordance with the data to be communicated or may use the phase-locked loop 90 mechanism to effect modulation by interference with the received RF signal (simulated load modulation). Keen at [0093] The NFC communicator 60 may use a combination of load modulation or carrier interference or may alternatively use only one or the other form of communication. As another possibility, the NFC communicator 60 may comprise multiple antennas, one being used for response to a received RF signal and the other being used for transmission of an RF signal with the antennas being switched on according to need, under the control of the controller of the NFC communicator. Thus, where the NFC communicator is acting in initiator mode, the antenna selected for transmission of an RF signal will be used while where the NFC communicator is, for example, acting as a passive target (i.e. similar to an RFID transponder) the controller 61 will switch the antennas, thereby utilising an antenna more suited to load modulation of an incoming RF signal. Keen at [0095] As with the RFID reader 1 shown in FIG. 1, the NFC communicator 60 has a control circuit 100 for controlling operation of the NFC communicator 60 in accordance with the strength of the magnetic field

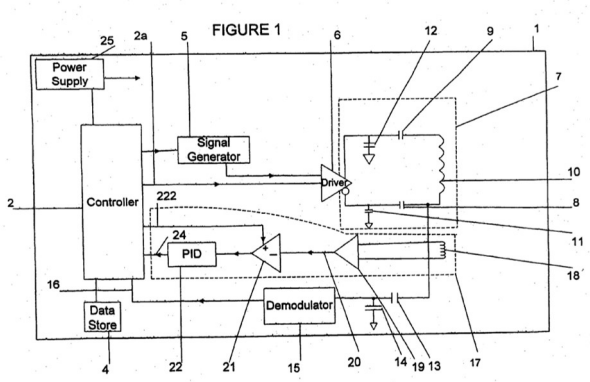
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	generated by the antenna circuit coil 66. As shown in FIG. 5, the control circuit 100 comprises a sense coil 101 positioned so as to be able to sense or detect at least part of the magnetic field (H field) produced by the antenna circuit coil 67, that is so that the sense coil 101 lies within the H field of the antenna circuit coil 67. The sense coil 101 is coupled to a sense amplifier 102 having its output coupled to one input (as shown the negative input) of a differential or error amplifier 103. The other input of the error amplifier 103 is coupled to a required magnetic field strength output 104 of the controller 61 which provides a signal indicating the magnetic field strength required to be produced by the antenna circuit 66. Keen at [0098] In operation of the NFC communicator shown in FIG. 5, the sense coil 101 detects the magnetic field at the antenna circuit coil 67. The detected signal is amplified and filtered by the sense amplifier 102 and fed to the error amplifier 103 which compares the received signal against a pre-set desired signal level or threshold level output 104 representing the required magnetic field strength provided by the controller 61 and produces an error or difference signal. This error or difference signal is processed by the control loop stabiliser 105 using PID techniques to provide instruction data utilisable by the controller 61 to control the modulation controller 64 and differential driver 65 to adjust or modify the RF signal fed to the antenna circuit 66 by the driver 65 to compensate for the difference between the sensed magnetic field strength and the required magnetic field strength. Keen at claim 1 1. A near field communicator comprising: a driver operable to supply a drive signal to drive an antenna to generate a magnetic field; a magnetic field sensor located so as to be within a magnetic field generated by the antenna to sense a magnetic field characteristic; and a controller operable to provide a control signal to compensate for any difference between the magnetic field characteristic sensed by the magnetic field sensor and a predetermined parameter. Keen at claim 8 8. A near field communicator according to claim 1, wherein the driver is operable to supply an oscillating, for example RF, drive signal to drive the antenna. *See also* [1c] above. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

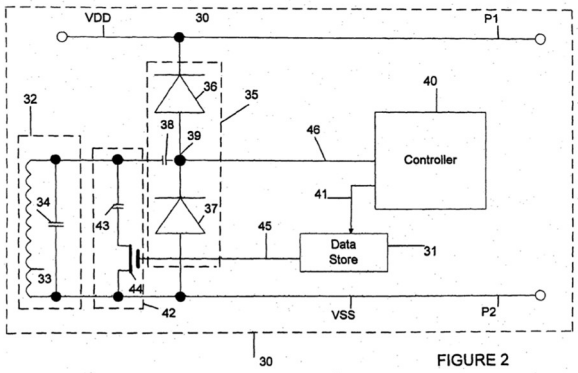
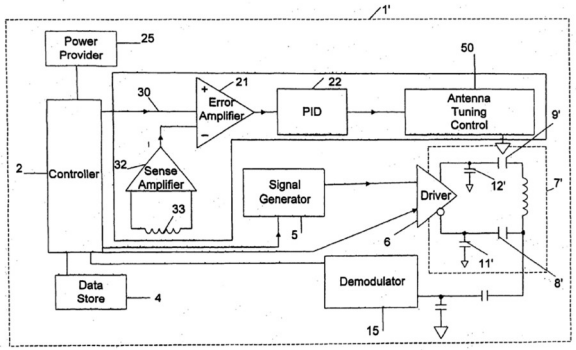
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
6. The mobile device of claim 5 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Keen discloses or renders obvious "[t]he mobile device of claim 5 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." *See* claim 2 above. *See also* claim 5 above.
7. The mobile device of claim 5 wherein the smartcard controller is coupled to be powered by the mobile device.	Keen discloses or renders obvious "[t]he mobile device of claim 5 wherein the smartcard controller is coupled to be powered by the mobile device." *See* claim 3 above. *See also* claim 5 above.
8. The mobile device of claim 5 wherein the transmit circuit comprises a load modulation circuit.	Keen discloses or renders obvious "[t]he mobile device of claim 5 wherein the transmit circuit comprises a load modulation circuit." For example: Keen at Figure 5  FIGURE 5 Keen at [0030] The controller 2 is also coupled to a signal generator 5 for generating a radio frequency signal (for example a 13.56 Mega Hertz RF signal). The generated RF signal may be unmodulated or modulated with control or other data supplied by the controller 2. The signal generator 5 may generate the RF signal in a variety of ways. For example the RF signal may be a digital signal generated by sine synthesis in which

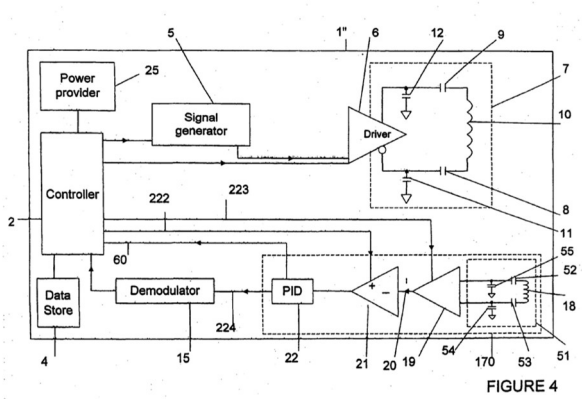
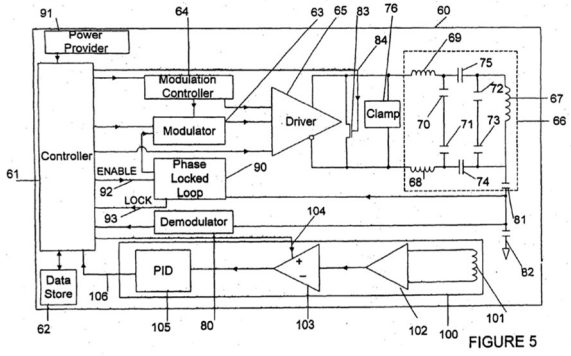
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	case any required modulation will generally be effected by pulse-width modulation (PWM), pulse code modulation or pulse-density modulation (PDM) techniques. As another possibility, the RF signal may be a digital signal generated by use of a pre-configured algorithm or direct digital synthesis. Where sine synthesis is not used additional filtering circuitry may be required (not shown) to meet electromagnetic energy emissions regulations. Other possible modulation schemes that may be used include amplitude shift key (ASK) modulation and load modulation. Keen at [0051] The tag 30 also has a controller 40 for controlling (via control line 41) reading of data from the data store 31 and supply of that data to a modulator 42 coupled to the antenna circuit 32. In the example shown, the modulator 42 comprises a series-connection of a capacitor 43 and an FET 44 coupled across the capacitor 34 of the antenna circuit 32 with the gate electrode of the FET 44 coupled to an output 45 of the data store 31 so that output of data from the data store 31 modulates the load on the antenna circuit 32 and thus on any antenna circuit 7 (FIG. 1) inductively coupled to the antenna circuit 32. Keen at [0055] In operation of the RFID reader 1 shown in FIG. 1, the controller 2 controls at least one of the signal generator 5 and differential driver 6 to affect both generation of the RF signal as required and modulation of that RF signal. Keen at [0056] In the case of a simple tag, the tag controller 40 may cause data to be read from the tag data store 31 upon powering up of the tag, that is once the power deriver 35 of the tag 30 derives a power supply for the tag 30 from the inductively coupled RF signal. Where the tag 30 is more sophisticated, then the communications protocol under which the tag and the reader operate may require some form of communication or handshaking to occur before the tag controller 40 causes data to be read from the tag data store. The reading of data from the data store 31 causes the modulator 42 to modulate the load on the antenna circuit 32 (and thus on the antenna circuit 7 inductively coupled thereto) in accordance with the data read from the data store 31. The modulation by the tag 30 of the RF signal is extracted by the reader demodulator 15 and supplied to the controller 2. The capacitors 13 and 14 limit the amplitude of the signal input to the demodulator 15 and so avoid over-voltage damage to the demodulator 15. Keen at [0067] FIG. 3 may also be implemented as an active RFID tag rather than an RFID reader if the controller 2 is configured not to initiate but to respond, that is if the controller 2 is configured to allow RF signal

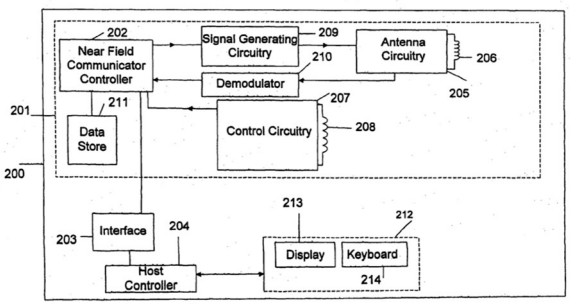
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	generation and any modulation only in response to an RF signal (H field) from an RFID reader or an NFC communicator in initiator mode. Keen at [0083] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator 60 in accordance with the invention. Unlike the RFID readers described with reference to FIGS. 1, 3 and 4, an NFC communicator is capable of communicating with transponders or tags, RFID transceivers or readers and other NFC communicators. Examples of such NFC communicators are described in ISO/IEC 18092 and ISO/IEC 21481. Thus, an NFC communicator can operate: 1) in an initiator mode in which the NFC communicator functions in a similar fashion to an RFID reader and will transmit an RF signal; and 2) in a target mode in which the NFC communicator waits for receipt of an RF signal from another NFC communicator operating in initiator mode or an RFID reader, that is it functions like a tag or transponder. NFC communicators may communicate with each other using an active or passive protocol. When using the active protocol, an initiator mode NFC communicator transmits an RF signal and then ceases RF signal transmission and a target mode NFC communicator responds by transmitting its own RF signal and then ceasing RF signal transmission. When using the passive protocol, an initiator mode NFC communicator transmits its RF signal and maintains that RF signal throughout the duration of the communication cycle and a target mode NFC communicator responds by causing modulation of the transmitted RF signal. Keen at [0085] The controller 61 is coupled to a signal modulator 63 for modulating an RF signal in accordance with data provided by the controller 61, to a modulation controller 64 and to a differential driver 65 which is also coupled to the outputs of the signal modulator 63 and the modulation controller 64. The modulation controller 64 may control the amplitude of the signal supplied by the modulator 63. As shown, the modulation controller 64 is separate from the controller 61. The functionality of the modulation controller may however be provided by the controller 61. Keen at [0088] The NFC communicator 60 shown in FIG. 5 has two mechanisms for enabling communication of data when the NFC communicator is in the target mode. One mechanism is a load modulation mechanism as described above with reference to FIG. 2 and the other is an interference mechanism which simulates load modulation. Keen at [0089]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	The load modulation mechanism is provided by a transistor 83 (as shown a FET) coupled across the antenna coil 67. The controller 61 has a data output 84 coupled to the gate or control electrode of the transistor 83 and, when this mechanism is operational, the transistor 83 is switched on and off in accordance with the data supplied by the controller 61, thereby modulating the load on the antenna circuit 66 and thus an RF signal supplied by the initiator NFC communicator or RFID reader. Keen at [0092] The controller 61 controls RF signal generation, modulation characteristics of any transmitted RF signal, response to any received RF signal, interpretation of any received demodulated signal, mode of operation (for example initiator or target or active or passive mode) and the communication protocol under which the NFC communicator 60 operates. In responding to a received signal when in target mode, the NFC communicator will respond in a manner dependent upon whether the NFC communicator 60 is operating under the active or passive protocol. Where the NFC communicator is operating under the active protocol, the controller 61 will cause the NFC communicator to respond by generation of a phase-locked modulated signal using the phase-locked loop mechanism whereas in the event the NFC communicator is operating under the passive protocol, the controller 61 may cause the received RF signal to be directly modulated by switching the transistor 83 in accordance with the data to be communicated or may use the phase-locked loop 90 mechanism to effect modulation by interference with the received RF signal (simulated load modulation). Keen at [0093] The NFC communicator 60 may use a combination of load modulation or carrier interference or may alternatively use only one or the other form of communication. As another possibility, the NFC communicator 60 may comprise multiple antennas, one being used for response to a received RF signal and the other being used for transmission of an RF signal with the antennas being switched on according to need, under the control of the controller of the NFC communicator. Thus, where the NFC communicator is acting in initiator mode, the antenna selected for transmission of an RF signal will be used while where the NFC communicator is, for example, acting as a passive target (i.e. similar to an RFID transponder) the controller 61 will switch the antennas, thereby utilising an antenna more suited to load modulation of an incoming RF signal. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 5 above.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
9. The mobile device of claim 5 wherein the transmit circuit comprises an active transmit driver.	Keen discloses or renders obvious "[t]he mobile device of claim 5 wherein the transmit circuit comprises an active transmit driver." For example: Keen at Abstract A near field communicator has a driver (6) to supply a drive signal to drive an antenna (10) to generate a magnetic field. A magnetic field sensor (18) is located so as to be within a magnetic field generated by the antenna (6) to sense a magnetic field characteristic. A controller (17) provides a control signal to control the operation of the driver (6) to compensate for any difference between the magnetic field characteristic sensed by the magnetic field sensor (18) and a predetermined parameter. Keen at Figure 1  Keen at Figure 2

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 2 Keen at Figure 3  FIGURE 3 Keen at Figure 4

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 4 Keen at Figure 5  FIGURE 5 Keen at Figure 6

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 6 Keen at [0009] A further issue is that, in order to create the strongest magnetic field for the lowest drive power, near field communicators generally use an antenna circuit tuned to have a resonant frequency coinciding with or very close to the operating carrier frequency of the near field communicator. One of the most influential parameters of a resonant circuit is its "Q" factor and to achieve optimum read range performance, especially when using small size (small form factor) antennas, relatively high Q factors are used. Although this achieves maximum read range it also makes the communicator very sensitive to the de-tuning effects of nearby metallic and/or magnetic materials. Indeed, the inventors have realised that these de-tuning effects can be more dominant than the unavoidable eddy current loses. Keen at [0011] In one aspect, the present invention provides a near field communicator having a magnetic field strength determiner and an antenna drive adjuster operable to adjust the drive to an antenna of the communicator in accordance with the determined magnetic field strength to provide the communicator with the required read range performance. Keen at [0013] In one aspect, the present invention provides a near field communicator comprising a driver operable to drive an antenna or coil to produce a magnetic field; a magnetic field sensor operable to sense the magnetic field produced by the antenna or coil; a comparator operable to compare, directly or indirectly, the sensed magnetic field strength with a desired parameter, and a controller operable to control the driver to compensate for a difference between the sensed magnetic field strength and the desired parameter.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at [0015] In an embodiment, the controller is operable to control the driver to control the magnetic signal strength produced by the antenna. Keen at [0018] In an embodiment, the controller is operable to control the driver using proportional, integral and differential (PID) techniques or algorithms. Keen at [0024] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator in accordance with the invention; Keen at [0031] The output of the signal generator 5 is coupled to one input of a differential driver 6. The other input of differential driver 6 is coupled to a driver control signal output 2a of the controller 2. Keen at [0032] The differential driver 6 is coupled to supply the RF signal to an antenna circuit 7. In this example, the antenna circuit 7 is a tuned circuit comprising respective capacitors 8 and 9 in series with an antenna coil 10 and further capacitors 11 and 12 each coupled between a respective one of the capacitors 8 and 9 and ground (earth). The presence of all four capacitors serves to reduce unwanted carrier harmonics but it may be possible to omit some of the capacitors, for example capacitors 11 and 12, where the signal generated by the differential driver 6 does not exceed electromagnetic energy emissions regulations. Keen at [0046] The RFID reader 1 will of course have or be associated with a power provider 25 for providing a power supply for the various components of the RFID reader 1. In the interests of simplicity, the couplings of most of the various components of the RFID reader 1 to the power provider 25 are omitted in FIG. 1. The power provider 25 may be, for example, an internal battery or may be a coupling to a power supply provided by any host apparatus, system or device of the RFID reader 1. Keen at [0048] To assist the explanation of the operation of the RFID reader 1, FIG. 2 shows a functional block diagram of an RFID data storage tag 30 that may be read by the reader 1 when the tag 30 is in the read range (H

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	field) of the reader 1. In this example, the RFID tag or transponder is a passive device, where "passive" in this context means that the RFID tag derives power from the RF signal supplied by the reader (it is not self-powered). As another possibility, the RFID tag may be an active device having a power provider (similar to that shown for an RFID reader in FIG. 1 as 25) for example at least one of a battery or a coupling to a power source of host device, system or apparatus containing or associated with the RFID tag. Keen at [0051] The tag 30 also has a controller 40 for controlling (via control line 41) reading of data from the data store 31 and supply of that data to a modulator 42 coupled to the antenna circuit 32. In the example shown, the modulator 42 comprises a series-connection of a capacitor 43 and an FET 44 coupled across the capacitor 34 of the antenna circuit 32 with the gate electrode of the FET 44 coupled to an output 45 of the data store 31 so that output of data from the data store 31 modulates the load on the antenna circuit 32 and thus on any antenna circuit 7 (FIG. 1) inductively coupled to the antenna circuit 32. Keen at [0055] In operation of the RFID reader 1 shown in FIG. 1, the controller 2 controls at least one of the signal generator 5 and differential driver 6 to affect both generation of the RF signal as required and modulation of that RF signal. Keen at [0056] In the case of a simple tag, the tag controller 40 may cause data to be read from the tag data store 31 upon powering up of the tag, that is once the power deriver 35 of the tag 30 derives a power supply for the tag 30 from the inductively coupled RF signal. Where the tag 30 is more sophisticated, then the communications protocol under which the tag and the reader operate may require some form of communication or handshaking to occur before the tag controller 40 causes data to be read from the tag data store. The reading of data from the data store 31 causes the modulator 42 to modulate the load on the antenna circuit 32 (and thus on the antenna circuit 7 inductively coupled thereto) in accordance with the data read from the data store 31. The modulation by the tag 30 of the RF signal is extracted by the reader demodulator 15 and supplied to the controller 2. The capacitors 13 and 14 limit the amplitude of the signal input to the demodulator 15 and so avoid over-voltage damage to the demodulator 15. Keen at [0067] FIG. 3 may also be implemented as an active RFID tag rather than an RFID reader if the controller 2 is configured not to initiate but to respond, that is if the controller 2 is configured to allow RF signal

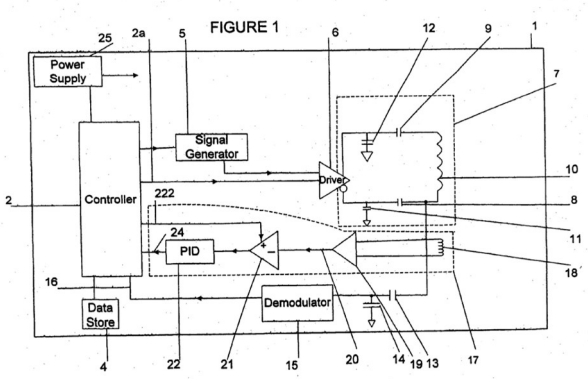
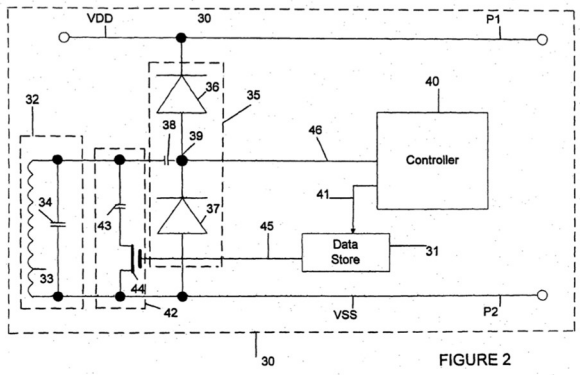
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	generation and any modulation only in response to an RF signal (H field) from an RFID reader or an NFC communicator in initiator mode. Keen at [0074] During operation of the RFID reader 1″ shown in FIG. 4, when the controller 2 causes the signal generator 5 to generate an RF signal, the digital signal generated by the signal generator 5 is fed into the differential driver 6 which outputs complementary pulses to the antenna circuit 7. The resulting oscillating magnetic H field produced by the antenna circuit 7 is inductively coupled to the antenna circuit of any tag (for example the tag 30 shown in FIG. 2) within the H field, that is within the read range of the reader 1″. Keen at [0083] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator 60 in accordance with the invention. Unlike the RFID readers described with reference to FIGS. 1, 3 and 4, an NFC communicator is capable of communicating with transponders or tags, RFID transceivers or readers and other NFC communicators. Examples of such NFC communicators are described in ISO/IEC 18092 and ISO/IEC 21481. Thus, an NFC communicator can operate: 1) in an initiator mode in which the NFC communicator functions in a similar fashion to an RFID reader and will transmit an RF signal; and 2) in a target mode in which the NFC communicator waits for receipt of an RF signal from another NFC communicator operating in initiator mode or an RFID reader, that is it functions like a tag or transponder. NFC communicators may communicate with each other using an active or passive protocol. When using the active protocol, an initiator mode NFC communicator transmits an RF signal and then ceases RF signal transmission and a target mode NFC communicator responds by transmitting its own RF signal and then ceasing RF signal transmission. When using the passive protocol, an initiator mode NFC communicator transmits its RF signal and maintains that RF signal throughout the duration of the communication cycle and a target mode NFC communicator responds by causing modulation of the transmitted RF signal. Keen at [0084] As shown in FIG. 5, the NFC communicator 60 includes a controller 61 for controlling overall operation of the NFC communicator in accordance with control data and/or instructions and other data stored by an internal memory of the controller 61 and/or a data store 62 coupled to the controller. The controller 61 may comprise a microcontroller, RISC computer or state machine, for example. Keen at [0085]

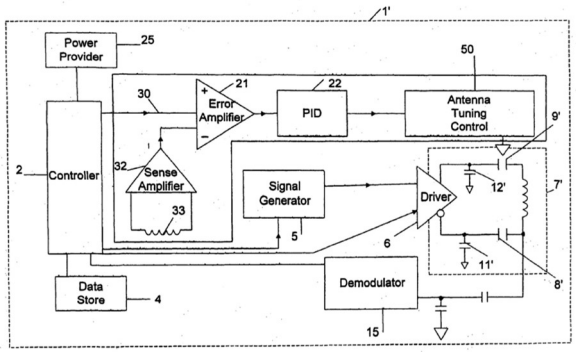
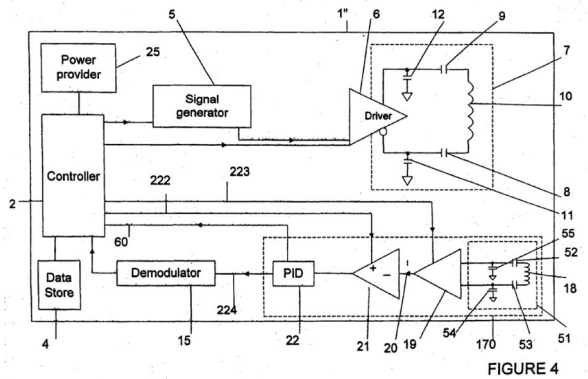
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	The controller 61 is coupled to a signal modulator 63 for modulating an RF signal in accordance with data provided by the controller 61, to a modulation controller 64 and to a differential driver 65 which is also coupled to the outputs of the signal modulator 63 and the modulation controller 64. The modulation controller 64 may control the amplitude of the signal supplied by the modulator 63. As shown, the modulation controller 64 is separate from the controller 61. The functionality of the modulation controller may however be provided by the controller 61. Keen at [0086] The differential driver 65 is coupled to supply an RF signal modulated under the control of the controller 61 to an antenna circuit 66 comprising an antenna coil 67. In this example the RF signal fed to the antenna circuit 66 is of a digital square-wave form and so filtering components (as shown inductors 68 and 69 and capacitors 70 to 75) may be required to reduce harmonics of the carrier so that electromagnetic energy emissions regulations are met. A clamp 76 is provided across the antenna circuit 66 to divert current in the event of a high voltage occurring to reduce the risk of high voltages destroying chip functionality. Keen at [0088] The NFC communicator 60 shown in FIG. 5 has two mechanisms for enabling communication of data when the NFC communicator is in the target mode. One mechanism is a load modulation mechanism as described above with reference to FIG. 2 and the other is an interference mechanism which simulates load modulation. Keen at [0089] The load modulation mechanism is provided by a transistor 83 (as shown a FET) coupled across the antenna coil 67. The controller 61 has a data output 84 coupled to the gate or control electrode of the transistor 83 and, when this mechanism is operational, the transistor 83 is switched on and off in accordance with the data supplied by the controller 61, thereby modulating the load on the antenna circuit 66 and thus an RF signal supplied by the initiator NFC communicator or RFID reader. Keen at [0090] The interference or simulated load modulation mechanism is provided by a phase-locked loop 90 comprising, in this example, a voltage controlled oscillator (VCO), a phase detector, a loop filter and preferably a sample and hold circuit). The phase-locked loop 90 is coupled, as shown via capacitor 81, to the antenna circuit 66. The phase-locked loop 90 generates an internal RF signal which is supplied to the modulator 63 when the NFC communicator 60 is in initiator mode. When, however, the NFC communicator 60 is in target mode, the phase-locked loop 90 is controlled by an enable signal output 92

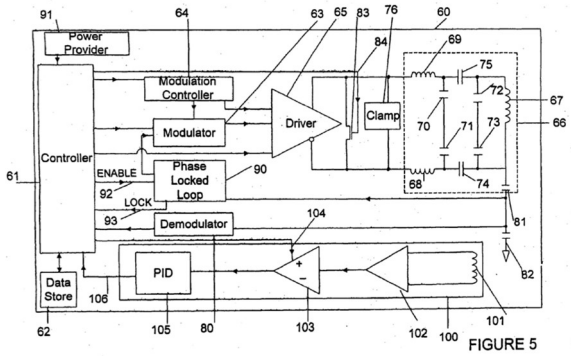
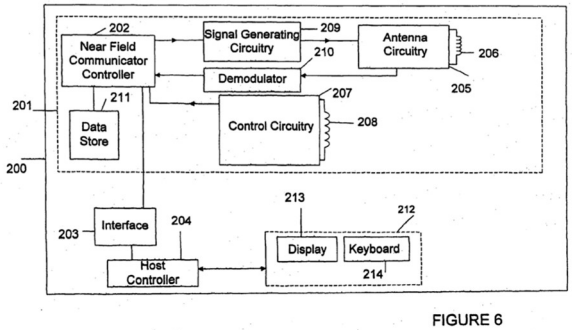
Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	of the controller 61 to bring the internally generated RF signal into phase ("lock") with an external RF signal coupled to the antenna circuit 66 (that is an RF signal from an initiator mode NFC communicator or RFID reader) so that the internally generated RF signal has a fixed phase relationship to the external RF signal. The phase-locked loop 90 provides a signal to an input 93 of the controller 61 when phase lock has been achieved. This ensures that the target mode NFC communicator can communicate with the initiator mode NFC communicator or RFID reader by modulating its internally generated RF signal. Keen at [0091] The NFC communicator 60 of course also has a power provider 91. For convenience the connections of the power provider to the remainder of the NFC communicator 91 are not shown. The power provider 91 may comprise at least one of a power supply such as a battery provided within the NFC communicator 60 and or a connection to a power supply of a host device, apparatus or system. The power provider could also comprise a power deriver for deriving a power supply from an RF signal inductively coupled to the antenna circuit 66 when the NFC communicator is in target mode. Keen at [0092] The controller 61 controls RF signal generation, modulation characteristics of any transmitted RF signal, response to any received RF signal, interpretation of any received demodulated signal, mode of operation (for example initiator or target or active or passive mode) and the communication protocol under which the NFC communicator 60 operates. In responding to a received signal when in target mode, the NFC communicator will respond in a manner dependent upon whether the NFC communicator 60 is operating under the active or passive protocol. Where the NFC communicator is operating under the active protocol, the controller 61 will cause the NFC communicator to respond by generation of a phase-locked modulated signal using the phase-locked loop mechanism whereas in the event the NFC communicator is operating under the passive protocol, the controller 61 may cause the received RF signal to be directly modulated by switching the transistor 83 in accordance with the data to be communicated or may use the phase-locked loop 90 mechanism to effect modulation by interference with the received RF signal (simulated load modulation). Keen at [0093] The NFC communicator 60 may use a combination of load modulation or carrier interference or may alternatively use only one or the other form of communication. As another possibility, the NFC communicator 60 may comprise multiple antennas, one being used for response to a received RF signal and the other being used for transmission of an RF signal with the antennas being switched on according to need, under the control of the controller of the NFC communicator. Thus, where the NFC

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	communicator is acting in initiator mode, the antenna selected for transmission of an RF signal will be used while where the NFC communicator is, for example, acting as a passive target (i.e. similar to an RFID transponder) the controller 61 will switch the antennas, thereby utilising an antenna more suited to load modulation of an incoming RF signal. Keen at [0098] In operation of the NFC communicator shown in FIG. 5, the sense coil 101 detects the magnetic field at the antenna circuit coil 67. The detected signal is amplified and filtered by the sense amplifier 102 and fed to the error amplifier 103 which compares the received signal against a pre-set desired signal level or threshold level output 104 representing the required magnetic field strength provided by the controller 61 and produces an error or difference signal. This error or difference signal is processed by the control loop stabiliser 105 using PID techniques to provide instruction data utilisable by the controller 61 to control the modulation controller 64 and differential driver 65 to adjust or modify the RF signal fed to the antenna circuit 66 by the driver 65 to compensate for the difference between the sensed magnetic field strength and the required magnetic field strength. Keen at claim 1 1. A near field communicator comprising: a driver operable to supply a drive signal to drive an antenna to generate a magnetic field; a magnetic field sensor located so as to be within a magnetic field generated by the antenna to sense a magnetic field characteristic; and a controller operable to provide a control signal to compensate for any difference between the magnetic field characteristic sensed by the magnetic field sensor and a predetermined parameter. Keen at claim 8 8. A near field communicator according to claim 1, wherein the driver is operable to supply an oscillating, for example RF, drive signal to drive the antenna. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 5 above.
10. The mobile device of claim 5 wherein the mobile device comprises a mobile phone.	Keen discloses or renders obvious "[t]he mobile device of claim 5 wherein the mobile device comprises a mobile phone."

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	See claim 4 above. *See also* claim 5 above.
11[pre]. A mobile device comprising:	By providing this disclosure, Defendants does not take a position on whether the preamble is a claim limitation. Keen discloses or renders obvious "[a] mobile device." *See* 1[pre] above.
[11a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Keen discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." *See* [1a] above. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[11b] an antenna tuned to operate at 13.56 MHz;	Keen discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." *See* [1b] above.
[11c] an amplifier coupled to be powered by the mobile device, wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller; and	Keen discloses or renders obvious "an amplifier coupled to be powered by the mobile device, wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller." *See* [5c] above.
[11d] an active transmit driver circuit coupled between the smartcard controller and the antenna, wherein the active transmit driver circuit is coupled to be powered by the mobile device.	Keen discloses or renders obvious "an active transmit driver circuit coupled between the smartcard controller and the antenna, wherein the active transmit driver circuit is coupled to be powered by the mobile device." For example: Keen at Abstract A near field communicator has a driver (6) to supply a drive signal to drive an antenna (10) to generate a magnetic field. A magnetic field sensor (18) is located so as to be within a magnetic field generated by the

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	antenna (6) to sense a magnetic field characteristic. A controller (17) provides a control signal to control the operation of the driver (6) to compensate for any difference between the magnetic field characteristic sensed by the magnetic field sensor (18) and a predetermined parameter. Keen at Figure 1  Keen at Figure 2  Keen at Figure 3

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 3 Keen at Figure 4  FIGURE 4 Keen at Figure 5

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	 FIGURE 5 Keen at Figure 6  FIGURE 6 Keen at [0009] A further issue is that, in order to create the strongest magnetic field for the lowest drive power, near field communicators generally use an antenna circuit tuned to have a resonant frequency coinciding with or very close to the operating carrier frequency of the near field communicator. One of the most influential parameters of a resonant circuit is its "Q" factor and to achieve optimum read range performance, especially when using small size (small form factor) antennas, relatively high Q factors are used. Although this achieves maximum read range it also makes the communicator very sensitive to the de-tuning effects of nearby metallic and/or magnetic materials. Indeed, the inventors have realised that these de-tuning effects can be more dominant than the unavoidable eddy current loses.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at [0011] In one aspect, the present invention provides a near field communicator having a magnetic field strength determiner and an antenna drive adjuster operable to adjust the drive to an antenna of the communicator in accordance with the determined magnetic field strength to provide the communicator with the required read range performance. Keen at [0013] In one aspect, the present invention provides a near field communicator comprising a driver operable to drive an antenna or coil to produce a magnetic field; a magnetic field sensor operable to sense the magnetic field produced by the antenna or coil; a comparator operable to compare, directly or indirectly, the sensed magnetic field strength with a desired parameter, and a controller operable to control the driver to compensate for a difference between the sensed magnetic field strength and the desired parameter. Keen at [0015] In an embodiment, the controller is operable to control the driver to control the magnetic signal strength produced by the antenna. Keen at [0018] In an embodiment, the controller is operable to control the driver using proportional, integral and differential (PID) techniques or algorithms. Keen at [0024] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator in accordance with the invention; Keen at [0031] The output of the signal generator 5 is coupled to one input of a differential driver 6. The other input of differential driver 6 is coupled to a driver control signal output 2a of the controller 2. Keen at [0032] The differential driver 6 is coupled to supply the RF signal to an antenna circuit 7. In this example, the antenna circuit 7 is a tuned circuit comprising respective capacitors 8 and 9 in series with an antenna coil 10 and further capacitors 11 and 12 each coupled between a respective one of the capacitors 8 and 9 and ground (earth). The presence of all four capacitors serves to reduce unwanted carrier harmonics but it may

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	be possible to omit some of the capacitors, for example capacitors 11 and 12, where the signal generated by the differential driver 6 does not exceed electromagnetic energy emissions regulations. Keen at [0046] The RFID reader 1 will of course have or be associated with a power provider 25 for providing a power supply for the various components of the RFID reader 1. In the interests of simplicity, the couplings of most of the various components of the RFID reader 1 to the power provider 25 are omitted in FIG. 1. The power provider 25 may be, for example, an internal battery or may be a coupling to a power supply provided by any host apparatus, system or device of the RFID reader 1. Keen at [0048] To assist the explanation of the operation of the RFID reader 1, FIG. 2 shows a functional block diagram of an RFID data storage tag 30 that may be read by the reader 1 when the tag 30 is in the read range (H field) of the reader 1. In this example, the RFID tag or transponder is a passive device, where "passive" in this context means that the RFID tag derives power from the RF signal supplied by the reader (it is not self-powered). As another possibility, the RFID tag may be an active device having a power provider (similar to that shown for an RFID reader in FIG. 1 as 25) for example at least one of a battery or a coupling to a power source of host device, system or apparatus containing or associated with the RFID tag. Keen at [0051] The tag 30 also has a controller 40 for controlling (via control line 41) reading of data from the data store 31 and supply of that data to a modulator 42 coupled to the antenna circuit 32. In the example shown, the modulator 42 comprises a series-connection of a capacitor 43 and an FET 44 coupled across the capacitor 34 of the antenna circuit 32 with the gate electrode of the FET 44 coupled to an output 45 of the data store 31 so that output of data from the data store 31 modulates the load on the antenna circuit 32 and thus on any antenna circuit 7 (FIG. 1) inductively coupled to the antenna circuit 32. Keen at [0055] In operation of the RFID reader 1 shown in FIG. 1, the controller 2 controls at least one of the signal generator 5 and differential driver 6 to affect both generation of the RF signal as required and modulation of that RF signal. Keen at [0056]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	In the case of a simple tag, the tag controller 40 may cause data to be read from the tag data store 31 upon powering up of the tag, that is once the power deriver 35 of the tag 30 derives a power supply for the tag 30 from the inductively coupled RF signal. Where the tag 30 is more sophisticated, then the communications protocol under which the tag and the reader operate may require some form of communication or handshaking to occur before the tag controller 40 causes data to be read from the tag data store. The reading of data from the data store 31 causes the modulator 42 to modulate the load on the antenna circuit 32 (and thus on the antenna circuit 7 inductively coupled thereto) in accordance with the data read from the data store 31. The modulation by the tag 30 of the RF signal is extracted by the reader demodulator 15 and supplied to the controller 2. The capacitors 13 and 14 limit the amplitude of the signal input to the demodulator 15 and so avoid over-voltage damage to the demodulator 15. Keen at [0067] FIG. 3 may also be implemented as an active RFID tag rather than an RFID reader if the controller 2 is configured not to initiate but to respond, that is if the controller 2 is configured to allow RF signal generation and any modulation only in response to an RF signal (H field) from an RFID reader or an NFC communicator in initiator mode. Keen at [0074] During operation of the RFID reader 1″ shown in FIG. 4, when the controller 2 causes the signal generator 5 to generate an RF signal, the digital signal generated by the signal generator 5 is fed into the differential driver 6 which outputs complementary pulses to the antenna circuit 7. The resulting oscillating magnetic H field produced by the antenna circuit 7 is inductively coupled to the antenna circuit of any tag (for example the tag 30 shown in FIG. 2) within the H field, that is within the read range of the reader 1″. Keen at [0083] FIG. 5 shows a functional block diagram of an embodiment of an NFC communicator 60 in accordance with the invention. Unlike the RFID readers described with reference to FIGS. 1, 3 and 4, an NFC communicator is capable of communicating with transponders or tags, RFID transceivers or readers and other NFC communicators. Examples of such NFC communicators are described in ISO/IEC 18092 and ISO/IEC 21481. Thus, an NFC communicator can operate: 1) in an initiator mode in which the NFC communicator functions in a similar fashion to an RFID reader and will transmit an RF signal; and 2) in a target mode in which the NFC communicator waits for receipt of an RF signal from another NFC communicator operating in initiator mode or an RFID reader, that is it functions like a tag or transponder. NFC communicators may communicate with each other using an active or passive protocol. When using the active protocol, an initiator mode NFC communicator transmits an RF signal and then ceases RF

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	signal transmission and a target mode NFC communicator responds by transmitting its own RF signal and then ceasing RF signal transmission. When using the passive protocol, an initiator mode NFC communicator transmits its RF signal and maintains that RF signal throughout the duration of the communication cycle and a target mode NFC communicator responds by causing modulation of the transmitted RF signal. Keen at [0084] As shown in FIG. 5, the NFC communicator 60 includes a controller 61 for controlling overall operation of the NFC communicator in accordance with control data and/or instructions and other data stored by an internal memory of the controller 61 and/or a data store 62 coupled to the controller. The controller 61 may comprise a microcontroller, RISC computer or state machine, for example. Keen at [0085] The controller 61 is coupled to a signal modulator 63 for modulating an RF signal in accordance with data provided by the controller 61, to a modulation controller 64 and to a differential driver 65 which is also coupled to the outputs of the signal modulator 63 and the modulation controller 64. The modulation controller 64 may control the amplitude of the signal supplied by the modulator 63. As shown, the modulation controller 64 is separate from the controller 61. The functionality of the modulation controller may however be provided by the controller 61. Keen at [0086] The differential driver 65 is coupled to supply an RF signal modulated under the control of the controller 61 to an antenna circuit 66 comprising an antenna coil 67. In this example the RF signal fed to the antenna circuit 66 is of a digital square-wave form and so filtering components (as shown inductors 68 and 69 and capacitors 70 to 75) may be required to reduce harmonics of the carrier so that electromagnetic energy emissions regulations are met. A clamp 76 is provided across the antenna circuit 66 to divert current in the event of a high voltage occurring to reduce the risk of high voltages destroying chip functionality. Keen at [0088] The NFC communicator 60 shown in FIG. 5 has two mechanisms for enabling communication of data when the NFC communicator is in the target mode. One mechanism is a load modulation mechanism as described above with reference to FIG. 2 and the other is an interference mechanism which simulates load modulation. Keen at [0089]

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	The load modulation mechanism is provided by a transistor 83 (as shown a FET) coupled across the antenna coil 67. The controller 61 has a data output 84 coupled to the gate or control electrode of the transistor 83 and, when this mechanism is operational, the transistor 83 is switched on and off in accordance with the data supplied by the controller 61, thereby modulating the load on the antenna circuit 66 and thus an RF signal supplied by the initiator NFC communicator or RFID reader. Keen at [0090] The interference or simulated load modulation mechanism is provided by a phase-locked loop 90 comprising, in this example, a voltage controlled oscillator (VCO), a phase detector, a loop filter and preferably a sample and hold circuit). The phase-locked loop 90 is coupled, as shown via capacitor 81, to the antenna circuit 66. The phase-locked loop 90 generates an internal RF signal which is supplied to the modulator 63 when the NFC communicator 60 is in initiator mode. When, however, the NFC communicator 60 is in target mode, the phase-locked loop 90 is controlled by an enable signal output 92 of the controller 61 to bring the internally generated RF signal into phase ("lock") with an external RF signal coupled to the antenna circuit 66 (that is an RF signal from an initiator mode NFC communicator or RFID reader) so that the internally generated RF signal has a fixed phase relationship to the external RF signal. The phase-locked loop 90 provides a signal to an input 93 of the controller 61 when phase lock has been achieved. This ensures that the target mode NFC communicator can communicate with the initiator mode NFC communicator or RFID reader by modulating its internally generated RF signal. Keen at [0091] The NFC communicator 60 of course also has a power provider 91. For convenience the connections of the power provider to the remainder of the NFC communicator 91 are not shown. The power provider 91 may comprise at least one of a power supply such as a battery provided within the NFC communicator 60 and or a connection to a power supply of a host device, apparatus or system. The power provider could also comprise a power deriver for deriving a power supply from an RF signal inductively coupled to the antenna circuit 66 when the NFC communicator is in target mode. Keen at [0092] The controller 61 controls RF signal generation, modulation characteristics of any transmitted RF signal, response to any received RF signal, interpretation of any received demodulated signal, mode of operation (for example initiator or target or active or passive mode) and the communication protocol under which the NFC communicator 60 operates. In responding to a received signal when in target mode, the NFC communicator will respond in a manner dependent upon whether the NFC communicator 60 is operating under the active or passive protocol. Where the NFC communicator is operating under the active protocol,

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	the controller 61 will cause the NFC communicator to respond by generation of a phase-locked modulated signal using the phase-locked loop mechanism whereas in the event the NFC communicator is operating under the passive protocol, the controller 61 may cause the received RF signal to be directly modulated by switching the transistor 83 in accordance with the data to be communicated or may use the phase-locked loop 90 mechanism to effect modulation by interference with the received RF signal (simulated load modulation). Keen at [0093] The NFC communicator 60 may use a combination of load modulation or carrier interference or may alternatively use only one or the other form of communication. As another possibility, the NFC communicator 60 may comprise multiple antennas, one being used for response to a received RF signal and the other being used for transmission of an RF signal with the antennas being switched on according to need, under the control of the controller of the NFC communicator. Thus, where the NFC communicator is acting in initiator mode, the antenna selected for transmission of an RF signal will be used while where the NFC communicator is, for example, acting as a passive target (i.e. similar to an RFID transponder) the controller 61 will switch the antennas, thereby utilising an antenna more suited to load modulation of an incoming RF signal. Keen at [0098] In operation of the NFC communicator shown in FIG. 5, the sense coil 101 detects the magnetic field at the antenna circuit coil 67. The detected signal is amplified and filtered by the sense amplifier 102 and fed to the error amplifier 103 which compares the received signal against a pre-set desired signal level or threshold level output 104 representing the required magnetic field strength provided by the controller 61 and produces an error or difference signal. This error or difference signal is processed by the control loop stabiliser 105 using PID techniques to provide instruction data utilisable by the controller 61 to control the modulation controller 64 and differential driver 65 to adjust or modify the RF signal fed to the antenna circuit 66 by the driver 65 to compensate for the difference between the sensed magnetic field strength and the required magnetic field strength. Keen at claim 1 1. A near field communicator comprising: a driver operable to supply a drive signal to drive an antenna to generate a magnetic field; a magnetic field sensor located so as to be within a magnetic field generated by the antenna to sense a magnetic field characteristic; and a controller operable to provide a control signal to compensate for any difference between the magnetic field characteristic sensed by the magnetic field sensor and a predetermined parameter.

Claim Element	Exemplary Citations to U.S. Patent Pub. No. 2008/0194200 ("Keen")
	Keen at claim 8 8. A near field communicator according to claim 1, wherein the driver is operable to supply an oscillating, for example RF, drive signal to drive the antenna. *See also* [5d] and claim 9 above. To the extent this limitation is not disclosed by Keen, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Keen, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
12. The mobile device of claim 11 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Keen discloses or renders obvious "[t]he mobile device of claim 11 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." *See* claim 2 above. *See also* claim 11 above.
13. The mobile device of claim 11 wherein the smartcard controller is coupled to be powered by the mobile device.	Keen discloses or renders obvious "[t]he mobile device of claim 11 wherein the smartcard controller is coupled to be powered by the mobile device." *See* claim 3 above. *See also* claim 11 above.
14. The mobile device of claim 11 wherein the mobile device comprises a mobile phone.	Keen discloses or renders obvious "[t]he mobile device of claim 11 wherein the mobile device comprises a mobile phone." *See* claim 4 above. *See also* claim 11 above.

DEFENDANTS' INVALIDITY CONTENTIONS FOR U.S. PAT. 9,483,722

EXHIBIT B04: U.S. Pat. No. 6,282,407 ("Vega")

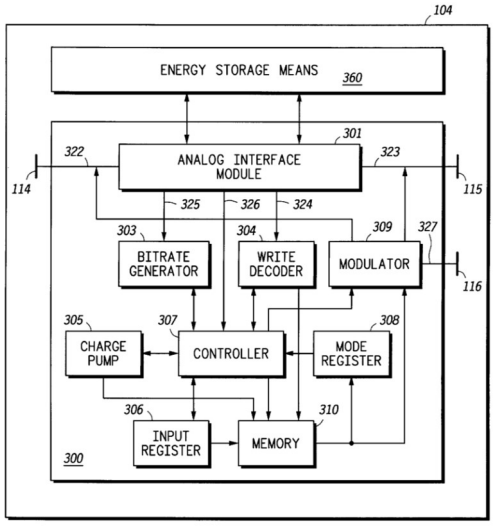
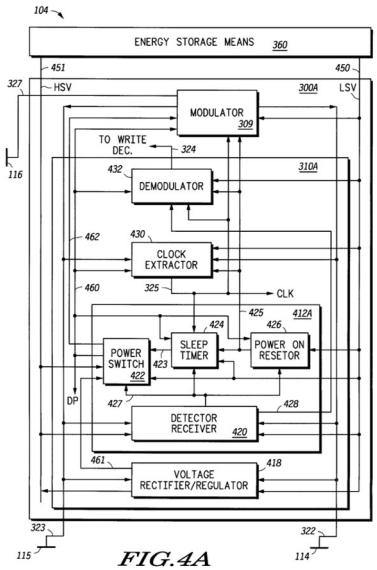
As demonstrated in the claim charts below, the claims of U.S. Patent No. 9,483,722 ("the '722 patent") are invalid (a) under one or more sections of 35 U.S.C. § 102 as anticipated by Vega and (b) under 35 U.S.C. § 103(a) as obvious over Vega standing alone and as set forth herein, and/or combined with the knowledge of a person of ordinary skill in the art, Applicant's Admitted Prior Art, and/or the additional prior art references discussed in Exhibit B and Exhibits B01–B05, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '722 patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

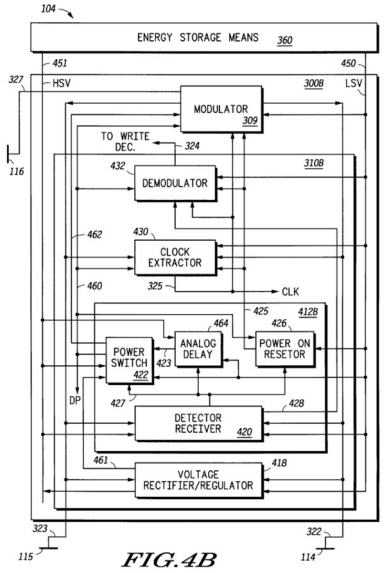
Defendants have conducted the invalidity analysis herein based at least in part and in some instance entirely upon Plaintiff's apparent application of the claims of the '722 patent. By charting the prior art against the claims and limitations herein, Defendants are not admitting or agreeing to Plaintiff's application of the claims at issue in this case, and these charts should not be interpreted as an admission or concession by Defendants that any particular construction or application of any claim limitation by Plaintiff is correct or proper. Additionally, these charts provide representative examples of portions of the charted references that disclose the indicated limitations of the claims; additional portions of these references other than the representative examples provided herein may also disclose the indicated limitation(s) and Defendants contend that the asserted claims are invalid in light of the charted reference(s) as a whole in its or their entirety. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well.

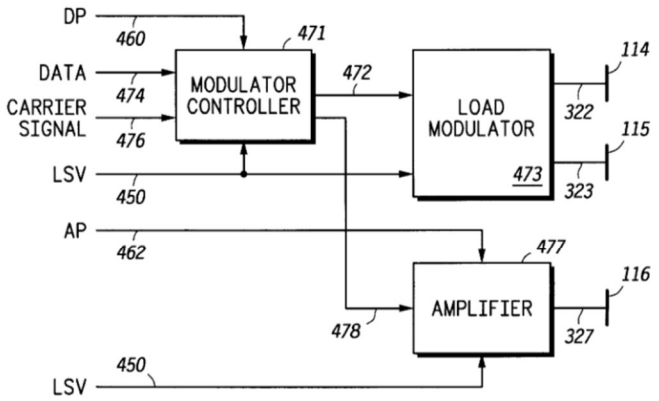
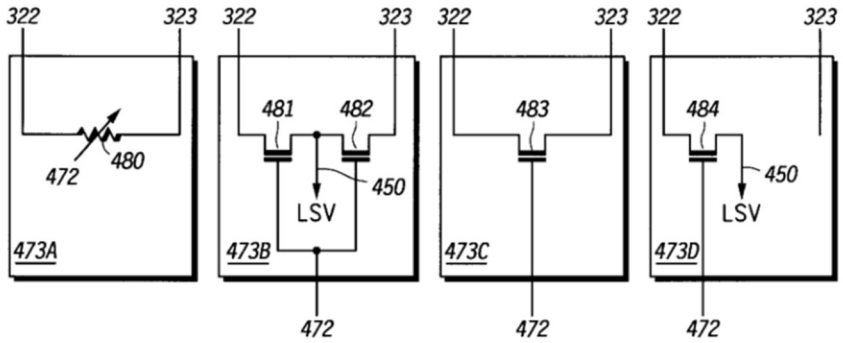
Claim Element	**Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")**
1[pre]. A mobile device comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is a claim limitation. Vega discloses or renders obvious "[a] mobile device." For example: Vega at Abstract An active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise sources are better filtered out. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Each embodiment of the transceiver circuit has power management features so that power is conserved. Additionally, each transceiver circuit has the ability to operate in a passive mode, when there is insufficient charge in the energy storage means or a lower power mode is desirable.

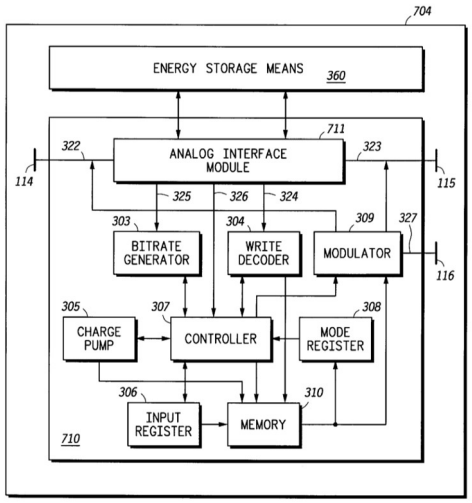
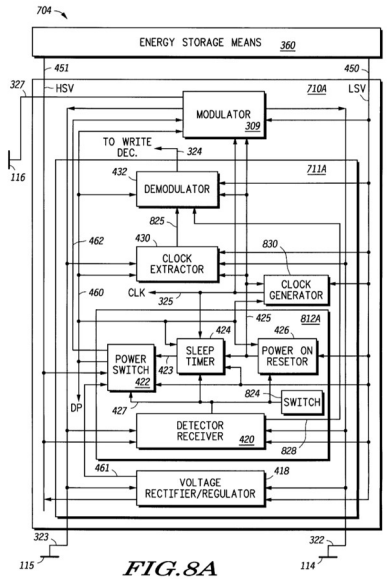
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 3:28–45 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that can decrease power consumption. Vega at 3:49–52 Another object of the present invention is to introduce power conservation techniques into an active electrostatic transceiver so that the read range between the electrostatic reader and electrostatic transceiver may be increased. Vega at 4:26–28 FIG. 6B is a block diagram of an electrostatic reader for supporting automatic detection and activation of an active electrostatic transceiver. Vega at 5:26–68 FIG. 1 illustrates the preferred embodiment of the combined electrostatic communication system 100 which includes an electrostatic reader 101, a passive electrostatic transceiver 102, host computer system 103 and an active electrostatic transceiver 104. Electrostatic reader 101, illustrated in a monopole configuration, includes an electrostatic electrode 105 for transmission of an excitation signal and modulated data signals on a carrier by means of electrostatic energy. The signals are transmitted by the reader to either an electrostatic transceiver, transponder, tag, badge, smart card, or other such RFID transceiver such as passive electrostatic transceiver 102 or active electrostatic transceiver 104. Electrostatic reader 101 includes an electrostatic electrode 106 for receiving data signals on a carrier by means of electrostatic energy. The data signals are communicated by either a passive electrostatic transceiver such as passive electrostatic transceiver 102 or active electrostatic transceiver 104. The passive electrostatic transceiver 102 includes at least two electrostatic electrodes 112 and 113 in order to

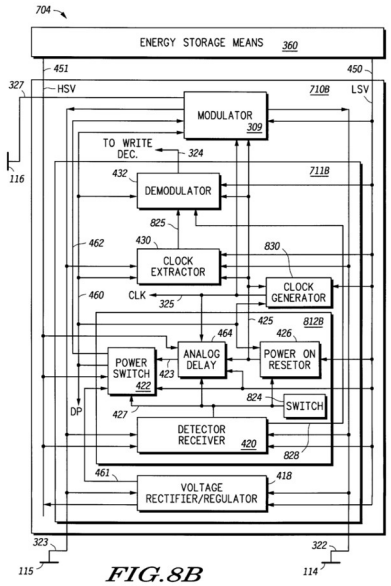
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	communicate using electrostatic signals. The electrostatic electrodes 112 and 113 may have differing shapes and be made of different materials. Some of the shapes for the electrostatic electrodes 112 and 113 include flat rectangular plates and bow tie shaped plates. The active electrostatic transceiver 104 includes at least two electrostatic electrodes 114 and 115 in order to receive electrostatic energy and communicate using electrostatic signals. As illustrated in FIG. 1, active electrostatic transceiver 104 includes an additional electrostatic electrode 116 for transmitting electrostatic signals. The electrostatic electrodes may also be referred to as antenna, capacitor plates, contactless electrodes, wireless electrodes or isolation electrodes. These electrostatic electrodes provide for the antenna, contactless, wireless and the somewhat isolated functionality of an electrostatic system which requires no physical contact between the electrostatic electrodes in order to communicate. Passive electrostatic transceiver 102 and active electrostatic transceiver 104 can communicate information to/from the electrostatic reader 101 by means of electrostatic signals and capacitive coupling. Host computer 103 is coupled to the electrostatic reader 101 and may couple to other electrostatic readers, electromagnetic readers or electrostatic readers (not shown in FIG. 1) in order to have other points of communication. To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Vega discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." For example: Vega at Figure 3

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG.3* Vega at Figure 4A  *FIG.4A*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 4B  FIG.4B Vega at Figure 4D

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 FIG.4D Vega at Figure 4E  FIG.4E Vega at Figure 7

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG. 7* Vega at Figure 8A  *FIG. 8A*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 8B  FIG.8B Vega at 4:14–16 FIG. 4D is a block diagram of components of the modulator block within the active electrostatic transceiver of FIG. 3. Vega at 4:17–18 FIG. 4E are schematic diagrams of load modulation circuitry of the load modulator. Vega at 6:1–22 FIG. 1 illustrates the advantage that an active electrostatic transceiver 104 has over a passive electrostatic transceiver 102. The distance between an electrostatic transceiver and an electrostatic reader where communication may start to occur is referred to as the read range. In FIG. 1 the passive read range 125 between passive ES transceiver 102 and ES reader 101 is significantly smaller than the active read range 126 between active ES transceiver 104 and ES reader 101. This is because an energy storage means within the active electrostatic transceiver 104 allows for active transmission of signals using an amplifier. Because of its passive nature, the passive electrostatic transceiver 102 relies on a load modulation

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	technique for communication of signals by reflecting back the energy of the excitation signal to the electrostatic reader 101. The reflection of the excitation signal requires that the passive electrostatic transceiver 102 be nearer the reader 101. The larger read range provided by reflected ES signals using load modulation or transmitted ES signals using an active transmitter allows the active electrostatic transceiver 104 to be used in other applications of RFID communication systems where a passive electrostatic transceiver 102 would not. Vega at 7:14–56 In general, electrostatic reader 101 generates an electrostatic (electrical) field for use both as a power source for the passive electrostatic transceiver 102 and for transferring information between electrostatic reader 101 and passive electrostatic transceiver 102 or active electrostatic transceiver 104. As such, electrostatic reader 101 electrostatically generates and transmits an excitation signal to the surrounding air, gas, atmosphere or non-electrically conductive medium via the reader's electrostatic electrodes, except for the return path in a monopole system. The excitation signal is an AC signal which activates the passive electrostatic transceiver 102 when it is comes within the capacitance coupling range of reader 101. Upon being sufficiently energized, the passive electrostatic transceiver 102 may respond by electrostatically transmitting a read data signal carrying the information stored in its memory to electrostatic reader 101 (as part of a read operation). Active electrostatic transceiver 104 includes an energy storage means such that it may not require the excitation signal to become sufficiently energized. In accordance to the present invention, reader 101 may also electrostatically couple a write signal to communicate and write information to the passive electrostatic transceiver 102 or active ES transceiver(as part of a write operation). Alternatively, such programming or charging can be carried out by a separate ES programming, ES encoding or electrostatic charger unit (not illustrated). It is to be appreciated that the excitation signal must be generated and transmitted by electrostatic reader 101 to excite the passive electrostatic transceiver 102 or charge the active electrostatic transceiver 104. The excitation signal is an AC energy source and can be a continuous waveform or a varying waveform (i.e. amplitude, frequency, time, etc. of the waveform may vary). Alternatively a user could manually cause the electrostatic reader 101 or a charger to generate the excitation signal to charge or communicate with the passive electrostatic transceiver 102 or active electrostatic transceiver 104 by selecting a button or switch. The reader 101 usually has available a larger power source than the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Thus, the reader 101 has very sensitive receiving and high energy transmission when compared with the passive electrostatic transceiver 102 or active electrostatic transceiver 104.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 7:57–8:17 Reference is now made to FIG. 3 illustrating in greater detail the components of a first embodiment of the active electrostatic transceiver 104. As shown in FIG. 3, transceiver 104 may include a circuit 300 having an analog interface module 301, a bitrate generator 303, a write decoder 304, an optional charge pump 305, an input register 306, a controller 307, a mode register 308, a modulator 309, a memory 310, and electrostatic electrodes 114-116. As previously discussed, electrostatic electrodes 114 and 115 receive electrostatic signals from the electrostatic reader 101 and may communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 116 and 115 may also communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 114 and electrostatic electrode 115 are coupled to the analog interface module 301 over the bidirectional signal lines 322 and 333 respectively. The analog interface module 301 couples to the bitrate generator 303 through the clock signal line 325. Analog interface module 301 couples to the controller 307 through the control signal lines 326 and to the write decoder 304 through the data in signal line 324. The modulator 309 couples to the electrostatic electrode 114 and electrostatic electrode 115 by signal lines 322 and 333 respectively. Additionally, the modulator 309 couples to the electrostatic electrode 116 by signal line 327. For optimum electrostatic performance, it is desirable to keep the parasitic capacitance measured between signal lines 322 and 323 as small as possible. Vega at 8:18–45 Controller 307 controls the functionality of the transceiver 104 in conjunction with the analog interface module 301. Controller 307 couples to nearly all components of the active electrostatic transceiver 104 except for the electrostatic electrodes and pads. Memory 310 may be a volatile memory requiring a constant supply of energy or a non-volatile memory such as an EEPROM memory or ferro-electric memory that retains its information when power is no longer supplied. In the case of EEPROM memory, the optional charge pump 305 may be required in order to boost the power supply voltage to write data into the EEPROM memory. Input register 306 temporarily stores information that is to be written into memory 310. It may need to store the information due to a delay in the write cycle caused by the charge pump 305 pumping up or other reasons. In any case, storing data into the input register 306 allows the controller 307 to process other information for the transceiver 104. Mode register 308 reads configuration information for the active electrostatic transceiver 104 from memory 310 and provides this to the controller 307. Write decoder 304 analyzes a data sequence being received by the electrostatic transceiver 104 and determines whether the transceiver should go into a write mode or whether it needs to remain in a receive mode. Modulator 309 prepares data read from memory 310 for communication by the active

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	electrostatic transceiver 104. Modulator 309 can encode and modulate data read from memory 310 in a number of ways for communication with the reader 101. Vega at 8:63–9:17 The analog interface module 301 performs multiple functions when receiving and communicating electrostatic signals and charges in an analog signal form. The analog interface module 301 generally performs the electrostatic communication and power management functions for the active electrostatic transceiver 104. Additionally, it performs clock extraction in order to provide a clock to other components of the active electrostatic transceiver 104 including the bitrate generator 303 such that the clock is synchronized with received data. The analog interface module 301 also demodulates a received signal to generate a received data stream. A gap detector (not shown) within the analog interface module 301 analyzes the data stream and determines if a write operation may be involved. If so, it forwards the data sequence signal to the write decoder 304. Write decoder 304 then decodes the data sequence signal to retrieve instruction, data, and address information related to the write operation. If it recognizes the codes as a write command, write decoder 304 signals to so notify controller 307. Write decoder 304 also verifies the validity of the data stream. The decoded instructions and information about the validity of the data stream are provided to controller 307. Vega at 9:30–60 Now referring to FIG. 4A, a detailed block diagram of components of the analog interface module 301 within the active transceiver 104 is illustrated including digital timing elements. The active electrostatic transceiver 104 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 300, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including an electrochemical storage cell, such as a rechargeable battery or a non-rechargeable battery, or a capacitor, but is preferably a thin foil battery to conform to a form factor of a smart card, tag, or badge. The transceiver circuit 300A as illustrated in FIG. 4A shows the relevant components in the first embodiment of the present invention. In FIG. 4A, the transceiver circuit 300A is illustrated as including the analog interface module 301 and the modulator 309. In FIG. 4A, the relevant components of the analog interface module 301 include a power manager 412A, a DC voltage rectifier/regulator 418, a clock extractor 430, and a demodulator 432. The power manager 412A includes a detector/receiver 420, a power switch 422, a sleep timer 424, and a power-on-resetor (POR) 426. The DC voltage rectifier/regulator 418 includes a rectifier, a voltage regulator and voltage control functionality such that a DC voltage and energy source may be generated from the excitation signal or other signals received by the active electrostatic transceiver 104 and

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	selectively used to power the transceiver 104 or charge the energy storage means 360. The DC voltage rectifier/regulator 418 couples to the power switch 422 for selection and to the energy storage means 360 for charging. Vega at 9:61–10:33 The detector/receiver 420 in the active electrostatic transceiver 104 may receive power directly from the energy storage means 360 in order to be actively listening for an excitation signal from an electrostatic reader 101. Alternatively, the detector/receiver 420 may have passive components sufficient to detect and receive signals when the energy storage means has insufficient energy to power active components. The detector/receiver 420 may have an amplifier for receiving and amplifying the incoming electrostatic signals, a bandpass filter for filtering unwanted frequencies outside a range of the carrier frequency, and a detector for detecting the presence of the carrier frequency in an excitation signal indicating that the transceiver is within the read range of an electrostatic reader 101. The detector may detect a number of oscillations in the received waveform at the carrier frequency indicating that it is not a noise source generating the waveform. In the preferred embodiment, if the detector detects any signal in the band of the carrier it provides an indication signal. Upon detection of the excitation signal, the detector/receiver 420 generates a wakeup signal on signal line 427 indicating that the active electrostatic transceiver 104 is within range of an electrostatic field and that the active electrostatic transceiver 104 needs to go through its wake up procedure. When outside the range of an electrostatic field, the signal line 427 indicates a go to-sleep signal so that the transceiver may go into a low power sleep state. The wakeup signal 427 is provided to the power on resetor 426, the sleep timer 424, the power switch 422 and clock extractor 430. Upon receiving the wakeup signal 427, power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 104 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 104. In FIG. 4A the reset signal line 425 is coupled to the sleep timer 424, the clock extractor 430, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 104. Vega at 10:34–52 The sleep timer 424 of the active electrostatic transceiver of FIG. 4A is a digital counter that counts to a predetermined count value using the clock signal on clock line 325 received from the clock extractor 430. Upon reaching the predetermined count value, the sleep timer 424 turns off active components within the modulator 309. While the sleep timer 424 is counting a transmit signal is indicated on signal line 423.

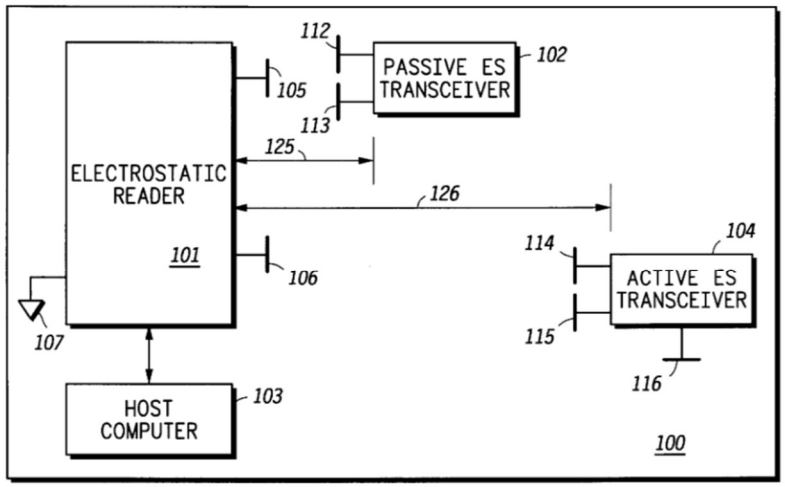
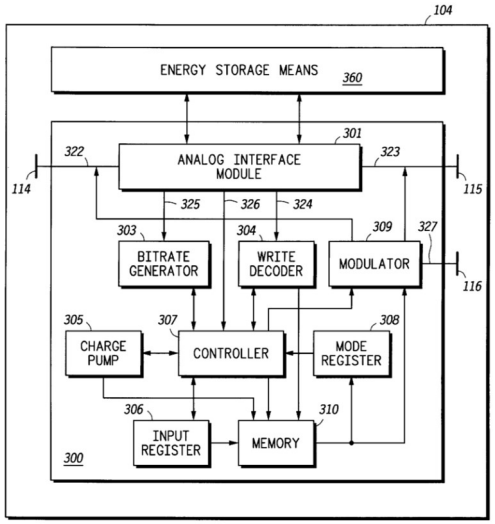
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	When the sleep timer 424 reaches the predetermined count value, signal line 423 indicates a receive signal and the active electrostatic transceiver powers off the active components within the modulator 309. While in this mode, the transceiver may still use passive components and the load modulators within the modulator 309 to communicate with a reader. Further, while in this mode, the transceiver may receive and respond to encoded write data transmitted by the reader. The predetermined count value is determined based on the time, in number of clock cycles, that it takes for the active electrostatic transceiver to complete a transmission cycle with an electrostatic reader 101. Vega at 10:53–11:6 Referring to FIG. 4B, the power manager 412B includes the detector/receiver 420, the power switch 422, an analog delay block 464, and the power-on-resetor (POR) 426. The digital sleep timer 424 of FIG. 4A is replaced with the analog delay block 464 within the power manager block 412B while other blocks function similar to the description of FIG. 4A. Analog delay block 464 provides an analog delay by using resistor and capacitor elements in conjunction with a threshold detector or comparator. The analog delay block is preferably designed to provide a lengthy delay such as a couple of seconds. The circuitry of the analog delay block is simpler than that of the sleep timer 424. Upon detection of a received signal, the wakeup signal on signal line 427 causes the analog delay block to initiate the RC delay. The transmit signal on signal line 423 is coupled to the power switch 422 and causes it to select power, if available, from the energy storage means 360 for the active transmitter of the modulator 309. Upon completion of the RC delay, a receive signal is indicated on signal line 423 causing the power switch 422 to disconnect power from the active transmitter of the modulator 309. Vega at 11:7–12:16 Power switch 422 is coupled to the detector/receiver 420 through the signal line 427 and to the sleep timer 424 or the analog delay block 464 through the signal line 423. The power switch 422 controls the switching of the high level power supply voltage 451 from the energy storage means 360 or the rectified voltage 461 and provides the analog interface module 301 with the means to manage power consumption. These energy sources may be coupled to the device power line 460 feeding power to other components of the active electrostatic transceiver 104. FIG. 4C illustrates the basic components of the power switch 422 that provide power selection for the active electrostatic transceiver 104. These components include the power analyzer 465, the multiplexor 466 and the multiplexor 469. Multiplexor 469 may optionally be a switch with one end connected to the amplifier power line 462 and another end connected to the device power line 460. Power analyzer 465 performs an analysis on the energy provided by the DC voltage rectifier/regulator 418 with that supplied by the energy storage means 360. The power analyzer 465

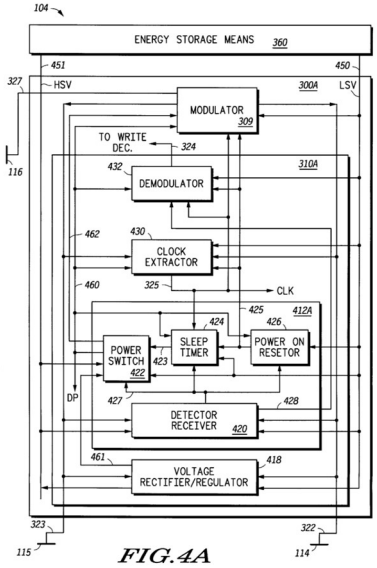
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	receives the rectified voltage 461, the high level supply voltage 451 and the low level supply voltage 450 in order to perform the analysis. Additionally, control signals 423, 427 and any other control signals are received by the power analyzer 465 to further control the multiplexor 466 and multiplexor 469. Signal lines 423 and 427 are exemplary control signals input into the power analyzer 465. Typically, if the energy storage means 360 has higher energy levels it is selectively coupled to the device power line 460 and the amplifier power line 462 when signal line 427 indicates a transmit signal. Optionally when the transceiver 104 is in an active mode for active transmission by amplifier 477 and when signal line 427 indicates a receive signal, the energy storage means may be selectively decoupled from the amplifier power line 462, have the rectified voltage 461 coupled to the amplifier power line 462 or alternatively have no power source coupled to the amplifier power line 462 powering OFF the circuitry of amplifier 477 in each case conserving power in the energy storage means. If it is the case that the energy storage means 360 has lower energy levels than that of the rectified voltage 461, the rectified voltage may be selectively coupled to the device power line 460 by multiplexor 466 and to the amplifier power line 462 by multiplexor 469 such that the load modulator 473 and the amplifier 477 can perform passive load modulation and passive transmission of electrostatic signals in a passive mode. Additionally if it is desirable to conserve power or more efficiently charge the energy storage means, multiplexor 466 or 469 can operate as switches decoupling the device power line 460 or the amplifier power line 462 from any power source. After selecting a power source where the power switch 422 couples the high level power supply 451 or the rectified voltage 461 with the device power line 460, circuitry within the active electrostatic transceiver goes into a power on reset sequence controlled by the power on resetor 426. When out of the power on reset sequence, the active electrostatic transceiver 104 can go through a communication cycle with the electrostatic reader 101 while in the read range and the sleep timer 424 starts counting or the analog delay cycle of the analog delay block 464 begins. If the active electrostatic transceiver remains in the electrostatic field (i.e. read range) and the sleep timer 424 reaches its predetermined count value or the analog delay block completes the predetermined RC delay time, a receive signal is indicated on signal line 423 to the power switch 422. The active electrostatic transceiver 104 continues to listen for signals from reader 101 or other sources that communicate on the carrier frequency. If the active electrostatic transceiver 104 is removed from the electrostatic field, the detector/receiver 420 resets and a sleep signal is indicated on signal line 427. Upon receiving the sleep signal, the power switch 422 selectively disconnects the high level voltage supply 451 from the device power line 460 so that components coupled to the device power line 460 become powered off and enter the sleep mode. In this manner when the active electrostatic transceiver 104 is outside the electrostatic field (i.e. read range) it goes into its low power sleep mode.

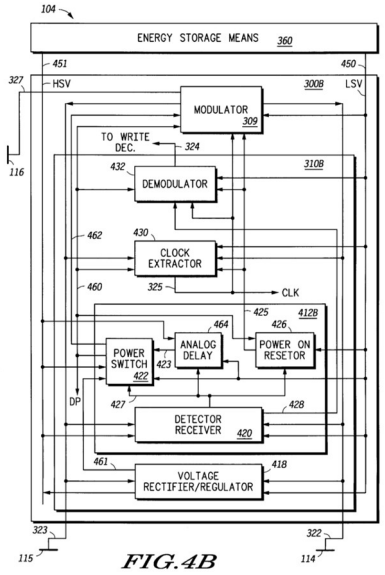
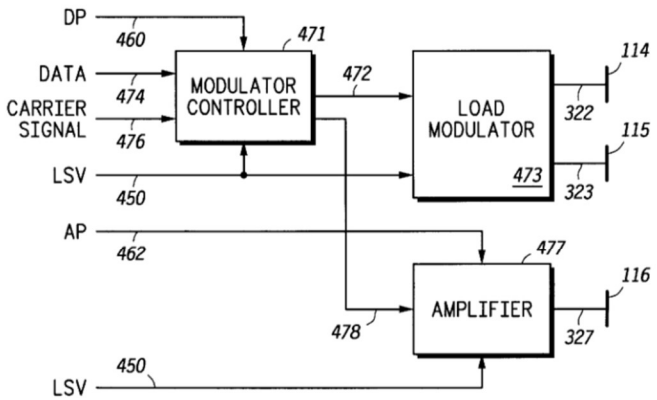
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 12:60–13:6 Modulator 309 is coupled to the power switch 422 through the device power line 460, the energy storage means 360 through the low level power supply 450, the electrostatic electrodes 114-116 respectively through signal lines 322, 323 and 327, power on resetor 426 through signal line 425, and the clock extractor 430 through clock signal line 325. Modulator 309 includes a load modulator for electrostatic electrodes 114-115 and an active power amplifier in order to amplify signals for the extra transmission distance to the reader over the electrostatic electrode 116. A passive electrostatic transceiver may not function properly at large read ranges because of weak signals. The electrostatic reader's receiver may require increased sensitivity in order to receive signals from large read ranges. Vega at 13:7–14:10 Referring now to FIG. 4D, a block diagram is illustrated of the components within the modulator 309 for active and passive load modulation and active transmission. Active and passive load modulation are accomplished by the modulator controller and the load modulator. Active load modulation occurs when the energy storage means 360 is coupled to the device power line 460 and the circuitry of the modulator controller 471. Passive load modulation occurs when the DC voltage rectifier/regulator within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the device power line 460 and the modulator controller 471. Load modulation is accomplished by varying the impedance between the electrostatic electrodes 114 and 115. Varying the impedance between the electrostatic electrodes, that are capacitively coupled with the electrostatic electrodes of the reader 101, causes the excitation signal generated by the reader 101 to be reflected back. A data signal and a carrier signal is input into the modulator controller 471 at line 474 and 476 respectively to control the load modulator 473. The carrier signal 476 is commonly referred to as the data carrier and has a carrier frequency. Preferably the carrier frequency of the data carrier is 62.5 K Hz or one-half the power carrier frequency. FIG. 4E illustrates a few load modulators 473A-473D. Load modulator 473A consists of a variable impedance 480 coupled between the electrostatic electrodes 114 and 115 that has its impedance varied or switched by control signal 472 from the modulator controller 471. Load modulator 473B includes transistors 481 and 482, each coupled respectively between an electrostatic electrode and the low level supply voltage 450. The transistors are preferably turned ON and OFF by having their gates switched by a digital drive signal supplied on control signal 472. Load modulator 473C includes transistor 483 coupled between the electrostatic electrodes 114 and 115. Transistor 483 is preferably turned ON and OFF by having its gate switched by a digital drive signal supplied on control signal 472. Load modulator 473D includes transistor 484 coupled between one electrostatic electrode 322 and the low level supply

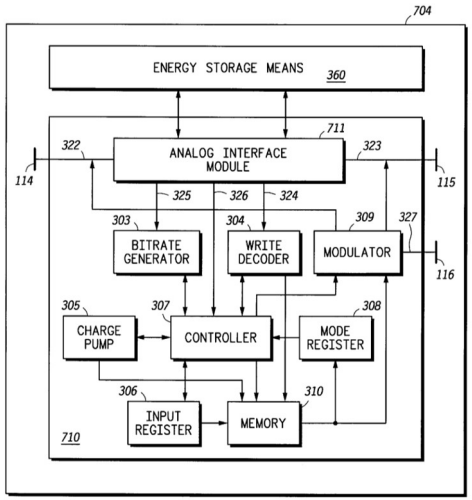
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	voltage 450. This is an asymmetrical load modulation technique where circuitry within a rectifier provides the return path through the opposite electrostatic electrode 323. Referring back to FIG. 4D, active and passive transmission is accomplished by the modulator controller 471 and amplifier 477. Amplifier 477 is preferably a CMOS fully complementary inverter or buffer with its VDD input connected to the amplifier power line 462 and its VSS connection coupled to the low level power supply 450. Active transmission occurs when power is coupled from the high level power supply 451 through the power switch and onto the amplifier power line 462 by multiplexor 469. Passive transmission occurs when the DC voltage rectifier/regulator 418 within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the amplifier power line 462 by multiplexor 469. Multiplexor 469 and 466 can further operate as a switch to selectively turn power OFF to circuitry connected to the device power line 460 or the amplifier power line 462 by turning OFF both of the transistor switches 467-468 or 470 and 475. Data 474 input into the modulator controller 471 is modulated with the input carrier signal 476 to generate the data signal on line 478. Signal line 478 is separate from signal line 472 such that the load modulator 473 and the amplifier 477 can be enabled or disabled independent from one another. Disabling the load modulator 473 or the amplifier 477 may be performed by setting the signal on line 472 or 478 respectively to a high or low DC logic level. The signal on signal line 478 is input into the amplifier 477. The amplifier 477 amplifies the signal on line 478 and transmits the information electrostatically over the electrostatic electrode 116. In active mode, after the transmit time has occurred, the power to the amplifier 477 may be turned OFF to conserve power. Vega at 14:11–44 Now referring to FIG. 5, a waveform diagram illustrates the exemplary current consumption for the active electrostatic transceiver 104 in various power managed levels. In FIG. 5 the logarithm of current consumption 500 is plotted against time 501. The idealized waveform 502 illustrates the current consumption from the energy storage means 360 during various operating conditions and states of the active electrostatic transceiver 104. In an out of range or out of electrostatic field state during time 503, the active electrostatic transceiver is in a sleep state which is its lowest current consumption state at current level 504. In this condition nearly all circuitry in the active transceiver 104 is turned off except for the detector/receiver 420. In sleep mode, the current consumption of current level 504 is preferably on the order of eight hundred nanoamps. When in the read range or the range of the electrostatic field during time 513, the current consumption level is at least at level 508 which is at all times greater than the out of read range mode illustrated during time 503. During a communication cycle of transmission and reception by the active electrostatic transceiver, such as time 513, the current consumption is relatively large compared to the sleep mode when outside of the read range. During periods of transmission, such as time

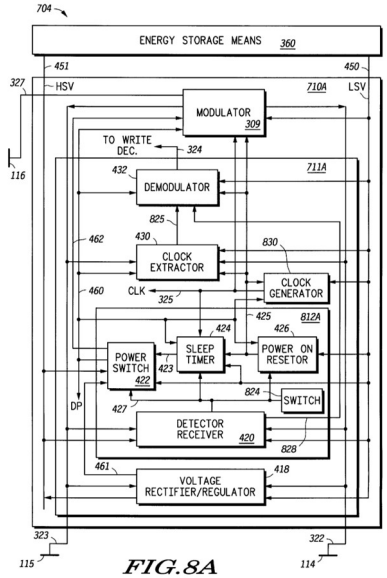
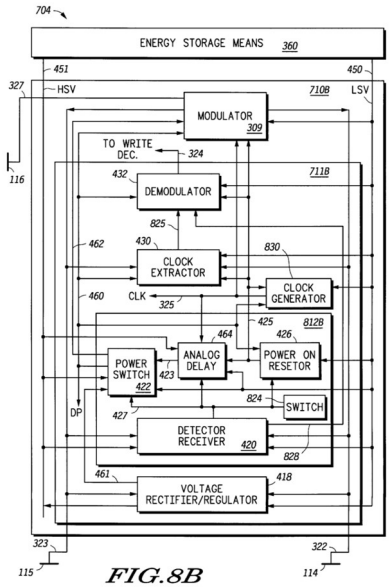
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	507, current consumption is at its highest level 510. During the receive time period, such as time 509, current consumption is at level 508 which is less than that of the transmission current consumption level 510. Time period 507 is exemplary of the predetermined count value for the sleep timer 424 or the RC delay time of the analog delay block 464. After performing a transmission phase during time 507, the active electrostatic transceiver goes into a receive phase during time 509. If transceiver is closely coupled to reader, transceiver data can be detected by reader when the active transceiver is passively load modulating. Vega at 15:20–37 The analog interface module 711 generally performs the power management function for the active electrostatic transceiver 704. Additionally, it generates its own clock from a free running low power clock oscillator. This generated clock is provided to other components of the active electrostatic transceiver 704 which require a clock including the bitrate generator 303. The analog interface module 711 also demodulates the received signal to generate a received data stream. The analog interface module 711 also analyzes the received data stream in order to determine if the active electrostatic transceiver 704 should perform some operation such as a read operation or a write operation and communicates the results of the analysis to the controller 307 and the write decoder 304. It preferably performs this analysis by searching for predetermined gaps in the received data stream. Modulator 309 as previously described in detail communicates information from the active electrostatic transceiver to a reader. *See also* Vega at 6:23–33, 15:38–61, 16:36–48, and 16:53–17:8. To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1b] an antenna tuned to operate at 13.56 MHz; and	Vega discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." For example: Vega at Figure 1

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG.1* Vega at Figure 3  *FIG.3*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 4A  FIG.4A Vega at Figure 4B

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG.4B* Vega at Figure 4D  *FIG.4D*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 7  *FIG. 7* Vega at Figure 8A

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 FIG.8A Vega at Figure 8B  FIG.8B

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 2:4–26 In contrast, conventional RFID technology is inductance-based. More precisely, conventional RFID technology uses near field electromagnetic waves which are also known as induction waves. Unlike radio waves, the field strength of induction waves is proportional to the inverse square of the distance involved. In inductance-based RFID technology, an electromagnetic field is generated for use both as a power source for the transponder and for transferring information between the reader and transponder. Inductance waves are generated using closed circuit alternating current coils that have multiple turns. Inductance coils are required to optimally transmit and receive electromagnetic signals are usually a wire wound or etched metal coil. Using inductance coils adversely impacts the costs, manufacturability, and packaging flexibility of inductance-based RFID technology particularly when used with high number of RFID tags usually required in a system. Due to the prohibitive costs and high degree of manufacturing difficulty, electromagnetic RFID technology is not practical in high volume and low cost applications such as in disposable applications. The bulky packaging, which is typical for electromagnetic RFID, further limits its application to those where thickness is not of primary importance. Vega at 5:26–68 FIG. 1 illustrates the preferred embodiment of the combined electrostatic communication system 100 which includes an electrostatic reader 101, a passive electrostatic transceiver 102, host computer system 103 and an active electrostatic transceiver 104. Electrostatic reader 101, illustrated in a monopole configuration, includes an electrostatic electrode 105 for transmission of an excitation signal and modulated data signals on a carrier by means of electrostatic energy. The signals are transmitted by the reader to either an electrostatic transceiver, transponder, tag, badge, smart card, or other such RFID transceiver such as passive electrostatic transceiver 102 or active electrostatic transceiver 104. Electrostatic reader 101 includes an electrostatic electrode 106 for receiving data signals on a carrier by means of electrostatic energy. The data signals are communicated by either a passive electrostatic transceiver such as passive electrostatic transceiver 102 or active electrostatic transceiver 104. The passive electrostatic transceiver 102 includes at least two electrostatic electrodes 112 and 113 in order to communicate using electrostatic signals. The electrostatic electrodes 112 and 113 may have differing shapes and be made of different materials. Some of the shapes for the electrostatic electrodes 112 and 113 include flat rectangular plates and bow tie shaped plates. The active electrostatic transceiver 104 includes at least two electrostatic electrodes 114 and 115 in order to receive electrostatic energy and communicate using electrostatic signals. As illustrated in FIG. 1, active electrostatic transceiver 104 includes an additional electrostatic electrode 116 for transmitting electrostatic signals. The electrostatic electrodes

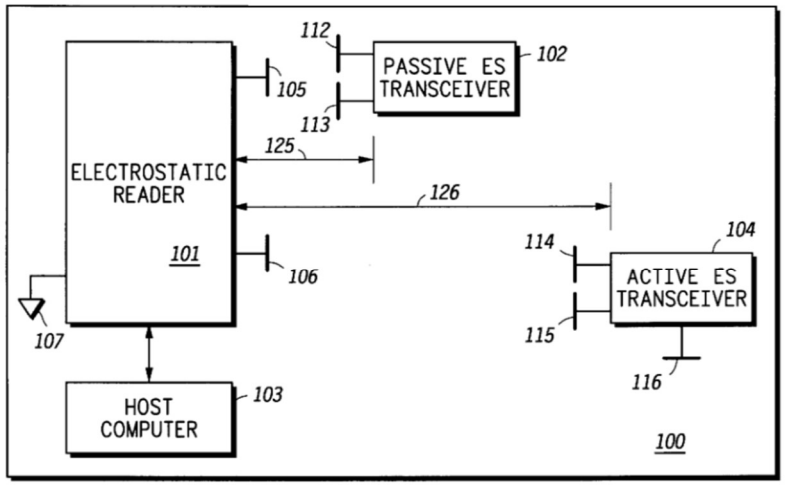
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	may also be referred to as antenna, capacitor plates, contactless electrodes, wireless electrodes or isolation electrodes. These electrostatic electrodes provide for the antenna, contactless, wireless and the somewhat isolated functionality of an electrostatic system which requires no physical contact between the electrostatic electrodes in order to communicate. Passive electrostatic transceiver 102 and active electrostatic transceiver 104 can communicate information to/from the electrostatic reader 101 by means of electrostatic signals and capacitive coupling. Host computer 103 is coupled to the electrostatic reader 101 and may couple to other electrostatic readers, electromagnetic readers or electrostatic readers (not shown in FIG. 1) in order to have other points of communication. Vega at 6:34–52 Electrostatic electrodes 112 and 113 of passive ES transceiver 102 and ES electrodes 114 and 115 of active transceiver 104 are one part of the capacitive plates for capacitive coupling in order to receive electrostatic charges and communications. The other part of the capacitive plates are provided by the electrostatic reader 101 or other ES source. The space between the coupled electrostatic electrodes defines the dielectric medium between the two parts of the capacitive plates. The capacitive plates of the electrostatic reader 101 can be in either a monopole or a dipole configuration. In a monopole configuration, only one set of coupling plates is used. Earth ground acts as a low impedance return path. The electrostatic transceiver may couple to earth ground through a human body or other relatively low impedance that couples to one or the other of the electrostatic electrodes. In a dipole configuration the reader had two electrostatic electrodes for receiving and two electrostatic electrodes for transmitting and none of the electrostatic electrodes has a preferential coupling path to earth ground. Vega at 7:14–56 In general, electrostatic reader 101 generates an electrostatic (electrical) field for use both as a power source for the passive electrostatic transceiver 102 and for transferring information between electrostatic reader 101 and passive electrostatic transceiver 102 or active electrostatic transceiver 104. As such, electrostatic reader 101 electrostatically generates and transmits an excitation signal to the surrounding air, gas, atmosphere or non-electrically conductive medium via the reader's electrostatic electrodes, except for the return path in a monopole system. The excitation signal is an AC signal which activates the passive electrostatic transceiver 102 when it is comes within the capacitance coupling range of reader 101. Upon being sufficiently energized, the passive electrostatic transceiver 102 may respond by electrostatically transmitting a read data signal carrying the information stored in its memory to electrostatic reader 101 (as part of a read operation). Active electrostatic transceiver 104 includes an energy storage means such that it may not require the excitation signal to become sufficiently energized. In accordance to the present

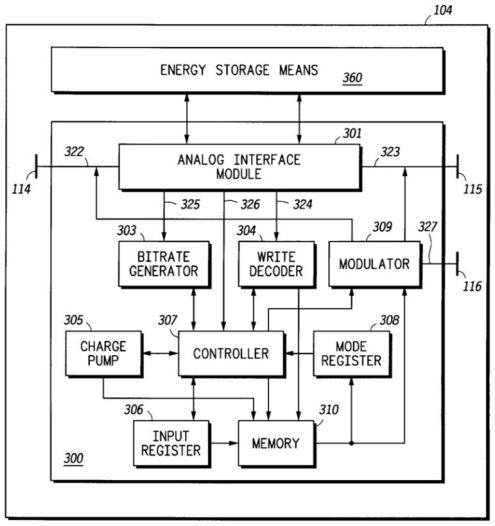
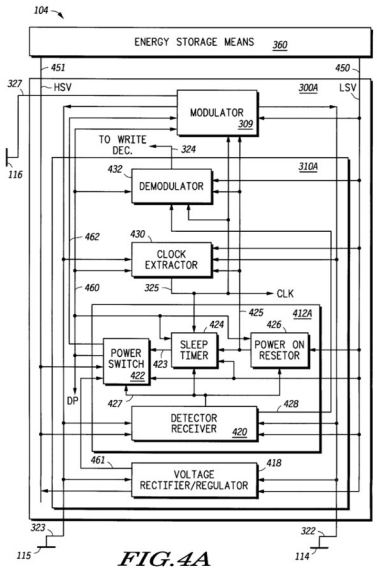
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	invention, reader 101 may also electrostatically couple a write signal to communicate and write information to the passive electrostatic transceiver 102 or active ES transceiver(as part of a write operation). Alternatively, such programming or charging can be carried out by a separate ES programming, ES encoding or electrostatic charger unit (not illustrated). It is to be appreciated that the excitation signal must be generated and transmitted by electrostatic reader 101 to excite the passive electrostatic transceiver 102 or charge the active electrostatic transceiver 104. The excitation signal is an AC energy source and can be a continuous waveform or a varying waveform (i.e. amplitude, frequency, time, etc. of the waveform may vary). Alternatively a user could manually cause the electrostatic reader 101 or a charger to generate the excitation signal to charge or communicate with the passive electrostatic transceiver 102 or active electrostatic transceiver 104 by selecting a button or switch. The reader 101 usually has available a larger power source than the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Thus, the reader 101 has very sensitive receiving and high energy transmission when compared with the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Vega at 7:57–8:17 Reference is now made to FIG. 3 illustrating in greater detail the components of a first embodiment of the active electrostatic transceiver 104. As shown in FIG. 3, transceiver 104 may include a circuit 300 having an analog interface module 301, a bitrate generator 303, a write decoder 304, an optional charge pump 305, an input register 306, a controller 307, a mode register 308, a modulator 309, a memory 310, and electrostatic electrodes 114-116. As previously discussed, electrostatic electrodes 114 and 115 receive electrostatic signals from the electrostatic reader 101 and may communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 116 and 115 may also communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 114 and electrostatic electrode 115 are coupled to the analog interface module 301 over the bidirectional signal lines 322 and 333 respectively. The analog interface module 301 couples to the bitrate generator 303 through the clock signal line 325. Analog interface module 301 couples to the controller 307 through the control signal lines 326 and to the write decoder 304 through the data in signal line 324. The modulator 309 couples to the electrostatic electrode 114 and electrostatic electrode 115 by signal lines 322 and 333 respectively. Additionally, the modulator 309 couples to the electrostatic electrode 116 by signal line 327. For optimum electrostatic performance, it is desirable to keep the parasitic capacitance measured between signal lines 322 and 323 as small as possible. Vega at 9:30–60

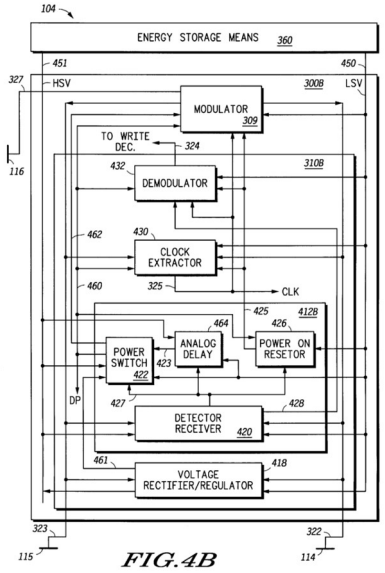
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Now referring to FIG. 4A, a detailed block diagram of components of the analog interface module 301 within the active transceiver 104 is illustrated including digital timing elements. The active electrostatic transceiver 104 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 300, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including an electrochemical storage cell, such as a rechargeable battery or a non-rechargeable battery, or a capacitor, but is preferably a thin foil battery to conform to a form factor of a smart card, tag, or badge. The transceiver circuit 300A as illustrated in FIG. 4A shows the relevant components in the first embodiment of the present invention. In FIG. 4A, the transceiver circuit 300A is illustrated as including the analog interface module 301 and the modulator 309. In FIG. 4A, the relevant components of the analog interface module 301 include a power manager 412A, a DC voltage rectifier/regulator 418, a clock extractor 430, and a demodulator 432. The power manager 412A includes a detector/receiver 420, a power switch 422, a sleep timer 424, and a power-on-resetor (POR) 426. The DC voltage rectifier/regulator 418 includes a rectifier, a voltage regulator and voltage control functionality such that a DC voltage and energy source may be generated from the excitation signal or other signals received by the active electrostatic transceiver 104 and selectively used to power the transceiver 104 or charge the energy storage means 360. The DC voltage rectifier/regulator 418 couples to the power switch 422 for selection and to the energy storage means 360 for charging. Vega at 12:60–13:6 Modulator 309 is coupled to the power switch 422 through the device power line 460, the energy storage means 360 through the low level power supply 450, the electrostatic electrodes 114-116 respectively through signal lines 322, 323 and 327, power on resetor 426 through signal line 425, and the clock extractor 430 through clock signal line 325. Modulator 309 includes a load modulator for electrostatic electrodes 114-115 and an active power amplifier in order to amplify signals for the extra transmission distance to the reader over the electrostatic electrode 116. A passive electrostatic transceiver may not function properly at large read ranges because of weak signals. The electrostatic reader's receiver may require increased sensitivity in order to receive signals from large read ranges. Vega at 13:7–14:10 Referring now to FIG. 4D, a block diagram is illustrated of the components within the modulator 309 for active and passive load modulation and active transmission. Active and passive load modulation are accomplished by the modulator controller and the load modulator. Active load modulation occurs when the energy storage means 360 is coupled to the device power line 460 and the circuitry of the modulator

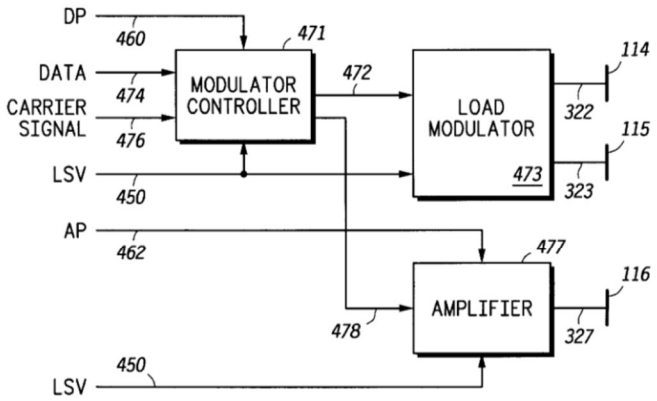
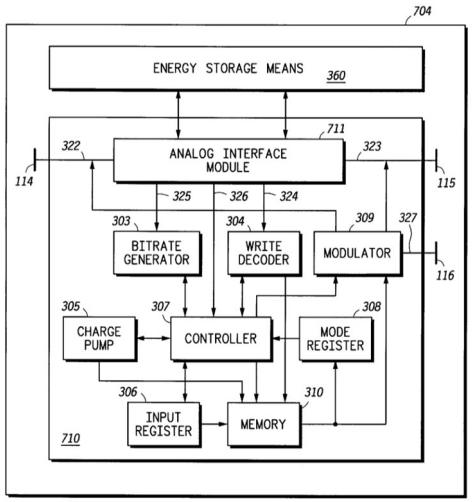
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	controller 471. Passive load modulation occurs when the DC voltage rectifier/regulator within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the device power line 460 and the modulator controller 471. Load modulation is accomplished by varying the impedance between the electrostatic electrodes 114 and 115. Varying the impedance between the electrostatic electrodes, that are capacitively coupled with the electrostatic electrodes of the reader 101, causes the excitation signal generated by the reader 101 to be reflected back. A data signal and a carrier signal is input into the modulator controller 471 at line 474 and 476 respectively to control the load modulator 473. The carrier signal 476 is commonly referred to as the data carrier and has a carrier frequency. Preferably the carrier frequency of the data carrier is 62.5 K Hz or one-half the power carrier frequency. FIG. 4E illustrates a few load modulators 473A-473D. Load modulator 473A consists of a variable impedance 480 coupled between the electrostatic electrodes 114 and 115 that has its impedance varied or switched by control signal 472 from the modulator controller 471. Load modulator 473B includes transistors 481 and 482, each coupled respectively between an electrostatic electrode and the low level supply voltage 450. The transistors are preferably turned ON and OFF by having their gates switched by a digital drive signal supplied on control signal 472. Load modulator 473C includes transistor 483 coupled between the electrostatic electrodes 114 and 115. Transistor 483 is preferably turned ON and OFF by having its gate switched by a digital drive signal supplied on control signal 472. Load modulator 473D includes transistor 484 coupled between one electrostatic electrode 322 and the low level supply voltage 450. This is an asymmetrical load modulation technique where circuitry within a rectifier provides the return path through the opposite electrostatic electrode 323. Referring back to FIG. 4D, active and passive transmission is accomplished by the modulator controller 471 and amplifier 477. Amplifier 477 is preferably a CMOS fully complementary inverter or buffer with its VDD input connected to the amplifier power line 462 and its VSS connection coupled to the low level power supply 450. Active transmission occurs when power is coupled from the high level power supply 451 through the power switch and onto the amplifier power line 462 by multiplexor 469. Passive transmission occurs when the DC voltage rectifier/regulator 418 within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the amplifier power line 462 by multiplexor 469. Multiplexor 469 and 466 can further operate as a switch to selectively turn power OFF to circuitry connected to the device power line 460 or the amplifier power line 462 by turning OFF both of the transistor switches 467-468 or 470 and 475. Data 474 input into the modulator controller 471 is modulated with the input carrier signal 476 to generate the data signal on line 478. Signal line 478 is separate from signal line 472 such that the load modulator 473 and the amplifier 477 can be enabled or disabled independent from one another. Disabling the load modulator 473 or the amplifier 477 may be performed by setting the signal on line 472 or 478 respectively to a high or low DC logic level. The signal on signal line 478 is input into the amplifier 477. The amplifier

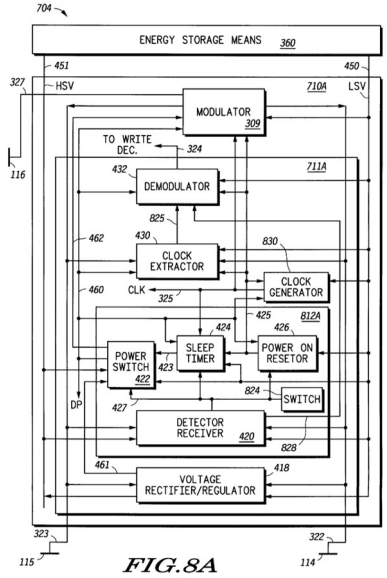
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	477 amplifies the signal on line 478 and transmits the information electrostatically over the electrostatic electrode 116. In active mode, after the transmit time has occurred, the power to the amplifier 477 may be turned OFF to conserve power. Vega at 15:38–61 Now referring to FIG. 8A, selected details of the analog interface module 711 within the active electrostatic transceiver 704 are illustrated. The active electrostatic transceiver 704 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 710, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including a battery or capacitor, preferably it is a thin foil battery to conform to a form factor for a smart card, tag, or badge. The transceiver circuit 710 as illustrated in FIG. 8A shows the relevant components for the second embodiment of the present invention. In FIG. 8A, the transceiver circuit 710 includes the analog interface module 711 and modulator 309. Components of the analog interface module 711 include a DC voltage rectifier/regulator 418, a power manager 812A, a clock extractor 430, a clock generator 830, a demodulator 432, and a modulator 309. The power manager 812A includes a detector/receiver 420, a power switch 422, a sleep timer 424, a power-on-resetor (POR) 426, and a manual switch 824. Except as otherwise described below, like numbered components of the transceiver circuit 710 operate similar to the similarly numbered components of the transceiver circuit 300 of the active electrostatic transceiver 104. *See also* Vega at 8:18–45. To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1c] at least one active circuit coupled between the smartcard controller and the antenna, wherein the at least one active circuit includes an amplifier coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard	Vega discloses or renders obvious "at least one active circuit coupled between the smartcard controller and the antenna, wherein the at least one active circuit includes an amplifier coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller, and the at least one active circuit further includes a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna." For example: Vega at Abstract An active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication

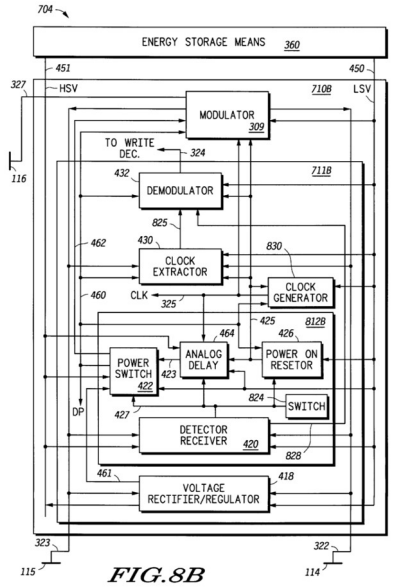
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
controller, and the at least one active circuit further includes a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna.	system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise sources are better filtered out. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Each embodiment of the transceiver circuit has power management features so that power is conserved. Additionally, each transceiver circuit has the ability to operate in a passive mode, when there is insufficient charge in the energy storage means or a lower power mode is desirable. Vega at Figure 1  FIG.1 Vega at Figure 3

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG.3* Vega at Figure 4A  *FIG.4A*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 4B  FIG.4B Vega at Figure 4D

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 FIG. 4D Vega at Figure 7  FIG. 7

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 8A  FIG.8A Vega at Figure 8B

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG.8B* Vega at 3:28–45 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that can decrease power consumption. Vega at 4:14–16 FIG. 4D is a block diagram of components of the modulator block within the active electrostatic transceiver of FIG. 3.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 4:17–18 FIG. 4E are schematic diagrams of load modulation circuitry of the load modulator. Vega at 4:51–5:7 The present invention includes a method, apparatus and system for providing electrostatic communication utilizing capacitance-based technology with active and passive electrostatic transceivers. Passive electrostatic transceivers derive their power from electrostatic signals being transmitted by an electrostatic reader or other electrostatic signal source. An active electrostatic transceiver has its own internal power source and need not rely on an electrostatic signal source from an electrostatic reader or other source to power up and perform certain functions. Electrostatic communication is accomplished through capacitive coupling which requires no physical contact or wires between a reader and an electrostatic transceiver (a.k.a. electrostatic tag or electrostatic transponder). In the electrostatic communication system, the voltage applied to the capacitively coupled plates is an AC voltage generated by an electric field (i.e. an electrostatic ("ES") field is developed) as opposed to an electromagnetic ("EM") field in order for a charge or signal to be communicated. In short, an electrostatic field is an energy (electrical) field created between two electrodes having a voltage differential. An electrostatic transceiver needs to be in the proximity of the reader, referred to as the read range, in order to have sufficient capacitive coupling to transceive electrostatic signals. Vega at 5:8–25 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means, such as a battery, and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that improve power conservation. Vega at 5:26–68

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	FIG. 1 illustrates the preferred embodiment of the combined electrostatic communication system 100 which includes an electrostatic reader 101, a passive electrostatic transceiver 102, host computer system 103 and an active electrostatic transceiver 104. Electrostatic reader 101, illustrated in a monopole configuration, includes an electrostatic electrode 105 for transmission of an excitation signal and modulated data signals on a carrier by means of electrostatic energy. The signals are transmitted by the reader to either an electrostatic transceiver, transponder, tag, badge, smart card, or other such RFID transceiver such as passive electrostatic transceiver 102 or active electrostatic transceiver 104. Electrostatic reader 101 includes an electrostatic electrode 106 for receiving data signals on a carrier by means of electrostatic energy. The data signals are communicated by either a passive electrostatic transceiver such as passive electrostatic transceiver 102 or active electrostatic transceiver 104. The passive electrostatic transceiver 102 includes at least two electrostatic electrodes 112 and 113 in order to communicate using electrostatic signals. The electrostatic electrodes 112 and 113 may have differing shapes and be made of different materials. Some of the shapes for the electrostatic electrodes 112 and 113 include flat rectangular plates and bow tie shaped plates. The active electrostatic transceiver 104 includes at least two electrostatic electrodes 114 and 115 in order to receive electrostatic energy and communicate using electrostatic signals. As illustrated in FIG. 1, active electrostatic transceiver 104 includes an additional electrostatic electrode 116 for transmitting electrostatic signals. The electrostatic electrodes may also be referred to as antenna, capacitor plates, contactless electrodes, wireless electrodes or isolation electrodes. These electrostatic electrodes provide for the antenna, contactless, wireless and the somewhat isolated functionality of an electrostatic system which requires no physical contact between the electrostatic electrodes in order to communicate. Passive electrostatic transceiver 102 and active electrostatic transceiver 104 can communicate information to/from the electrostatic reader 101 by means of electrostatic signals and capacitive coupling. Host computer 103 is coupled to the electrostatic reader 101 and may couple to other electrostatic readers, electromagnetic readers or electrostatic readers (not shown in FIG. 1) in order to have other points of communication. Vega at 6:1–22 FIG. 1 illustrates the advantage that an active electrostatic transceiver 104 has over a passive electrostatic transceiver 102. The distance between an electrostatic transceiver and an electrostatic reader where communication may start to occur is referred to as the read range. In FIG. 1 the passive read range 125 between passive ES transceiver 102 and ES reader 101 is significantly smaller than the active read range 126 between active ES transceiver 104 and ES reader 101. This is because an energy storage means within the active electrostatic transceiver 104 allows for active transmission of signals using an amplifier. Because of its passive nature, the passive electrostatic transceiver 102 relies on a load modulation

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	technique for communication of signals by reflecting back the energy of the excitation signal to the electrostatic reader 101. The reflection of the excitation signal requires that the passive electrostatic transceiver 102 be nearer the reader 101. The larger read range provided by reflected ES signals using load modulation or transmitted ES signals using an active transmitter allows the active electrostatic transceiver 104 to be used in other applications of RFID communication systems where a passive electrostatic transceiver 102 would not. Vega at 6:23–33 An active electrostatic transceiver 104 is not simply formed by adding an energy storage means to the passive electrostatic transceiver 102. Components of a passive electrostatic transceiver require modification, particularly in the area of power management. The power or energy of an energy storage means must be conserved and properly managed in order for the active electrostatic transceiver to have greater utility. Additionally noise must be properly filtered out to avoid false signal detection and power inadvertently being applied to circuits within the active electrostatic transceiver in order to more properly conserve power. Vega at 6:34–52 Electrostatic electrodes 112 and 113 of passive ES transceiver 102 and ES electrodes 114 and 115 of active transceiver 104 are one part of the capacitive plates for capacitive coupling in order to receive electrostatic charges and communications. The other part of the capacitive plates are provided by the electrostatic reader 101 or other ES source. The space between the coupled electrostatic electrodes defines the dielectric medium between the two parts of the capacitive plates. The capacitive plates of the electrostatic reader 101 can be in either a monopole or a dipole configuration. In a monopole configuration, only one set of coupling plates is used. Earth ground acts as a low impedance return path. The electrostatic transceiver may couple to earth ground through a human body or other relatively low impedance that couples to one or the other of the electrostatic electrodes. In a dipole configuration the reader had two electrostatic electrodes for receiving and two electrostatic electrodes for transmitting and none of the electrostatic electrodes has a preferential coupling path to earth ground. Vega at 7:14–56 In general, electrostatic reader 101 generates an electrostatic (electrical) field for use both as a power source for the passive electrostatic transceiver 102 and for transferring information between electrostatic reader 101 and passive electrostatic transceiver 102 or active electrostatic transceiver 104. As such, electrostatic reader 101 electrostatically generates and transmits an excitation signal to the surrounding air, gas, atmosphere or non-electrically conductive medium via the reader's electrostatic electrodes, except

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	for the return path in a monopole system. The excitation signal is an AC signal which activates the passive electrostatic transceiver 102 when it is comes within the capacitance coupling range of reader 101. Upon being sufficiently energized, the passive electrostatic transceiver 102 may respond by electrostatically transmitting a read data signal carrying the information stored in its memory to electrostatic reader 101 (as part of a read operation). Active electrostatic transceiver 104 includes an energy storage means such that it may not require the excitation signal to become sufficiently energized. In accordance to the present invention, reader 101 may also electrostatically couple a write signal to communicate and write information to the passive electrostatic transceiver 102 or active ES transceiver(as part of a write operation). Alternatively, such programming or charging can be carried out by a separate ES programming, ES encoding or electrostatic charger unit (not illustrated). It is to be appreciated that the excitation signal must be generated and transmitted by electrostatic reader 101 to excite the passive electrostatic transceiver 102 or charge the active electrostatic transceiver 104. The excitation signal is an AC energy source and can be a continuous waveform or a varying waveform (i.e. amplitude, frequency, time, etc. of the waveform may vary). Alternatively a user could manually cause the electrostatic reader 101 or a charger to generate the excitation signal to charge or communicate with the passive electrostatic transceiver 102 or active electrostatic transceiver 104 by selecting a button or switch. The reader 101 usually has available a larger power source than the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Thus, the reader 101 has very sensitive receiving and high energy transmission when compared with the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Vega at 7:57–8:17 Reference is now made to FIG. 3 illustrating in greater detail the components of a first embodiment of the active electrostatic transceiver 104. As shown in FIG. 3, transceiver 104 may include a circuit 300 having an analog interface module 301, a bitrate generator 303, a write decoder 304, an optional charge pump 305, an input register 306, a controller 307, a mode register 308, a modulator 309, a memory 310, and electrostatic electrodes 114-116. As previously discussed, electrostatic electrodes 114 and 115 receive electrostatic signals from the electrostatic reader 101 and may communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 116 and 115 may also communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 114 and electrostatic electrode 115 are coupled to the analog interface module 301 over the bidirectional signal lines 322 and 333 respectively. The analog interface module 301 couples to the bitrate generator 303 through the clock signal line 325. Analog interface module 301 couples to the controller 307 through the control signal lines 326 and to the write decoder 304 through the data in signal line 324. The modulator 309 couples to the electrostatic

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	electrode 114 and electrostatic electrode 115 by signal lines 322 and 333 respectively. Additionally, the modulator 309 couples to the electrostatic electrode 116 by signal line 327. For optimum electrostatic performance, it is desirable to keep the parasitic capacitance measured between signal lines 322 and 323 as small as possible. Vega at 8:18–45 Controller 307 controls the functionality of the transceiver 104 in conjunction with the analog interface module 301. Controller 307 couples to nearly all components of the active electrostatic transceiver 104 except for the electrostatic electrodes and pads. Memory 310 may be a volatile memory requiring a constant supply of energy or a non-volatile memory such as an EEPROM memory or ferro-electric memory that retains its information when power is no longer supplied. In the case of EEPROM memory, the optional charge pump 305 may be required in order to boost the power supply voltage to write data into the EEPROM memory. Input register 306 temporarily stores information that is to be written into memory 310. It may need to store the information due to a delay in the write cycle caused by the charge pump 305 pumping up or other reasons. In any case, storing data into the input register 306 allows the controller 307 to process other information for the transceiver 104. Mode register 308 reads configuration information for the active electrostatic transceiver 104 from memory 310 and provides this to the controller 307. Write decoder 304 analyzes a data sequence being received by the electrostatic transceiver 104 and determines whether the transceiver should go into a write mode or whether it needs to remain in a receive mode. Modulator 309 prepares data read from memory 310 for communication by the active electrostatic transceiver 104. Modulator 309 can encode and modulate data read from memory 310 in a number of ways for communication with the reader 101. Vega at 8:46–62 When in proximity of a reader 101, the active electrostatic transceiver 104 first detects the excitation signal being emitted by an electrostatic reader 101. The excitation signal is generated by reader 101 at a carrier frequency, commonly referred to as a power carrier frequency or exciter frequency. The power carrier frequency, which may be modulated with data, is preferably 125 k Hz. After detecting the excitation signal, the first embodiment of the active electrostatic transceiver 104 goes through a power management sequence and powers up in order to derive a square wave based on the excitation signal at the carrier frequency which is used as a clock signal for the active transceiver. In this manner of generating a clock signal, information received by the active electrostatic transceiver 104 is synchronized with the clock signal. This alleviates generating a clock with a clock oscillator and synchronizing the data and clock using phase-locked loop techniques.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 9:30–60 Now referring to FIG. 4A, a detailed block diagram of components of the analog interface module 301 within the active transceiver 104 is illustrated including digital timing elements. The active electrostatic transceiver 104 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 300, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including an electrochemical storage cell, such as a rechargeable battery or a non-rechargeable battery, or a capacitor, but is preferably a thin foil battery to conform to a form factor of a smart card, tag, or badge. The transceiver circuit 300A as illustrated in FIG. 4A shows the relevant components in the first embodiment of the present invention. In FIG. 4A, the transceiver circuit 300A is illustrated as including the analog interface module 301 and the modulator 309. In FIG. 4A, the relevant components of the analog interface module 301 include a power manager 412A, a DC voltage rectifier/regulator 418, a clock extractor 430, and a demodulator 432. The power manager 412A includes a detector/receiver 420, a power switch 422, a sleep timer 424, and a power-on-resetor (POR) 426. The DC voltage rectifier/regulator 418 includes a rectifier, a voltage regulator and voltage control functionality such that a DC voltage and energy source may be generated from the excitation signal or other signals received by the active electrostatic transceiver 104 and selectively used to power the transceiver 104 or charge the energy storage means 360. The DC voltage rectifier/regulator 418 couples to the power switch 422 for selection and to the energy storage means 360 for charging. Vega at 9:61–10:33 The detector/receiver 420 in the active electrostatic transceiver 104 may receive power directly from the energy storage means 360 in order to be actively listening for an excitation signal from an electrostatic reader 101. Alternatively, the detector/receiver 420 may have passive components sufficient to detect and receive signals when the energy storage means has insufficient energy to power active components. The detector/receiver 420 may have an amplifier for receiving and amplifying the incoming electrostatic signals, a bandpass filter for filtering unwanted frequencies outside a range of the carrier frequency, and a detector for detecting the presence of the carrier frequency in an excitation signal indicating that the transceiver is within the read range of an electrostatic reader 101. The detector may detect a number of oscillations in the received waveform at the carrier frequency indicating that it is not a noise source generating the waveform. In the preferred embodiment, if the detector detects any signal in the band of the carrier it provides an indication signal. Upon detection of the excitation signal, the detector/receiver 420 generates a wakeup signal on signal line 427 indicating that the active electrostatic transceiver 104 is

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	within range of an electrostatic field and that the active electrostatic transceiver 104 needs to go through its wake up procedure. When outside the range of an electrostatic field, the signal line 427 indicates a go to-sleep signal so that the transceiver may go into a low power sleep state. The wakeup signal 427 is provided to the power on resetor 426, the sleep timer 424, the power switch 422 and clock extractor 430. Upon receiving the wakeup signal 427, power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 104 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 104. In FIG. 4A the reset signal line 425 is coupled to the sleep timer 424, the clock extractor 430, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 104. Vega at 10:34–52 The sleep timer 424 of the active electrostatic transceiver of FIG. 4A is a digital counter that counts to a predetermined count value using the clock signal on clock line 325 received from the clock extractor 430. Upon reaching the predetermined count value, the sleep timer 424 turns off active components within the modulator 309. While the sleep timer 424 is counting a transmit signal is indicated on signal line 423. When the sleep timer 424 reaches the predetermined count value, signal line 423 indicates a receive signal and the active electrostatic transceiver powers off the active components within the modulator 309. While in this mode, the transceiver may still use passive components and the load modulators within the modulator 309 to communicate with a reader. Further, while in this mode, the transceiver may receive and respond to encoded write data transmitted by the reader. The predetermined count value is determined based on the time, in number of clock cycles, that it takes for the active electrostatic transceiver to complete a transmission cycle with an electrostatic reader 101. Vega at 10:53–11:6 Referring to FIG. 4B, the power manager 412B includes the detector/receiver 420, the power switch 422, an analog delay block 464, and the power-on-resetor (POR) 426. The digital sleep timer 424 of FIG. 4A is replaced with the analog delay block 464 within the power manager block 412B while other blocks function similar to the description of FIG. 4A. Analog delay block 464 provides an analog delay by using resistor and capacitor elements in conjunction with a threshold detector or comparator. The analog delay block is preferably designed to provide a lengthy delay such as a couple of seconds. The circuitry of the analog delay block is simpler than that of the sleep timer 424. Upon detection of a received signal, the wakeup signal on signal line 427 causes the analog delay block to initiate the RC delay. The transmit

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	signal on signal line 423 is coupled to the power switch 422 and causes it to select power, if available, from the energy storage means 360 for the active transmitter of the modulator 309. Upon completion of the RC delay, a receive signal is indicated on signal line 423 causing the power switch 422 to disconnect power from the active transmitter of the modulator 309. Vega at 11:7–12:16 Power switch 422 is coupled to the detector/receiver 420 through the signal line 427 and to the sleep timer 424 or the analog delay block 464 through the signal line 423. The power switch 422 controls the switching of the high level power supply voltage 451 from the energy storage means 360 or the rectified voltage 461 and provides the analog interface module 301 with the means to manage power consumption. These energy sources may be coupled to the device power line 460 feeding power to other components of the active electrostatic transceiver 104. FIG. 4C illustrates the basic components of the power switch 422 that provide power selection for the active electrostatic transceiver 104. These components include the power analyzer 465, the multiplexor 466 and the multiplexor 469. Multiplexor 469 may optionally be a switch with one end connected to the amplifier power line 462 and another end connected to the device power line 460. Power analyzer 465 performs an analysis on the energy provided by the DC voltage rectifier/regulator 418 with that supplied by the energy storage means 360. The power analyzer 465 receives the rectified voltage 461, the high level supply voltage 451 and the low level supply voltage 450 in order to perform the analysis. Additionally, control signals 423, 427 and any other control signals are received by the power analyzer 465 to further control the multiplexor 466 and multiplexor 469. Signal lines 423 and 427 are exemplary control signals input into the power analyzer 465. Typically, if the energy storage means 360 has higher energy levels it is selectively coupled to the device power line 460 and the amplifier power line 462 when signal line 427 indicates a transmit signal. Optionally when the transceiver 104 is in an active mode for active transmission by amplifier 477 and when signal line 427 indicates a receive signal, the energy storage means may be selectively decoupled from the amplifier power line 462, have the rectified voltage 461 coupled to the amplifier power line 462 or alternatively have no power source coupled to the amplifier power line 462 powering OFF the circuitry of amplifier 477 in each case conserving power in the energy storage means. If it is the case that the energy storage means 360 has lower energy levels than that of the rectified voltage 461, the rectified voltage may be selectively coupled to the device power line 460 by multiplexor 466 and to the amplifier power line 462 by multiplexor 469 such that the load modulator 473 and the amplifier 477 can perform passive load modulation and passive transmission of electrostatic signals in a passive mode. Additionally if it is desirable to conserve power or more efficiently charge the energy storage means, multiplexor 466 or 469 can operate as switches decoupling the device power line 460 or the amplifier power line 462 from any

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	power source. After selecting a power source where the power switch 422 couples the high level power supply 451 or the rectified voltage 461 with the device power line 460, circuitry within the active electrostatic transceiver goes into a power on reset sequence controlled by the power on resetor 426. When out of the power on reset sequence, the active electrostatic transceiver 104 can go through a communication cycle with the electrostatic reader 101 while in the read range and the sleep timer 424 starts counting or the analog delay cycle of the analog delay block 464 begins. If the active electrostatic transceiver remains in the electrostatic field (i.e. read range) and the sleep timer 424 reaches its predetermined count value or the analog delay block completes the predetermined RC delay time, a receive signal is indicated on signal line 423 to the power switch 422. The active electrostatic transceiver 104 continues to listen for signals from reader 101 or other sources that communicate on the carrier frequency. If the active electrostatic transceiver 104 is removed from the electrostatic field, the detector/receiver 420 resets and a sleep signal is indicated on signal line 427. Upon receiving the sleep signal, the power switch 422 selectively disconnects the high level voltage supply 451 from the device power line 460 so that components coupled to the device power line 460 become powered off and enter the sleep mode. In this manner when the active electrostatic transceiver 104 is outside the electrostatic field (i.e. read range) it goes into its low power sleep mode. Vega at 12:60–13:6 Modulator 309 is coupled to the power switch 422 through the device power line 460, the energy storage means 360 through the low level power supply 450, the electrostatic electrodes 114-116 respectively through signal lines 322, 323 and 327, power on resetor 426 through signal line 425, and the clock extractor 430 through clock signal line 325. Modulator 309 includes a load modulator for electrostatic electrodes 114-115 and an active power amplifier in order to amplify signals for the extra transmission distance to the reader over the electrostatic electrode 116. A passive electrostatic transceiver may not function properly at large read ranges because of weak signals. The electrostatic reader's receiver may require increased sensitivity in order to receive signals from large read ranges. Vega at 13:7–14:10 Referring now to FIG. 4D, a block diagram is illustrated of the components within the modulator 309 for active and passive load modulation and active transmission. Active and passive load modulation are accomplished by the modulator controller and the load modulator. Active load modulation occurs when the energy storage means 360 is coupled to the device power line 460 and the circuitry of the modulator controller 471. Passive load modulation occurs when the DC voltage rectifier/regulator within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the device

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	power line 460 and the modulator controller 471. Load modulation is accomplished by varying the impedance between the electrostatic electrodes 114 and 115. Varying the impedance between the electrostatic electrodes, that are capacitively coupled with the electrostatic electrodes of the reader 101, causes the excitation signal generated by the reader 101 to be reflected back. A data signal and a carrier signal is input into the modulator controller 471 at line 474 and 476 respectively to control the load modulator 473. The carrier signal 476 is commonly referred to as the data carrier and has a carrier frequency. Preferably the carrier frequency of the data carrier is 62.5 K Hz or one-half the power carrier frequency. FIG. 4E illustrates a few load modulators 473A-473D. Load modulator 473A consists of a variable impedance 480 coupled between the electrostatic electrodes 114 and 115 that has its impedance varied or switched by control signal 472 from the modulator controller 471. Load modulator 473B includes transistors 481 and 482, each coupled respectively between an electrostatic electrode and the low level supply voltage 450. The transistors are preferably turned ON and OFF by having their gates switched by a digital drive signal supplied on control signal 472. Load modulator 473C includes transistor 483 coupled between the electrostatic electrodes 114 and 115. Transistor 483 is preferably turned ON and OFF by having its gate switched by a digital drive signal supplied on control signal 472. Load modulator 473D includes transistor 484 coupled between one electrostatic electrode 322 and the low level supply voltage 450. This is an asymmetrical load modulation technique where circuitry within a rectifier provides the return path through the opposite electrostatic electrode 323. Referring back to FIG. 4D, active and passive transmission is accomplished by the modulator controller 471 and amplifier 477. Amplifier 477 is preferably a CMOS fully complementary inverter or buffer with its VDD input connected to the amplifier power line 462 and its VSS connection coupled to the low level power supply 450. Active transmission occurs when power is coupled from the high level power supply 451 through the power switch and onto the amplifier power line 462 by multiplexor 469. Passive transmission occurs when the DC voltage rectifier/regulator 418 within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the amplifier power line 462 by multiplexor 469. Multiplexor 469 and 466 can further operate as a switch to selectively turn power OFF to circuitry connected to the device power line 460 or the amplifier power line 462 by turning OFF both of the transistor switches 467-468 or 470 and 475. Data 474 input into the modulator controller 471 is modulated with the input carrier signal 476 to generate the data signal on line 478. Signal line 478 is separate from signal line 472 such that the load modulator 473 and the amplifier 477 can be enabled or disabled independent from one another. Disabling the load modulator 473 or the amplifier 477 may be performed by setting the signal on line 472 or 478 respectively to a high or low DC logic level. The signal on signal line 478 is input into the amplifier 477. The amplifier 477 amplifies the signal on line 478 and transmits the information electrostatically over the electrostatic

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	electrode 116. In active mode, after the transmit time has occurred, the power to the amplifier 477 may be turned OFF to conserve power. Vega at 15:20–37 The analog interface module 711 generally performs the power management function for the active electrostatic transceiver 704. Additionally, it generates its own clock from a free running low power clock oscillator. This generated clock is provided to other components of the active electrostatic transceiver 704 which require a clock including the bitrate generator 303. The analog interface module 711 also demodulates the received signal to generate a received data stream. The analog interface module 711 also analyzes the received data stream in order to determine if the active electrostatic transceiver 704 should perform some operation such as a read operation or a write operation and communicates the results of the analysis to the controller 307 and the write decoder 304. It preferably performs this analysis by searching for predetermined gaps in the received data stream. Modulator 309 as previously described in detail communicates information from the active electrostatic transceiver to a reader. Vega at 15:38–61 Now referring to FIG. 8A, selected details of the analog interface module 711 within the active electrostatic transceiver 704 are illustrated. The active electrostatic transceiver 704 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 710, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including a battery or capacitor, preferably it is a thin foil battery to conform to a form factor for a smart card, tag, or badge. The transceiver circuit 710 as illustrated in FIG. 8A shows the relevant components for the second embodiment of the present invention. In FIG. 8A, the transceiver circuit 710 includes the analog interface module 711 and modulator 309. Components of the analog interface module 711 include a DC voltage rectifier/regulator 418, a power manager 812A, a clock extractor 430, a clock generator 830, a demodulator 432, and a modulator 309. The power manager 812A includes a detector/receiver 420, a power switch 422, a sleep timer 424, a power-on-resetor (POR) 426, and a manual switch 824. Except as otherwise described below, like numbered components of the transceiver circuit 710 operate similar to the similarly numbered components of the transceiver circuit 300 of the active electrostatic transceiver 104. Vega at 15:62–16:8 In the second embodiment of the present invention the active electrostatic transceiver 704 may not receive an excitation signal from which to extract a clock signal, particularly when coupled to the reader 601 of FIG. 6A. Thus, the transceiver circuit 710 includes its own clock generator 830. A clock extractor 430 is

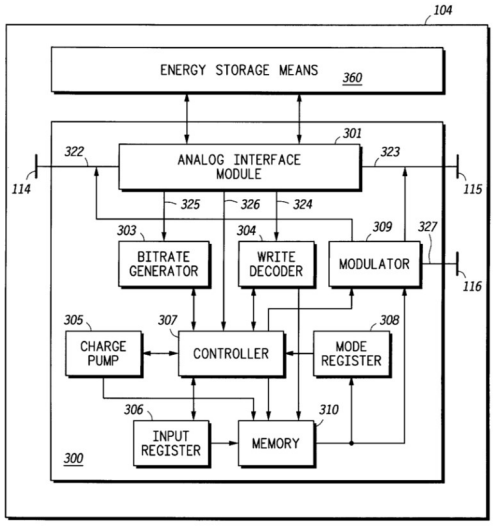
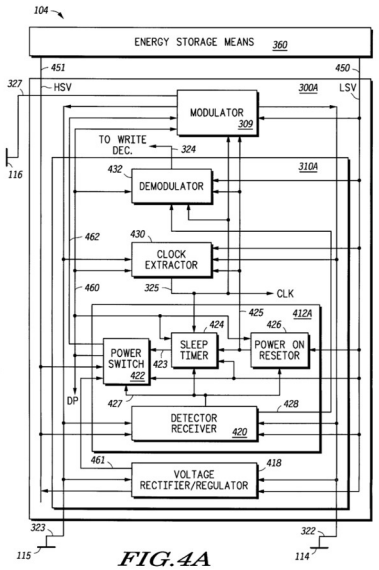
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	retained to generate an extracted clock 825 for demodulation of signals that may be received from readers other than reader 601. Clock generator 830 receives power by coupling to the device power line 460 and the low level power supply 450. Clock generator 830 has its own low power clock oscillator in order to generate a clock. The clock signal on clock line 325 is provided to the sleep timer 424 amongst other components of the transceiver circuit 710. Vega at 16:36–48 Power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 704 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 704. In FIG. 8A the reset signal line 425 is coupled to the sleep timer 424, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. In FIG. 8B, the reset signal line 425 is coupled to the analog delay block 464, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. Vega at 16:53–17:8 The present invention has many advantages over the prior art. The present invention provides a larger read range over passive RFID communication systems and therefore increases the applicability of electrostatic communication systems. Additionally, the present invention provides for greater flexibility in choosing components for an electrostatic transceiver. Also, the present invention provides greater operational functionality in an electrostatic transceiver because the available power is greater. Furthermore, the present invention provides for greater integration in circuitry and reduces the amount space utilized for an active electrostatic transceiver. Additionally the present invention in its second embodiment reduces the interference and noise in an electrostatic communication system so that it may be used in environments requiring low noise emission. The present invention provides for lower cost RFID transceivers such that disposable applications are possible. Furthermore, the present invention provides the capability to operate an active electrostatic transceiver in an active mode operating under the power of an energy storage means or in a passive mode under the power generated by a voltage rectifier/regulator when the energy storage means power is too low or if in the case of a desirable low-power operational mode. To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

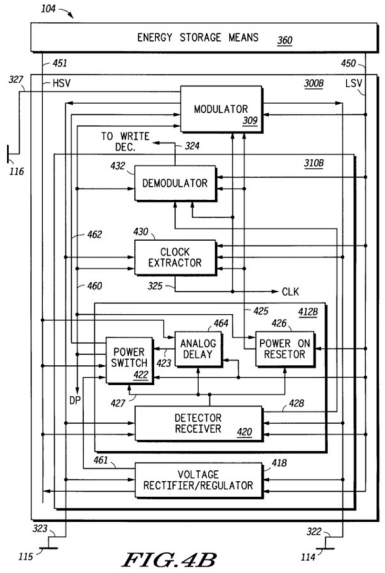
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
2. The mobile device of claim 1 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Vega discloses or renders obvious "[t]he mobile device of claim 1 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." For example: Vega at 2:4–26 In contrast, conventional RFID technology is inductance-based. More precisely, conventional RFID technology uses near field electromagnetic waves which are also known as induction waves. Unlike radio waves, the field strength of induction waves is proportional to the inverse square of the distance involved. In inductance-based RFID technology, an electromagnetic field is generated for use both as a power source for the transponder and for transferring information between the reader and transponder. Inductance waves are generated using closed circuit alternating current coils that have multiple turns. Inductance coils are required to optimally transmit and receive electromagnetic signals are usually a wire wound or etched metal coil. Using inductance coils adversely impacts the costs, manufacturability, and packaging flexibility of inductance-based RFID technology particularly when used with high number of RFID tags usually required in a system. Due to the prohibitive costs and high degree of manufacturing difficulty, electromagnetic RFID technology is not practical in high volume and low cost applications such as in disposable applications. The bulky packaging, which is typical for electromagnetic RFID, further limits its application to those where thickness is not of primary importance. Vega at 2:27–40 Traditionally electromagnetic transponders in electromagnetic RFID systems derive their power from the electromagnetic signals being transmitted by an electromagnetic reader through induction coupling and have no power storage device. These electromagnetic transponders are often referred to as passive electromagnetic transponders. Because they require inductive coupling, the distance for communication between an electromagnetic reader and a passive electromagnetic transponder, referred to as the read range, is limited. The read range is limited because a sufficient amount of charge to power up the components within a passive electromagnetic transponder is required and is only available within certain distances from the electromagnetic reader. Vega at 2:41–52 Additionally, only certain amounts of power are available for components within a passive electromagnetic transponder. This limited amount of power constrains the choices of components used within a passive electromagnetic transponder. For example amplifiers may be restricted in their power consumption and gain or they may not be used at all within a passive electromagnetic transponder. Additionally certain passive components are often used due to the limited power and take up larger

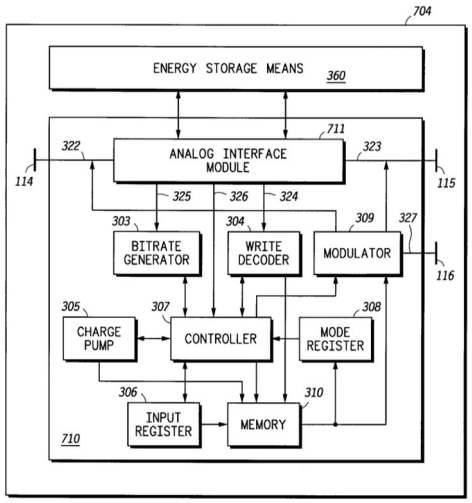
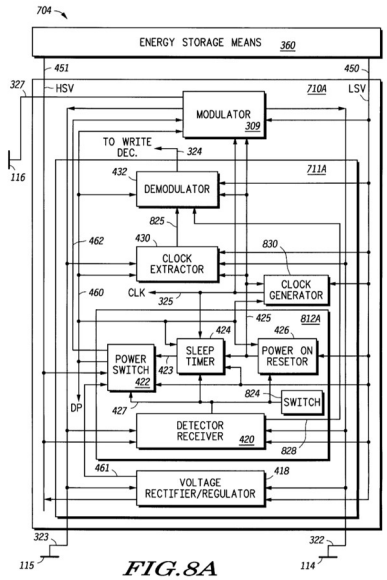
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	amounts of space than otherwise might be required. Furthermore the limited of amount of available power in a passive electromagnetic transponder reduces the available functionality and operation of a transponder. Vega at 2:66–3:9 In certain applications it is desirable to have an RFID communication system with larger read range than available with passive electromagnetic transponders. Typical read range for passive electromagnetic transponders is on the order of four inches to thirty inches. An exemplary application for larger read range is a ticket admittance system. It may be desirable to have a reader be quite a distance away, such as five to eight feet, when a ticket holder passes through an entrance of the ticket admittance system. In cases such as this, it is difficult to bring an electromagnetic transponder within the passive read range. Vega at 3:28–45 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that can decrease power consumption. Vega at 4:51–5:7 The present invention includes a method, apparatus and system for providing electrostatic communication utilizing capacitance-based technology with active and passive electrostatic transceivers. Passive electrostatic transceivers derive their power from electrostatic signals being transmitted by an electrostatic reader or other electrostatic signal source. An active electrostatic transceiver has its own internal power source and need not rely on an electrostatic signal source from an electrostatic reader or other source to power up and perform certain functions. Electrostatic communication is accomplished through capacitive coupling which requires no physical contact or wires between a reader and an electrostatic transceiver (a.k.a. electrostatic tag or electrostatic transponder). In the electrostatic communication system, the voltage applied to the capacitively coupled plates is an AC voltage generated by an electric field (i.e. an

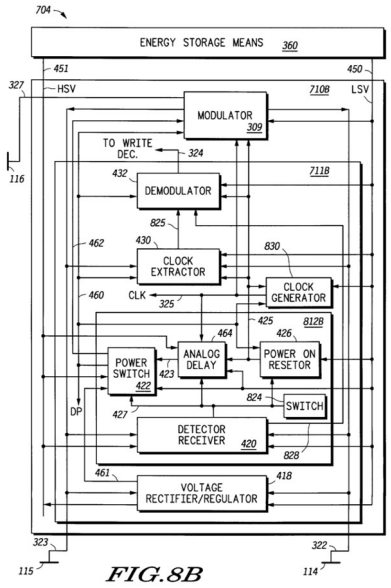
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	electrostatic ("ES") field is developed) as opposed to an electromagnetic ("EM") field in order for a charge or signal to be communicated. In short, an electrostatic field is an energy (electrical) field created between two electrodes having a voltage differential. An electrostatic transceiver needs to be in the proximity of the reader, referred to as the read range, in order to have sufficient capacitive coupling to transceive electrostatic signals. Vega at 9:61–10:33 The detector/receiver 420 in the active electrostatic transceiver 104 may receive power directly from the energy storage means 360 in order to be actively listening for an excitation signal from an electrostatic reader 101. Alternatively, the detector/receiver 420 may have passive components sufficient to detect and receive signals when the energy storage means has insufficient energy to power active components. The detector/receiver 420 may have an amplifier for receiving and amplifying the incoming electrostatic signals, a bandpass filter for filtering unwanted frequencies outside a range of the carrier frequency, and a detector for detecting the presence of the carrier frequency in an excitation signal indicating that the transceiver is within the read range of an electrostatic reader 101. The detector may detect a number of oscillations in the received waveform at the carrier frequency indicating that it is not a noise source generating the waveform. In the preferred embodiment, if the detector detects any signal in the band of the carrier it provides an indication signal. Upon detection of the excitation signal, the detector/receiver 420 generates a wakeup signal on signal line 427 indicating that the active electrostatic transceiver 104 is within range of an electrostatic field and that the active electrostatic transceiver 104 needs to go through its wake up procedure. When outside the range of an electrostatic field, the signal line 427 indicates a go to-sleep signal so that the transceiver may go into a low power sleep state. The wakeup signal 427 is provided to the power on resetor 426, the sleep timer 424, the power switch 422 and clock extractor 430. Upon receiving the wakeup signal 427, power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 104 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 104. In FIG. 4A the reset signal line 425 is coupled to the sleep timer 424, the clock extractor 430, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 104. *See also* Vega at Abstract, 5:8–25, 6:1–22, and 16:53–17:8.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
3. The mobile device of claim 1 wherein the smartcard controller is coupled to be powered by the mobile device.	Vega discloses or renders obvious "[t]he mobile device of claim 1 wherein the smartcard controller is coupled to be powered by the mobile device." For example: Vega at Abstract > An active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise sources are better filtered out. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Each embodiment of the transceiver circuit has power management features so that power is conserved. Additionally, each transceiver circuit has the ability to operate in a passive mode, when there is insufficient charge in the energy storage means or a lower power mode is desirable. Vega at Figure 3

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG.3* Vega at Figure 4A  *FIG.4A*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 4B  FIG.4B Vega at Figure 7

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG. 7* Vega at Figure 8A  *FIG. 8A*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 8B  FIG.8B Vega at 3:28–45 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that can decrease power consumption. Vega at 4:51–5:7

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	The present invention includes a method, apparatus and system for providing electrostatic communication utilizing capacitance-based technology with active and passive electrostatic transceivers. Passive electrostatic transceivers derive their power from electrostatic signals being transmitted by an electrostatic reader or other electrostatic signal source. An active electrostatic transceiver has its own internal power source and need not rely on an electrostatic signal source from an electrostatic reader or other source to power up and perform certain functions. Electrostatic communication is accomplished through capacitive coupling which requires no physical contact or wires between a reader and an electrostatic transceiver (a.k.a. electrostatic tag or electrostatic transponder). In the electrostatic communication system, the voltage applied to the capacitively coupled plates is an AC voltage generated by an electric field (i.e. an electrostatic ("ES") field is developed) as opposed to an electromagnetic ("EM") field in order for a charge or signal to be communicated. In short, an electrostatic field is an energy (electrical) field created between two electrodes having a voltage differential. An electrostatic transceiver needs to be in the proximity of the reader, referred to as the read range, in order to have sufficient capacitive coupling to transceive electrostatic signals. Vega at 5:8–25 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means, such as a battery, and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that improve power conservation. Vega at 6:1–22 FIG. 1 illustrates the advantage that an active electrostatic transceiver 104 has over a passive electrostatic transceiver 102. The distance between an electrostatic transceiver and an electrostatic reader where communication may start to occur is referred to as the read range. In FIG. 1 the passive read range 125 between passive ES transceiver 102 and ES reader 101 is significantly smaller than the active read range 126 between active ES transceiver 104 and ES reader 101. This is because an energy storage means

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	within the active electrostatic transceiver 104 allows for active transmission of signals using an amplifier. Because of its passive nature, the passive electrostatic transceiver 102 relies on a load modulation technique for communication of signals by reflecting back the energy of the excitation signal to the electrostatic reader 101. The reflection of the excitation signal requires that the passive electrostatic transceiver 102 be nearer the reader 101. The larger read range provided by reflected ES signals using load modulation or transmitted ES signals using an active transmitter allows the active electrostatic transceiver 104 to be used in other applications of RFID communication systems where a passive electrostatic transceiver 102 would not. Vega at 7:14–56 In general, electrostatic reader 101 generates an electrostatic (electrical) field for use both as a power source for the passive electrostatic transceiver 102 and for transferring information between electrostatic reader 101 and passive electrostatic transceiver 102 or active electrostatic transceiver 104. As such, electrostatic reader 101 electrostatically generates and transmits an excitation signal to the surrounding air, gas, atmosphere or non-electrically conductive medium via the reader's electrostatic electrodes, except for the return path in a monopole system. The excitation signal is an AC signal which activates the passive electrostatic transceiver 102 when it is comes within the capacitance coupling range of reader 101. Upon being sufficiently energized, the passive electrostatic transceiver 102 may respond by electrostatically transmitting a read data signal carrying the information stored in its memory to electrostatic reader 101 (as part of a read operation). Active electrostatic transceiver 104 includes an energy storage means such that it may not require the excitation signal to become sufficiently energized. In accordance to the present invention, reader 101 may also electrostatically couple a write signal to communicate and write information to the passive electrostatic transceiver 102 or active ES transceiver(as part of a write operation). Alternatively, such programming or charging can be carried out by a separate ES programming, ES encoding or electrostatic charger unit (not illustrated). It is to be appreciated that the excitation signal must be generated and transmitted by electrostatic reader 101 to excite the passive electrostatic transceiver 102 or charge the active electrostatic transceiver 104. The excitation signal is an AC energy source and can be a continuous waveform or a varying waveform (i.e. amplitude, frequency, time, etc. of the waveform may vary). Alternatively a user could manually cause the electrostatic reader 101 or a charger to generate the excitation signal to charge or communicate with the passive electrostatic transceiver 102 or active electrostatic transceiver 104 by selecting a button or switch. The reader 101 usually has available a larger power source than the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Thus, the reader 101 has very sensitive receiving and high energy

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	transmission when compared with the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Vega at 8:46–62 When in proximity of a reader 101, the active electrostatic transceiver 104 first detects the excitation signal being emitted by an electrostatic reader 101. The excitation signal is generated by reader 101 at a carrier frequency, commonly referred to as a power carrier frequency or exciter frequency. The power carrier frequency, which may be modulated with data, is preferably 125 k Hz. After detecting the excitation signal, the first embodiment of the active electrostatic transceiver 104 goes through a power management sequence and powers up in order to derive a square wave based on the excitation signal at the carrier frequency which is used as a clock signal for the active transceiver. In this manner of generating a clock signal, information received by the active electrostatic transceiver 104 is synchronized with the clock signal. This alleviates generating a clock with a clock oscillator and synchronizing the data and clock using phase-locked loop techniques. Vega at 9:30–60 Now referring to FIG. 4A, a detailed block diagram of components of the analog interface module 301 within the active transceiver 104 is illustrated including digital timing elements. The active electrostatic transceiver 104 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 300, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including an electrochemical storage cell, such as a rechargeable battery or a non-rechargeable battery, or a capacitor, but is preferably a thin foil battery to conform to a form factor of a smart card, tag, or badge. The transceiver circuit 300A as illustrated in FIG. 4A shows the relevant components in the first embodiment of the present invention. In FIG. 4A, the transceiver circuit 300A is illustrated as including the analog interface module 301 and the modulator 309. In FIG. 4A, the relevant components of the analog interface module 301 include a power manager 412A, a DC voltage rectifier/regulator 418, a clock extractor 430, and a demodulator 432. The power manager 412A includes a detector/receiver 420, a power switch 422, a sleep timer 424, and a power-on-resetor (POR) 426. The DC voltage rectifier/regulator 418 includes a rectifier, a voltage regulator and voltage control functionality such that a DC voltage and energy source may be generated from the excitation signal or other signals received by the active electrostatic transceiver 104 and selectively used to power the transceiver 104 or charge the energy storage means 360. The DC voltage rectifier/regulator 418 couples to the power switch 422 for selection and to the energy storage means 360 for charging.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 9:61–10:33 The detector/receiver 420 in the active electrostatic transceiver 104 may receive power directly from the energy storage means 360 in order to be actively listening for an excitation signal from an electrostatic reader 101. Alternatively, the detector/receiver 420 may have passive components sufficient to detect and receive signals when the energy storage means has insufficient energy to power active components. The detector/receiver 420 may have an amplifier for receiving and amplifying the incoming electrostatic signals, a bandpass filter for filtering unwanted frequencies outside a range of the carrier frequency, and a detector for detecting the presence of the carrier frequency in an excitation signal indicating that the transceiver is within the read range of an electrostatic reader 101. The detector may detect a number of oscillations in the received waveform at the carrier frequency indicating that it is not a noise source generating the waveform. In the preferred embodiment, if the detector detects any signal in the band of the carrier it provides an indication signal. Upon detection of the excitation signal, the detector/receiver 420 generates a wakeup signal on signal line 427 indicating that the active electrostatic transceiver 104 is within range of an electrostatic field and that the active electrostatic transceiver 104 needs to go through its wake up procedure. When outside the range of an electrostatic field, the signal line 427 indicates a go to-sleep signal so that the transceiver may go into a low power sleep state. The wakeup signal 427 is provided to the power on resetor 426, the sleep timer 424, the power switch 422 and clock extractor 430. Upon receiving the wakeup signal 427, power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 104 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 104. In FIG. 4A the reset signal line 425 is coupled to the sleep timer 424, the clock extractor 430, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 104. Vega at 10:34–52 The sleep timer 424 of the active electrostatic transceiver of FIG. 4A is a digital counter that counts to a predetermined count value using the clock signal on clock line 325 received from the clock extractor 430. Upon reaching the predetermined count value, the sleep timer 424 turns off active components within the modulator 309. While the sleep timer 424 is counting a transmit signal is indicated on signal line 423. When the sleep timer 424 reaches the predetermined count value, signal line 423 indicates a receive signal and the active electrostatic transceiver powers off the active components within the modulator 309. While in this mode, the transceiver may still use passive components and the load modulators within the

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	modulator 309 to communicate with a reader. Further, while in this mode, the transceiver may receive and respond to encoded write data transmitted by the reader. The predetermined count value is determined based on the time, in number of clock cycles, that it takes for the active electrostatic transceiver to complete a transmission cycle with an electrostatic reader 101. Vega at 10:53–11:6 Referring to FIG. 4B, the power manager 412B includes the detector/receiver 420, the power switch 422, an analog delay block 464, and the power-on-resetor (POR) 426. The digital sleep timer 424 of FIG. 4A is replaced with the analog delay block 464 within the power manager block 412B while other blocks function similar to the description of FIG. 4A. Analog delay block 464 provides an analog delay by using resistor and capacitor elements in conjunction with a threshold detector or comparator. The analog delay block is preferably designed to provide a lengthy delay such as a couple of seconds. The circuitry of the analog delay block is simpler than that of the sleep timer 424. Upon detection of a received signal, the wakeup signal on signal line 427 causes the analog delay block to initiate the RC delay. The transmit signal on signal line 423 is coupled to the power switch 422 and causes it to select power, if available, from the energy storage means 360 for the active transmitter of the modulator 309. Upon completion of the RC delay, a receive signal is indicated on signal line 423 causing the power switch 422 to disconnect power from the active transmitter of the modulator 309. Vega at 11:7–12:16 Power switch 422 is coupled to the detector/receiver 420 through the signal line 427 and to the sleep timer 424 or the analog delay block 464 through the signal line 423. The power switch 422 controls the switching of the high level power supply voltage 451 from the energy storage means 360 or the rectified voltage 461 and provides the analog interface module 301 with the means to manage power consumption. These energy sources may be coupled to the device power line 460 feeding power to other components of the active electrostatic transceiver 104. FIG. 4C illustrates the basic components of the power switch 422 that provide power selection for the active electrostatic transceiver 104. These components include the power analyzer 465, the multiplexor 466 and the multiplexor 469. Multiplexor 469 may optionally be a switch with one end connected to the amplifier power line 462 and another end connected to the device power line 460. Power analyzer 465 performs an analysis on the energy provided by the DC voltage rectifier/regulator 418 with that supplied by the energy storage means 360. The power analyzer 465 receives the rectified voltage 461, the high level supply voltage 451 and the low level supply voltage 450 in order to perform the analysis. Additionally, control signals 423, 427 and any other control signals are received by the power analyzer 465 to further control the multiplexor 466 and multiplexor 469. Signal

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	lines 423 and 427 are exemplary control signals input into the power analyzer 465. Typically, if the energy storage means 360 has higher energy levels it is selectively coupled to the device power line 460 and the amplifier power line 462 when signal line 427 indicates a transmit signal. Optionally when the transceiver 104 is in an active mode for active transmission by amplifier 477 and when signal line 427 indicates a receive signal, the energy storage means may be selectively decoupled from the amplifier power line 462, have the rectified voltage 461 coupled to the amplifier power line 462 or alternatively have no power source coupled to the amplifier power line 462 powering OFF the circuitry of amplifier 477 in each case conserving power in the energy storage means. If it is the case that the energy storage means 360 has lower energy levels than that of the rectified voltage 461, the rectified voltage may be selectively coupled to the device power line 460 by multiplexor 466 and to the amplifier power line 462 by multiplexor 469 such that the load modulator 473 and the amplifier 477 can perform passive load modulation and passive transmission of electrostatic signals in a passive mode. Additionally if it is desirable to conserve power or more efficiently charge the energy storage means, multiplexor 466 or 469 can operate as switches decoupling the device power line 460 or the amplifier power line 462 from any power source. After selecting a power source where the power switch 422 couples the high level power supply 451 or the rectified voltage 461 with the device power line 460, circuitry within the active electrostatic transceiver goes into a power on reset sequence controlled by the power on resetor 426. When out of the power on reset sequence, the active electrostatic transceiver 104 can go through a communication cycle with the electrostatic reader 101 while in the read range and the sleep timer 424 starts counting or the analog delay cycle of the analog delay block 464 begins. If the active electrostatic transceiver remains in the electrostatic field (i.e. read range) and the sleep timer 424 reaches its predetermined count value or the analog delay block completes the predetermined RC delay time, a receive signal is indicated on signal line 423 to the power switch 422. The active electrostatic transceiver 104 continues to listen for signals from reader 101 or other sources that communicate on the carrier frequency. If the active electrostatic transceiver 104 is removed from the electrostatic field, the detector/receiver 420 resets and a sleep signal is indicated on signal line 427. Upon receiving the sleep signal, the power switch 422 selectively disconnects the high level voltage supply 451 from the device power line 460 so that components coupled to the device power line 460 become powered off and enter the sleep mode. In this manner when the active electrostatic transceiver 104 is outside the electrostatic field (i.e. read range) it goes into its low power sleep mode. Vega at 12:60–13:6 Modulator 309 is coupled to the power switch 422 through the device power line 460, the energy storage means 360 through the low level power supply 450, the electrostatic electrodes 114-116 respectively

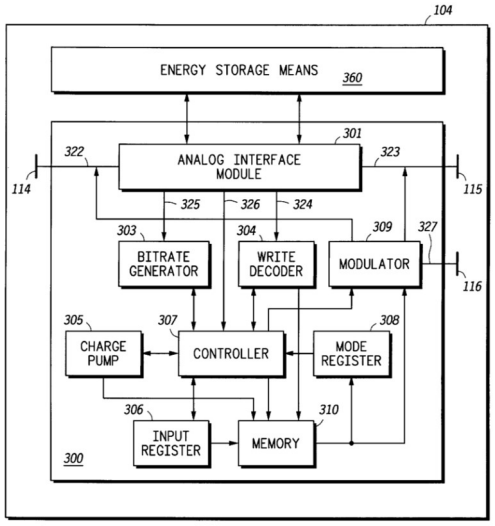
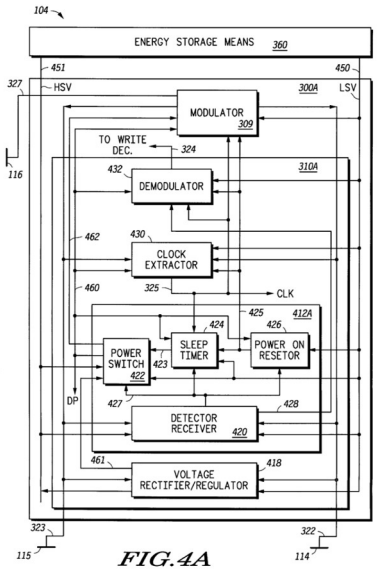
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	through signal lines 322, 323 and 327, power on resetor 426 through signal line 425, and the clock extractor 430 through clock signal line 325. Modulator 309 includes a load modulator for electrostatic electrodes 114-115 and an active power amplifier in order to amplify signals for the extra transmission distance to the reader over the electrostatic electrode 116. A passive electrostatic transceiver may not function properly at large read ranges because of weak signals. The electrostatic reader's receiver may require increased sensitivity in order to receive signals from large read ranges. Vega at 13:7–14:10 Referring now to FIG. 4D, a block diagram is illustrated of the components within the modulator 309 for active and passive load modulation and active transmission. Active and passive load modulation are accomplished by the modulator controller and the load modulator. Active load modulation occurs when the energy storage means 360 is coupled to the device power line 460 and the circuitry of the modulator controller 471. Passive load modulation occurs when the DC voltage rectifier/regulator within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the device power line 460 and the modulator controller 471. Load modulation is accomplished by varying the impedance between the electrostatic electrodes 114 and 115. Varying the impedance between the electrostatic electrodes, that are capacitively coupled with the electrostatic electrodes of the reader 101, causes the excitation signal generated by the reader 101 to be reflected back. A data signal and a carrier signal is input into the modulator controller 471 at line 474 and 476 respectively to control the load modulator 473. The carrier signal 476 is commonly referred to as the data carrier and has a carrier frequency. Preferably the carrier frequency of the data carrier is 62.5 K Hz or one-half the power carrier frequency. FIG. 4E illustrates a few load modulators 473A-473D. Load modulator 473A consists of a variable impedance 480 coupled between the electrostatic electrodes 114 and 115 that has its impedance varied or switched by control signal 472 from the modulator controller 471. Load modulator 473B includes transistors 481 and 482, each coupled respectively between an electrostatic electrode and the low level supply voltage 450. The transistors are preferably turned ON and OFF by having their gates switched by a digital drive signal supplied on control signal 472. Load modulator 473C includes transistor 483 coupled between the electrostatic electrodes 114 and 115. Transistor 483 is preferably turned ON and OFF by having its gate switched by a digital drive signal supplied on control signal 472. Load modulator 473D includes transistor 484 coupled between one electrostatic electrode 322 and the low level supply voltage 450. This is an asymmetrical load modulation technique where circuitry within a rectifier provides the return path through the opposite electrostatic electrode 323. Referring back to FIG. 4D, active and passive transmission is accomplished by the modulator controller 471 and amplifier 477. Amplifier 477 is preferably a CMOS fully complementary inverter or buffer with its VDD input connected to the amplifier

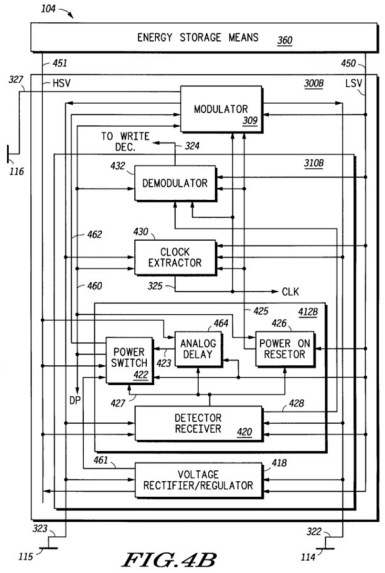
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	power line 462 and its VSS connection coupled to the low level power supply 450. Active transmission occurs when power is coupled from the high level power supply 451 through the power switch and onto the amplifier power line 462 by multiplexor 469. Passive transmission occurs when the DC voltage rectifier/regulator 418 within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the amplifier power line 462 by multiplexor 469. Multiplexor 469 and 466 can further operate as a switch to selectively turn power OFF to circuitry connected to the device power line 460 or the amplifier power line 462 by turning OFF both of the transistor switches 467-468 or 470 and 475. Data 474 input into the modulator controller 471 is modulated with the input carrier signal 476 to generate the data signal on line 478. Signal line 478 is separate from signal line 472 such that the load modulator 473 and the amplifier 477 can be enabled or disabled independent from one another. Disabling the load modulator 473 or the amplifier 477 may be performed by setting the signal on line 472 or 478 respectively to a high or low DC logic level. The signal on signal line 478 is input into the amplifier 477. The amplifier 477 amplifies the signal on line 478 and transmits the information electrostatically over the electrostatic electrode 116. In active mode, after the transmit time has occurred, the power to the amplifier 477 may be turned OFF to conserve power. Vega at 15:20–37 The analog interface module 711 generally performs the power management function for the active electrostatic transceiver 704. Additionally, it generates its own clock from a free running low power clock oscillator. This generated clock is provided to other components of the active electrostatic transceiver 704 which require a clock including the bitrate generator 303. The analog interface module 711 also demodulates the received signal to generate a received data stream. The analog interface module 711 also analyzes the received data stream in order to determine if the active electrostatic transceiver 704 should perform some operation such as a read operation or a write operation and communicates the results of the analysis to the controller 307 and the write decoder 304. It preferably performs this analysis by searching for predetermined gaps in the received data stream. Modulator 309 as previously described in detail communicates information from the active electrostatic transceiver to a reader. Vega at 15:38–61 Now referring to FIG. 8A, selected details of the analog interface module 711 within the active electrostatic transceiver 704 are illustrated. The active electrostatic transceiver 704 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 710, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including a battery or capacitor, preferably it is a thin foil battery to conform to a

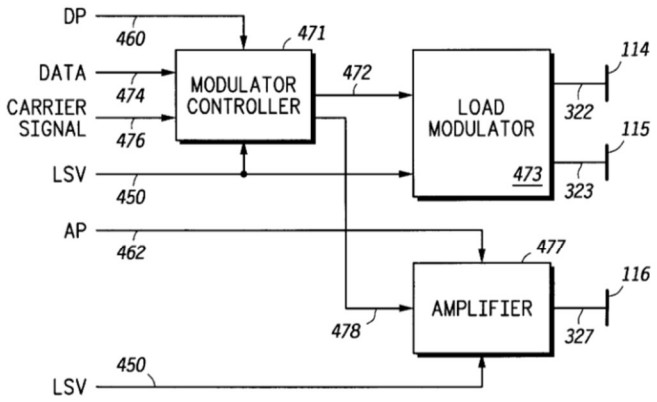
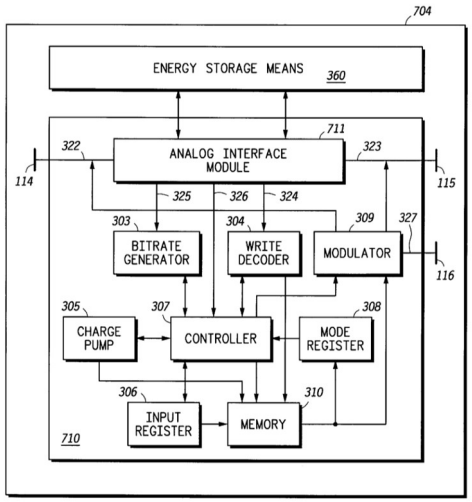
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	form factor for a smart card, tag, or badge. The transceiver circuit 710 as illustrated in FIG. 8A shows the relevant components for the second embodiment of the present invention. In FIG. 8A, the transceiver circuit 710 includes the analog interface module 711 and modulator 309. Components of the analog interface module 711 include a DC voltage rectifier/regulator 418, a power manager 812A, a clock extractor 430, a clock generator 830, a demodulator 432, and a modulator 309. The power manager 812A includes a detector/receiver 420, a power switch 422, a sleep timer 424, a power-on-resetor (POR) 426, and a manual switch 824. Except as otherwise described below, like numbered components of the transceiver circuit 710 operate similar to the similarly numbered components of the transceiver circuit 300 of the active electrostatic transceiver 104. Vega at 16:36–48 Power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 704 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 704. In FIG. 8A the reset signal line 425 is coupled to the sleep timer 424, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. In FIG. 8B, the reset signal line 425 is coupled to the analog delay block 464, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. Vega at 16:53–17:8 The present invention has many advantages over the prior art. The present invention provides a larger read range over passive RFID communication systems and therefore increases the applicability of electrostatic communication systems. Additionally, the present invention provides for greater flexibility in choosing components for an electrostatic transceiver. Also, the present invention provides greater operational functionality in an electrostatic transceiver because the available power is greater. Furthermore, the present invention provides for greater integration in circuitry and reduces the amount space utilized for an active electrostatic transceiver. Additionally the present invention in its second embodiment reduces the interference and noise in an electrostatic communication system so that it may be used in environments requiring low noise emission. The present invention provides for lower cost RFID transceivers such that disposable applications are possible. Furthermore, the present invention provides the capability to operate an active electrostatic transceiver in an active mode operating under the power of an energy storage means or in a passive mode under the power generated by a voltage rectifier/regulator when the energy storage means power is too low or if in the case of a desirable low-power operational mode.

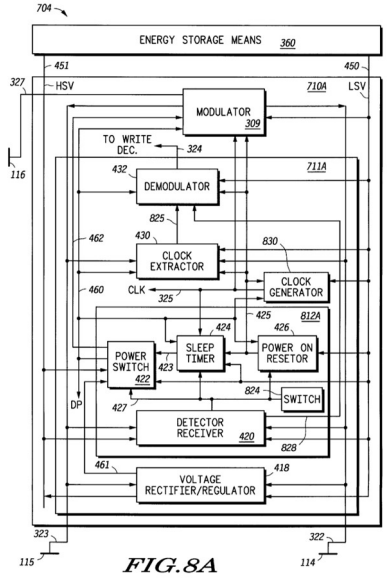
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
4. The mobile device of claim 1 wherein the mobile device comprises a mobile phone.	Vega discloses or renders obvious "[t]he mobile device of claim 1 wherein the mobile device comprises a mobile phone." For example: Vega at 1:37–50 Radio Frequency Identification (RFID) technology allows identification data to be transferred remotely which provides a significant advantage in identifying persons, articles, parcels, and others. In general, to access identification data stored in a RFID transponder (a.k.a. a tag) remotely, a RFID reader generates an energy field to activate the RFID transponder and subsequently to retrieve data stored in the transponder unit from a distance. The data retrieved is then processed by a host computer system to identify the person or article that is associated with the transponder. RFID technology has found a wide range of applications including tracking, access control, theft prevention, security, etc. An example of an application of RFID technology is for article theft prevention in retail stores and libraries. Vega at 3:10–24 Thus it is desirable to have an apparatus, system and method for increasing the read range for an RFID communication system. It is desirable to increase the choices of components available for use in an RFID transponder. It is desirable to further integrate components of an RFID transponder such that manufacturing costs are lowered. Additionally, it is desirable to increase the operational functionality of RFID transponders. It is desirable to reduce interference within an RFID communication system so that more sensitive receivers in an RFID reader may be developed. Additionally, it is desirable to introduce an RFID apparatus, system, and method that is cost-effective, has high manufacturability, and can be easily packaged for a wide range of applications including a disposable RFID tag or transponder. To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.

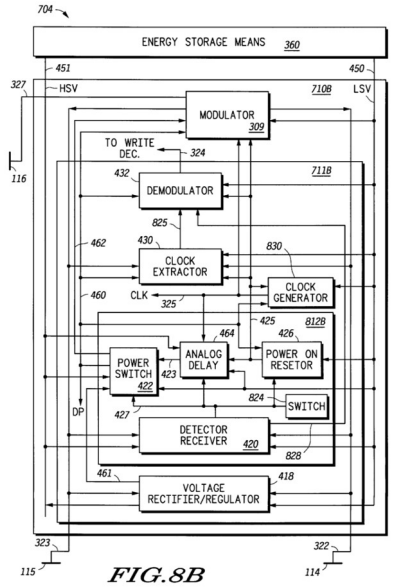
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
5[pre]. A mobile device comprising:	Vega discloses or renders obvious "[a] mobile device." *See* 1[pre] above.
[5a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Vega discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." *See* [1a] above.
[5b] an antenna tuned to operate at 13.56 MHz;	Vega discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." *See* [1b] above.
[5c] an amplifier coupled between the smartcard controller and the antenna, wherein the amplifier is coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller; and	Vega discloses or renders obvious "an amplifier coupled between the smartcard controller and the antenna, wherein the amplifier is coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller." For example: Vega at Abstract > An active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise sources are better filtered out. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Each embodiment of the transceiver circuit has power management features so that power is conserved. Additionally, each transceiver circuit has the ability to operate in a passive mode, when there is insufficient charge in the energy storage means or a lower power mode is desirable. Vega at Figure 3

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG.3* Vega at Figure 4A  *FIG.4A*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 4B  FIG.4B Vega at Figure 4D

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 FIG. 4D Vega at Figure 7  FIG. 7

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 8A  FIG.8A Vega at Figure 8B

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG.8B* Vega at 3:28–45 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that can decrease power consumption. Vega at 4:51–5:7 The present invention includes a method, apparatus and system for providing electrostatic communication utilizing capacitance-based technology with active and passive electrostatic transceivers. Passive electrostatic transceivers derive their power from electrostatic signals being transmitted by an electrostatic

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	reader or other electrostatic signal source. An active electrostatic transceiver has its own internal power source and need not rely on an electrostatic signal source from an electrostatic reader or other source to power up and perform certain functions. Electrostatic communication is accomplished through capacitive coupling which requires no physical contact or wires between a reader and an electrostatic transceiver (a.k.a. electrostatic tag or electrostatic transponder). In the electrostatic communication system, the voltage applied to the capacitively coupled plates is an AC voltage generated by an electric field (i.e. an electrostatic ("ES") field is developed) as opposed to an electromagnetic ("EM") field in order for a charge or signal to be communicated. In short, an electrostatic field is an energy (electrical) field created between two electrodes having a voltage differential. An electrostatic transceiver needs to be in the proximity of the reader, referred to as the read range, in order to have sufficient capacitive coupling to transceive electrostatic signals. Vega at 5:8–25 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means, such as a battery, and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that improve power conservation. Vega at 6:1–22 FIG. 1 illustrates the advantage that an active electrostatic transceiver 104 has over a passive electrostatic transceiver 102. The distance between an electrostatic transceiver and an electrostatic reader where communication may start to occur is referred to as the read range. In FIG. 1 the passive read range 125 between passive ES transceiver 102 and ES reader 101 is significantly smaller than the active read range 126 between active ES transceiver 104 and ES reader 101. This is because an energy storage means within the active electrostatic transceiver 104 allows for active transmission of signals using an amplifier. Because of its passive nature, the passive electrostatic transceiver 102 relies on a load modulation technique for communication of signals by reflecting back the energy of the excitation signal to the

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	electrostatic reader 101. The reflection of the excitation signal requires that the passive electrostatic transceiver 102 be nearer the reader 101. The larger read range provided by reflected ES signals using load modulation or transmitted ES signals using an active transmitter allows the active electrostatic transceiver 104 to be used in other applications of RFID communication systems where a passive electrostatic transceiver 102 would not. Vega at 7:14–56 In general, electrostatic reader 101 generates an electrostatic (electrical) field for use both as a power source for the passive electrostatic transceiver 102 and for transferring information between electrostatic reader 101 and passive electrostatic transceiver 102 or active electrostatic transceiver 104. As such, electrostatic reader 101 electrostatically generates and transmits an excitation signal to the surrounding air, gas, atmosphere or non-electrically conductive medium via the reader's electrostatic electrodes, except for the return path in a monopole system. The excitation signal is an AC signal which activates the passive electrostatic transceiver 102 when it is comes within the capacitance coupling range of reader 101. Upon being sufficiently energized, the passive electrostatic transceiver 102 may respond by electrostatically transmitting a read data signal carrying the information stored in its memory to electrostatic reader 101 (as part of a read operation). Active electrostatic transceiver 104 includes an energy storage means such that it may not require the excitation signal to become sufficiently energized. In accordance to the present invention, reader 101 may also electrostatically couple a write signal to communicate and write information to the passive electrostatic transceiver 102 or active ES transceiver(as part of a write operation). Alternatively, such programming or charging can be carried out by a separate ES programming, ES encoding or electrostatic charger unit (not illustrated). It is to be appreciated that the excitation signal must be generated and transmitted by electrostatic reader 101 to excite the passive electrostatic transceiver 102 or charge the active electrostatic transceiver 104. The excitation signal is an AC energy source and can be a continuous waveform or a varying waveform (i.e. amplitude, frequency, time, etc. of the waveform may vary). Alternatively a user could manually cause the electrostatic reader 101 or a charger to generate the excitation signal to charge or communicate with the passive electrostatic transceiver 102 or active electrostatic transceiver 104 by selecting a button or switch. The reader 101 usually has available a larger power source than the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Thus, the reader 101 has very sensitive receiving and high energy transmission when compared with the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Vega at 8:46–62

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	When in proximity of a reader 101, the active electrostatic transceiver 104 first detects the excitation signal being emitted by an electrostatic reader 101. The excitation signal is generated by reader 101 at a carrier frequency, commonly referred to as a power carrier frequency or exciter frequency. The power carrier frequency, which may be modulated with data, is preferably 125 k Hz. After detecting the excitation signal, the first embodiment of the active electrostatic transceiver 104 goes through a power management sequence and powers up in order to derive a square wave based on the excitation signal at the carrier frequency which is used as a clock signal for the active transceiver. In this manner of generating a clock signal, information received by the active electrostatic transceiver 104 is synchronized with the clock signal. This alleviates generating a clock with a clock oscillator and synchronizing the data and clock using phase-locked loop techniques. Vega at 9:30–60 Now referring to FIG. 4A, a detailed block diagram of components of the analog interface module 301 within the active transceiver 104 is illustrated including digital timing elements. The active electrostatic transceiver 104 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 300, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including an electrochemical storage cell, such as a rechargeable battery or a non-rechargeable battery, or a capacitor, but is preferably a thin foil battery to conform to a form factor of a smart card, tag, or badge. The transceiver circuit 300A as illustrated in FIG. 4A shows the relevant components in the first embodiment of the present invention. In FIG. 4A, the transceiver circuit 300A is illustrated as including the analog interface module 301 and the modulator 309. In FIG. 4A, the relevant components of the analog interface module 301 include a power manager 412A, a DC voltage rectifier/regulator 418, a clock extractor 430, and a demodulator 432. The power manager 412A includes a detector/receiver 420, a power switch 422, a sleep timer 424, and a power-on-resetor (POR) 426. The DC voltage rectifier/regulator 418 includes a rectifier, a voltage regulator and voltage control functionality such that a DC voltage and energy source may be generated from the excitation signal or other signals received by the active electrostatic transceiver 104 and selectively used to power the transceiver 104 or charge the energy storage means 360. The DC voltage rectifier/regulator 418 couples to the power switch 422 for selection and to the energy storage means 360 for charging. Vega at 9:61–10:33 The detector/receiver 420 in the active electrostatic transceiver 104 may receive power directly from the energy storage means 360 in order to be actively listening for an excitation signal from an electrostatic

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	reader 101. Alternatively, the detector/receiver 420 may have passive components sufficient to detect and receive signals when the energy storage means has insufficient energy to power active components. The detector/receiver 420 may have an amplifier for receiving and amplifying the incoming electrostatic signals, a bandpass filter for filtering unwanted frequencies outside a range of the carrier frequency, and a detector for detecting the presence of the carrier frequency in an excitation signal indicating that the transceiver is within the read range of an electrostatic reader 101. The detector may detect a number of oscillations in the received waveform at the carrier frequency indicating that it is not a noise source generating the waveform. In the preferred embodiment, if the detector detects any signal in the band of the carrier it provides an indication signal. Upon detection of the excitation signal, the detector/receiver 420 generates a wakeup signal on signal line 427 indicating that the active electrostatic transceiver 104 is within range of an electrostatic field and that the active electrostatic transceiver 104 needs to go through its wake up procedure. When outside the range of an electrostatic field, the signal line 427 indicates a go to-sleep signal so that the transceiver may go into a low power sleep state. The wakeup signal 427 is provided to the power on resetor 426, the sleep timer 424, the power switch 422 and clock extractor 430. Upon receiving the wakeup signal 427, power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 104 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 104. In FIG. 4A the reset signal line 425 is coupled to the sleep timer 424, the clock extractor 430, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 104. Vega at 10:34–52 The sleep timer 424 of the active electrostatic transceiver of FIG. 4A is a digital counter that counts to a predetermined count value using the clock signal on clock line 325 received from the clock extractor 430. Upon reaching the predetermined count value, the sleep timer 424 turns off active components within the modulator 309. While the sleep timer 424 is counting a transmit signal is indicated on signal line 423. When the sleep timer 424 reaches the predetermined count value, signal line 423 indicates a receive signal and the active electrostatic transceiver powers off the active components within the modulator 309. While in this mode, the transceiver may still use passive components and the load modulators within the modulator 309 to communicate with a reader. Further, while in this mode, the transceiver may receive and respond to encoded write data transmitted by the reader. The predetermined count value is determined based on the time, in number of clock cycles, that it takes for the active electrostatic transceiver to complete a transmission cycle with an electrostatic reader 101.

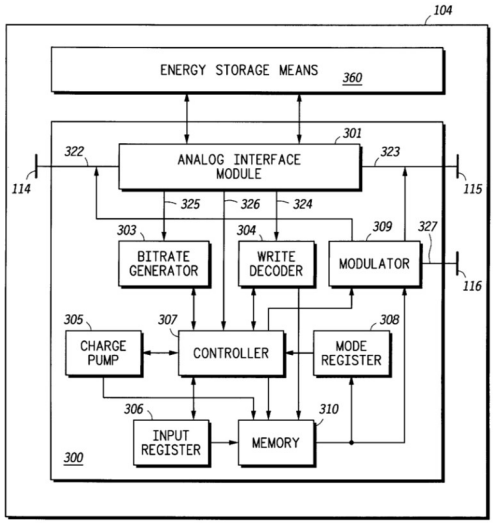
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 10:53–11:6 Referring to FIG. 4B, the power manager 412B includes the detector/receiver 420, the power switch 422, an analog delay block 464, and the power-on-resetor (POR) 426. The digital sleep timer 424 of FIG. 4A is replaced with the analog delay block 464 within the power manager block 412B while other blocks function similar to the description of FIG. 4A. Analog delay block 464 provides an analog delay by using resistor and capacitor elements in conjunction with a threshold detector or comparator. The analog delay block is preferably designed to provide a lengthy delay such as a couple of seconds. The circuitry of the analog delay block is simpler than that of the sleep timer 424. Upon detection of a received signal, the wakeup signal on signal line 427 causes the analog delay block to initiate the RC delay. The transmit signal on signal line 423 is coupled to the power switch 422 and causes it to select power, if available, from the energy storage means 360 for the active transmitter of the modulator 309. Upon completion of the RC delay, a receive signal is indicated on signal line 423 causing the power switch 422 to disconnect power from the active transmitter of the modulator 309. Vega at 11:7–12:16 Power switch 422 is coupled to the detector/receiver 420 through the signal line 427 and to the sleep timer 424 or the analog delay block 464 through the signal line 423. The power switch 422 controls the switching of the high level power supply voltage 451 from the energy storage means 360 or the rectified voltage 461 and provides the analog interface module 301 with the means to manage power consumption. These energy sources may be coupled to the device power line 460 feeding power to other components of the active electrostatic transceiver 104. FIG. 4C illustrates the basic components of the power switch 422 that provide power selection for the active electrostatic transceiver 104. These components include the power analyzer 465, the multiplexor 466 and the multiplexor 469. Multiplexor 469 may optionally be a switch with one end connected to the amplifier power line 462 and another end connected to the device power line 460. Power analyzer 465 performs an analysis on the energy provided by the DC voltage rectifier/regulator 418 with that supplied by the energy storage means 360. The power analyzer 465 receives the rectified voltage 461, the high level supply voltage 451 and the low level supply voltage 450 in order to perform the analysis. Additionally, control signals 423, 427 and any other control signals are received by the power analyzer 465 to further control the multiplexor 466 and multiplexor 469. Signal lines 423 and 427 are exemplary control signals input into the power analyzer 465. Typically, if the energy storage means 360 has higher energy levels it is selectively coupled to the device power line 460 and the amplifier power line 462 when signal line 427 indicates a transmit signal. Optionally when the transceiver 104 is in an active mode for active transmission by amplifier 477 and when signal line 427

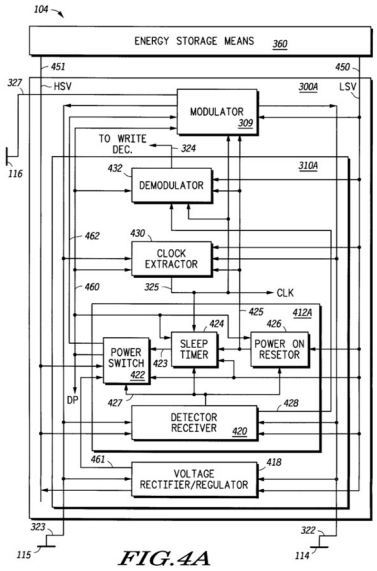
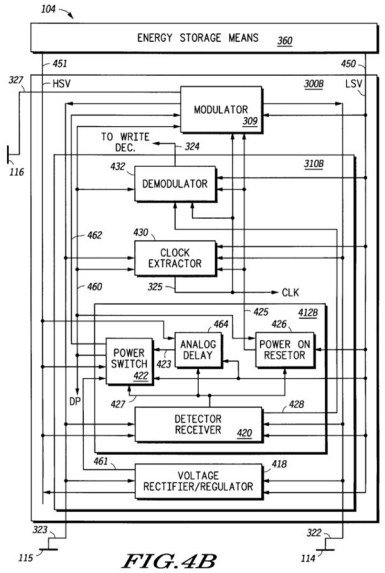
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	indicates a receive signal, the energy storage means may be selectively decoupled from the amplifier power line 462, have the rectified voltage 461 coupled to the amplifier power line 462 or alternatively have no power source coupled to the amplifier power line 462 powering OFF the circuitry of amplifier 477 in each case conserving power in the energy storage means. If it is the case that the energy storage means 360 has lower energy levels than that of the rectified voltage 461, the rectified voltage may be selectively coupled to the device power line 460 by multiplexor 466 and to the amplifier power line 462 by multiplexor 469 such that the load modulator 473 and the amplifier 477 can perform passive load modulation and passive transmission of electrostatic signals in a passive mode. Additionally if it is desirable to conserve power or more efficiently charge the energy storage means, multiplexor 466 or 469 can operate as switches decoupling the device power line 460 or the amplifier power line 462 from any power source. After selecting a power source where the power switch 422 couples the high level power supply 451 or the rectified voltage 461 with the device power line 460, circuitry within the active electrostatic transceiver goes into a power on reset sequence controlled by the power on resetor 426. When out of the power on reset sequence, the active electrostatic transceiver 104 can go through a communication cycle with the electrostatic reader 101 while in the read range and the sleep timer 424 starts counting or the analog delay cycle of the analog delay block 464 begins. If the active electrostatic transceiver remains in the electrostatic field (i.e. read range) and the sleep timer 424 reaches its predetermined count value or the analog delay block completes the predetermined RC delay time, a receive signal is indicated on signal line 423 to the power switch 422. The active electrostatic transceiver 104 continues to listen for signals from reader 101 or other sources that communicate on the carrier frequency. If the active electrostatic transceiver 104 is removed from the electrostatic field, the detector/receiver 420 resets and a sleep signal is indicated on signal line 427. Upon receiving the sleep signal, the power switch 422 selectively disconnects the high level voltage supply 451 from the device power line 460 so that components coupled to the device power line 460 become powered off and enter the sleep mode. In this manner when the active electrostatic transceiver 104 is outside the electrostatic field (i.e. read range) it goes into its low power sleep mode. Vega at 12:60–13:6 Modulator 309 is coupled to the power switch 422 through the device power line 460, the energy storage means 360 through the low level power supply 450, the electrostatic electrodes 114-116 respectively through signal lines 322, 323 and 327, power on resetor 426 through signal line 425, and the clock extractor 430 through clock signal line 325. Modulator 309 includes a load modulator for electrostatic electrodes 114-115 and an active power amplifier in order to amplify signals for the extra transmission distance to the reader over the electrostatic electrode 116. A passive electrostatic transceiver may not

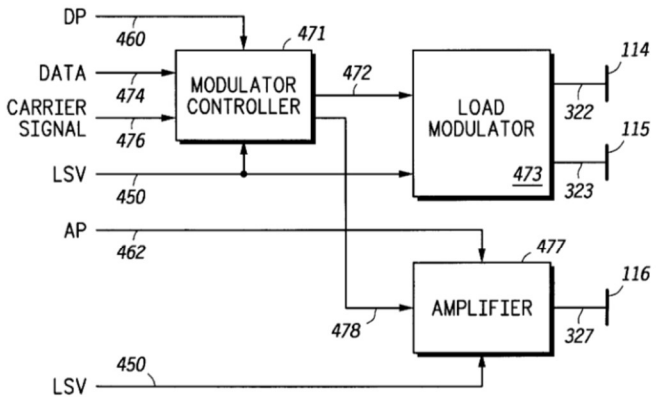
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	function properly at large read ranges because of weak signals. The electrostatic reader's receiver may require increased sensitivity in order to receive signals from large read ranges. Vega at 13:7–14:10 Referring now to FIG. 4D, a block diagram is illustrated of the components within the modulator 309 for active and passive load modulation and active transmission. Active and passive load modulation are accomplished by the modulator controller and the load modulator. Active load modulation occurs when the energy storage means 360 is coupled to the device power line 460 and the circuitry of the modulator controller 471. Passive load modulation occurs when the DC voltage rectifier/regulator within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the device power line 460 and the modulator controller 471. Load modulation is accomplished by varying the impedance between the electrostatic electrodes 114 and 115. Varying the impedance between the electrostatic electrodes, that are capacitively coupled with the electrostatic electrodes of the reader 101, causes the excitation signal generated by the reader 101 to be reflected back. A data signal and a carrier signal is input into the modulator controller 471 at line 474 and 476 respectively to control the load modulator 473. The carrier signal 476 is commonly referred to as the data carrier and has a carrier frequency. Preferably the carrier frequency of the data carrier is 62.5 K Hz or one-half the power carrier frequency. FIG. 4E illustrates a few load modulators 473A-473D. Load modulator 473A consists of a variable impedance 480 coupled between the electrostatic electrodes 114 and 115 that has its impedance varied or switched by control signal 472 from the modulator controller 471. Load modulator 473B includes transistors 481 and 482, each coupled respectively between an electrostatic electrode and the low level supply voltage 450. The transistors are preferably turned ON and OFF by having their gates switched by a digital drive signal supplied on control signal 472. Load modulator 473C includes transistor 483 coupled between the electrostatic electrodes 114 and 115. Transistor 483 is preferably turned ON and OFF by having its gate switched by a digital drive signal supplied on control signal 472. Load modulator 473D includes transistor 484 coupled between one electrostatic electrode 322 and the low level supply voltage 450. This is an asymmetrical load modulation technique where circuitry within a rectifier provides the return path through the opposite electrostatic electrode 323. Referring back to FIG. 4D, active and passive transmission is accomplished by the modulator controller 471 and amplifier 477. Amplifier 477 is preferably a CMOS fully complementary inverter or buffer with its VDD input connected to the amplifier power line 462 and its VSS connection coupled to the low level power supply 450. Active transmission occurs when power is coupled from the high level power supply 451 through the power switch and onto the amplifier power line 462 by multiplexor 469. Passive transmission occurs when the DC voltage rectifier/regulator 418 within the transceiver 104 provides the rectified voltage and is coupled through the

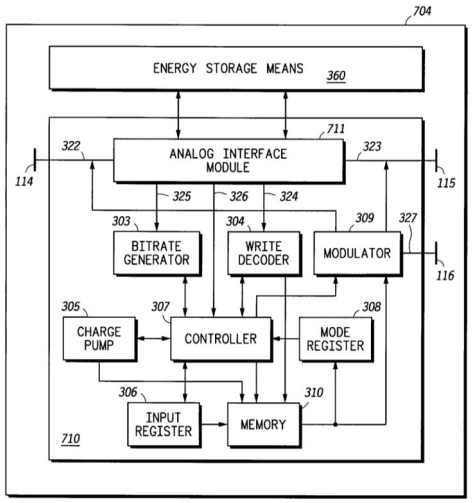
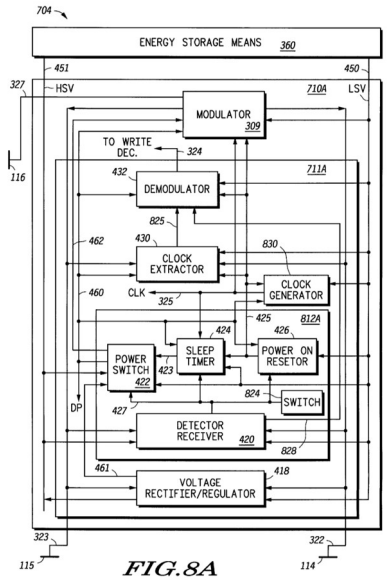
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	power switch to the amplifier power line 462 by multiplexor 469. Multiplexor 469 and 466 can further operate as a switch to selectively turn power OFF to circuitry connected to the device power line 460 or the amplifier power line 462 by turning OFF both of the transistor switches 467-468 or 470 and 475. Data 474 input into the modulator controller 471 is modulated with the input carrier signal 476 to generate the data signal on line 478. Signal line 478 is separate from signal line 472 such that the load modulator 473 and the amplifier 477 can be enabled or disabled independent from one another. Disabling the load modulator 473 or the amplifier 477 may be performed by setting the signal on line 472 or 478 respectively to a high or low DC logic level. The signal on signal line 478 is input into the amplifier 477. The amplifier 477 amplifies the signal on line 478 and transmits the information electrostatically over the electrostatic electrode 116. In active mode, after the transmit time has occurred, the power to the amplifier 477 may be turned OFF to conserve power. Vega at 15:20–37 The analog interface module 711 generally performs the power management function for the active electrostatic transceiver 704. Additionally, it generates its own clock from a free running low power clock oscillator. This generated clock is provided to other components of the active electrostatic transceiver 704 which require a clock including the bitrate generator 303. The analog interface module 711 also demodulates the received signal to generate a received data stream. The analog interface module 711 also analyzes the received data stream in order to determine if the active electrostatic transceiver 704 should perform some operation such as a read operation or a write operation and communicates the results of the analysis to the controller 307 and the write decoder 304. It preferably performs this analysis by searching for predetermined gaps in the received data stream. Modulator 309 as previously described in detail communicates information from the active electrostatic transceiver to a reader. Vega at 15:38–61 Now referring to FIG. 8A, selected details of the analog interface module 711 within the active electrostatic transceiver 704 are illustrated. The active electrostatic transceiver 704 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 710, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including a battery or capacitor, preferably it is a thin foil battery to conform to a form factor for a smart card, tag, or badge. The transceiver circuit 710 as illustrated in FIG. 8A shows the relevant components for the second embodiment of the present invention. In FIG. 8A, the transceiver circuit 710 includes the analog interface module 711 and modulator 309. Components of the analog interface module 711 include a DC voltage rectifier/regulator 418, a power manager 812A, a clock

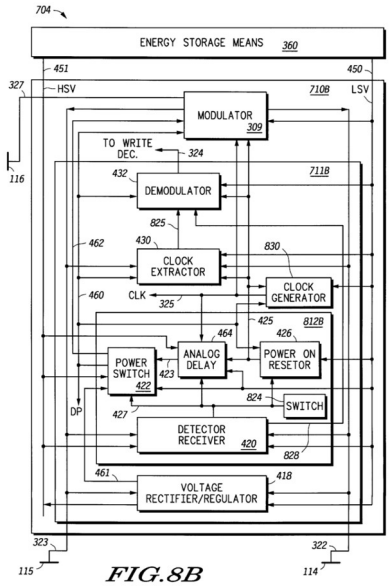
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	extractor 430, a clock generator 830, a demodulator 432, and a modulator 309. The power manager 812A includes a detector/receiver 420, a power switch 422, a sleep timer 424, a power-on-resetor (POR) 426, and a manual switch 824. Except as otherwise described below, like numbered components of the transceiver circuit 710 operate similar to the similarly numbered components of the transceiver circuit 300 of the active electrostatic transceiver 104. Vega at 15:62–16:8 In the second embodiment of the present invention the active electrostatic transceiver 704 may not receive an excitation signal from which to extract a clock signal, particularly when coupled to the reader 601 of FIG. 6A. Thus, the transceiver circuit 710 includes its own clock generator 830. A clock extractor 430 is retained to generate an extracted clock 825 for demodulation of signals that may be received from readers other than reader 601. Clock generator 830 receives power by coupling to the device power line 460 and the low level power supply 450. Clock generator 830 has its own low power clock oscillator in order to generate a clock. The clock signal on clock line 325 is provided to the sleep timer 424 amongst other components of the transceiver circuit 710. Vega at 16:36–48 Power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 704 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 704. In FIG. 8A the reset signal line 425 is coupled to the sleep timer 424, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. In FIG. 8B, the reset signal line 425 is coupled to the analog delay block 464, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. Vega at 16:53–17:8 The present invention has many advantages over the prior art. The present invention provides a larger read range over passive RFID communication systems and therefore increases the applicability of electrostatic communication systems. Additionally, the present invention provides for greater flexibility in choosing components for an electrostatic transceiver. Also, the present invention provides greater operational functionality in an electrostatic transceiver because the available power is greater. Furthermore, the present invention provides for greater integration in circuitry and reduces the amount space utilized for an active electrostatic transceiver. Additionally the present invention in its second embodiment reduces the interference and noise in an electrostatic communication system so that it may be used in environments

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	requiring low noise emission. The present invention provides for lower cost RFID transceivers such that disposable applications are possible. Furthermore, the present invention provides the capability to operate an active electrostatic transceiver in an active mode operating under the power of an energy storage means or in a passive mode under the power generated by a voltage rectifier/regulator when the energy storage means power is too low or if in the case of a desirable low-power operational mode. *See also* [1c] above. To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[5d] a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna.	Vega discloses or renders obvious "a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna." For example: Vega at Figure 3  *FIG.3* Vega at Figure 4A

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 FIG.4A Vega at Figure 4B  FIG.4B

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 4D  FIG. 4D Vega at Figure 7

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG. 7* Vega at Figure 8A  *FIG. 8A*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 8B  FIG.8B Vega at 3:28–45 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that can decrease power consumption. Vega at 4:14–16

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	FIG. 4D is a block diagram of components of the modulator block within the active electrostatic transceiver of FIG. 3. Vega at 4:17–18 FIG. 4E are schematic diagrams of load modulation circuitry of the load modulator. Vega at 4:51–5:7 The present invention includes a method, apparatus and system for providing electrostatic communication utilizing capacitance-based technology with active and passive electrostatic transceivers. Passive electrostatic transceivers derive their power from electrostatic signals being transmitted by an electrostatic reader or other electrostatic signal source. An active electrostatic transceiver has its own internal power source and need not rely on an electrostatic signal source from an electrostatic reader or other source to power up and perform certain functions. Electrostatic communication is accomplished through capacitive coupling which requires no physical contact or wires between a reader and an electrostatic transceiver (a.k.a. electrostatic tag or electrostatic transponder). In the electrostatic communication system, the voltage applied to the capacitively coupled plates is an AC voltage generated by an electric field (i.e. an electrostatic ("ES") field is developed) as opposed to an electromagnetic ("EM") field in order for a charge or signal to be communicated. In short, an electrostatic field is an energy (electrical) field created between two electrodes having a voltage differential. An electrostatic transceiver needs to be in the proximity of the reader, referred to as the read range, in order to have sufficient capacitive coupling to transceive electrostatic signals. Vega at 5:8–25 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means, such as a battery, and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that improve power conservation.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 6:1–22 FIG. 1 illustrates the advantage that an active electrostatic transceiver 104 has over a passive electrostatic transceiver 102. The distance between an electrostatic transceiver and an electrostatic reader where communication may start to occur is referred to as the read range. In FIG. 1 the passive read range 125 between passive ES transceiver 102 and ES reader 101 is significantly smaller than the active read range 126 between active ES transceiver 104 and ES reader 101. This is because an energy storage means within the active electrostatic transceiver 104 allows for active transmission of signals using an amplifier. Because of its passive nature, the passive electrostatic transceiver 102 relies on a load modulation technique for communication of signals by reflecting back the energy of the excitation signal to the electrostatic reader 101. The reflection of the excitation signal requires that the passive electrostatic transceiver 102 be nearer the reader 101. The larger read range provided by reflected ES signals using load modulation or transmitted ES signals using an active transmitter allows the active electrostatic transceiver 104 to be used in other applications of RFID communication systems where a passive electrostatic transceiver 102 would not. Vega at 6:23–33 An active electrostatic transceiver 104 is not simply formed by adding an energy storage means to the passive electrostatic transceiver 102. Components of a passive electrostatic transceiver require modification, particularly in the area of power management. The power or energy of an energy storage means must be conserved and properly managed in order for the active electrostatic transceiver to have greater utility. Additionally noise must be properly filtered out to avoid false signal detection and power inadvertently being applied to circuits within the active electrostatic transceiver in order to more properly conserve power. Vega at 7:14–56 In general, electrostatic reader 101 generates an electrostatic (electrical) field for use both as a power source for the passive electrostatic transceiver 102 and for transferring information between electrostatic reader 101 and passive electrostatic transceiver 102 or active electrostatic transceiver 104. As such, electrostatic reader 101 electrostatically generates and transmits an excitation signal to the surrounding air, gas, atmosphere or non-electrically conductive medium via the reader's electrostatic electrodes, except for the return path in a monopole system. The excitation signal is an AC signal which activates the passive electrostatic transceiver 102 when it is comes within the capacitance coupling range of reader 101. Upon being sufficiently energized, the passive electrostatic transceiver 102 may respond by electrostatically transmitting a read data signal carrying the information stored in its memory to electrostatic reader 101 (as

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	part of a read operation). Active electrostatic transceiver 104 includes an energy storage means such that it may not require the excitation signal to become sufficiently energized. In accordance to the present invention, reader 101 may also electrostatically couple a write signal to communicate and write information to the passive electrostatic transceiver 102 or active ES transceiver(as part of a write operation). Alternatively, such programming or charging can be carried out by a separate ES programming, ES encoding or electrostatic charger unit (not illustrated). It is to be appreciated that the excitation signal must be generated and transmitted by electrostatic reader 101 to excite the passive electrostatic transceiver 102 or charge the active electrostatic transceiver 104. The excitation signal is an AC energy source and can be a continuous waveform or a varying waveform (i.e. amplitude, frequency, time, etc. of the waveform may vary). Alternatively a user could manually cause the electrostatic reader 101 or a charger to generate the excitation signal to charge or communicate with the passive electrostatic transceiver 102 or active electrostatic transceiver 104 by selecting a button or switch. The reader 101 usually has available a larger power source than the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Thus, the reader 101 has very sensitive receiving and high energy transmission when compared with the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Vega at 7:57–8:17 Reference is now made to FIG. 3 illustrating in greater detail the components of a first embodiment of the active electrostatic transceiver 104. As shown in FIG. 3, transceiver 104 may include a circuit 300 having an analog interface module 301, a bitrate generator 303, a write decoder 304, an optional charge pump 305, an input register 306, a controller 307, a mode register 308, a modulator 309, a memory 310, and electrostatic electrodes 114-116. As previously discussed, electrostatic electrodes 114 and 115 receive electrostatic signals from the electrostatic reader 101 and may communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 116 and 115 may also communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 114 and electrostatic electrode 115 are coupled to the analog interface module 301 over the bidirectional signal lines 322 and 333 respectively. The analog interface module 301 couples to the bitrate generator 303 through the clock signal line 325. Analog interface module 301 couples to the controller 307 through the control signal lines 326 and to the write decoder 304 through the data in signal line 324. The modulator 309 couples to the electrostatic electrode 114 and electrostatic electrode 115 by signal lines 322 and 333 respectively. Additionally, the modulator 309 couples to the electrostatic electrode 116 by signal line 327. For optimum electrostatic performance, it is desirable to keep the parasitic capacitance measured between signal lines 322 and 323 as small as possible.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 8:18–45 Controller 307 controls the functionality of the transceiver 104 in conjunction with the analog interface module 301. Controller 307 couples to nearly all components of the active electrostatic transceiver 104 except for the electrostatic electrodes and pads. Memory 310 may be a volatile memory requiring a constant supply of energy or a non-volatile memory such as an EEPROM memory or ferro-electric memory that retains its information when power is no longer supplied. In the case of EEPROM memory, the optional charge pump 305 may be required in order to boost the power supply voltage to write data into the EEPROM memory. Input register 306 temporarily stores information that is to be written into memory 310. It may need to store the information due to a delay in the write cycle caused by the charge pump 305 pumping up or other reasons. In any case, storing data into the input register 306 allows the controller 307 to process other information for the transceiver 104. Mode register 308 reads configuration information for the active electrostatic transceiver 104 from memory 310 and provides this to the controller 307. Write decoder 304 analyzes a data sequence being received by the electrostatic transceiver 104 and determines whether the transceiver should go into a write mode or whether it needs to remain in a receive mode. Modulator 309 prepares data read from memory 310 for communication by the active electrostatic transceiver 104. Modulator 309 can encode and modulate data read from memory 310 in a number of ways for communication with the reader 101. Vega at 9:30–60 Now referring to FIG. 4A, a detailed block diagram of components of the analog interface module 301 within the active transceiver 104 is illustrated including digital timing elements. The active electrostatic transceiver 104 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 300, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including an electrochemical storage cell, such as a rechargeable battery or a non-rechargeable battery, or a capacitor, but is preferably a thin foil battery to conform to a form factor of a smart card, tag, or badge. The transceiver circuit 300A as illustrated in FIG. 4A shows the relevant components in the first embodiment of the present invention. In FIG. 4A, the transceiver circuit 300A is illustrated as including the analog interface module 301 and the modulator 309. In FIG. 4A, the relevant components of the analog interface module 301 include a power manager 412A, a DC voltage rectifier/regulator 418, a clock extractor 430, and a demodulator 432. The power manager 412A includes a detector/receiver 420, a power switch 422, a sleep timer 424, and a power-on-resetor (POR) 426. The DC voltage rectifier/regulator 418 includes a rectifier, a voltage regulator and voltage control functionality such that a DC voltage and energy source may be generated

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	from the excitation signal or other signals received by the active electrostatic transceiver 104 and selectively used to power the transceiver 104 or charge the energy storage means 360. The DC voltage rectifier/regulator 418 couples to the power switch 422 for selection and to the energy storage means 360 for charging. Vega at 9:61–10:33 The detector/receiver 420 in the active electrostatic transceiver 104 may receive power directly from the energy storage means 360 in order to be actively listening for an excitation signal from an electrostatic reader 101. Alternatively, the detector/receiver 420 may have passive components sufficient to detect and receive signals when the energy storage means has insufficient energy to power active components. The detector/receiver 420 may have an amplifier for receiving and amplifying the incoming electrostatic signals, a bandpass filter for filtering unwanted frequencies outside a range of the carrier frequency, and a detector for detecting the presence of the carrier frequency in an excitation signal indicating that the transceiver is within the read range of an electrostatic reader 101. The detector may detect a number of oscillations in the received waveform at the carrier frequency indicating that it is not a noise source generating the waveform. In the preferred embodiment, if the detector detects any signal in the band of the carrier it provides an indication signal. Upon detection of the excitation signal, the detector/receiver 420 generates a wakeup signal on signal line 427 indicating that the active electrostatic transceiver 104 is within range of an electrostatic field and that the active electrostatic transceiver 104 needs to go through its wake up procedure. When outside the range of an electrostatic field, the signal line 427 indicates a go to-sleep signal so that the transceiver may go into a low power sleep state. The wakeup signal 427 is provided to the power on resetor 426, the sleep timer 424, the power switch 422 and clock extractor 430. Upon receiving the wakeup signal 427, power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 104 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 104. In FIG. 4A the reset signal line 425 is coupled to the sleep timer 424, the clock extractor 430, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 104. Vega at 10:34–52 The sleep timer 424 of the active electrostatic transceiver of FIG. 4A is a digital counter that counts to a predetermined count value using the clock signal on clock line 325 received from the clock extractor 430. Upon reaching the predetermined count value, the sleep timer 424 turns off active components within the

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	modulator 309. While the sleep timer 424 is counting a transmit signal is indicated on signal line 423. When the sleep timer 424 reaches the predetermined count value, signal line 423 indicates a receive signal and the active electrostatic transceiver powers off the active components within the modulator 309. While in this mode, the transceiver may still use passive components and the load modulators within the modulator 309 to communicate with a reader. Further, while in this mode, the transceiver may receive and respond to encoded write data transmitted by the reader. The predetermined count value is determined based on the time, in number of clock cycles, that it takes for the active electrostatic transceiver to complete a transmission cycle with an electrostatic reader 101. Vega at 10:53–11:6 Referring to FIG. 4B, the power manager 412B includes the detector/receiver 420, the power switch 422, an analog delay block 464, and the power-on-resetor (POR) 426. The digital sleep timer 424 of FIG. 4A is replaced with the analog delay block 464 within the power manager block 412B while other blocks function similar to the description of FIG. 4A. Analog delay block 464 provides an analog delay by using resistor and capacitor elements in conjunction with a threshold detector or comparator. The analog delay block is preferably designed to provide a lengthy delay such as a couple of seconds. The circuitry of the analog delay block is simpler than that of the sleep timer 424. Upon detection of a received signal, the wakeup signal on signal line 427 causes the analog delay block to initiate the RC delay. The transmit signal on signal line 423 is coupled to the power switch 422 and causes it to select power, if available, from the energy storage means 360 for the active transmitter of the modulator 309. Upon completion of the RC delay, a receive signal is indicated on signal line 423 causing the power switch 422 to disconnect power from the active transmitter of the modulator 309. Vega at 11:7–12:16 Power switch 422 is coupled to the detector/receiver 420 through the signal line 427 and to the sleep timer 424 or the analog delay block 464 through the signal line 423. The power switch 422 controls the switching of the high level power supply voltage 451 from the energy storage means 360 or the rectified voltage 461 and provides the analog interface module 301 with the means to manage power consumption. These energy sources may be coupled to the device power line 460 feeding power to other components of the active electrostatic transceiver 104. FIG. 4C illustrates the basic components of the power switch 422 that provide power selection for the active electrostatic transceiver 104. These components include the power analyzer 465, the multiplexor 466 and the multiplexor 469. Multiplexor 469 may optionally be a switch with one end connected to the amplifier power line 462 and another end connected to the device power line 460. Power analyzer 465 performs an analysis on the energy provided by the DC voltage

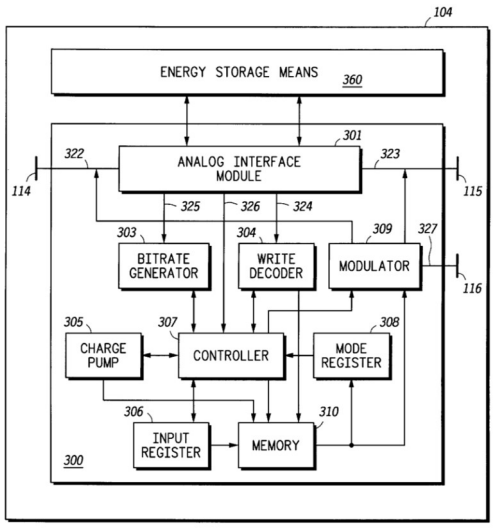
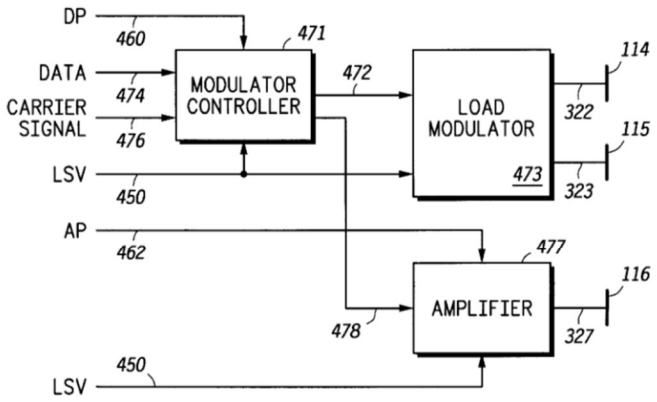
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	rectifier/regulator 418 with that supplied by the energy storage means 360. The power analyzer 465 receives the rectified voltage 461, the high level supply voltage 451 and the low level supply voltage 450 in order to perform the analysis. Additionally, control signals 423, 427 and any other control signals are received by the power analyzer 465 to further control the multiplexor 466 and multiplexor 469. Signal lines 423 and 427 are exemplary control signals input into the power analyzer 465. Typically, if the energy storage means 360 has higher energy levels it is selectively coupled to the device power line 460 and the amplifier power line 462 when signal line 427 indicates a transmit signal. Optionally when the transceiver 104 is in an active mode for active transmission by amplifier 477 and when signal line 427 indicates a receive signal, the energy storage means may be selectively decoupled from the amplifier power line 462, have the rectified voltage 461 coupled to the amplifier power line 462 or alternatively have no power source coupled to the amplifier power line 462 powering OFF the circuitry of amplifier 477 in each case conserving power in the energy storage means. If it is the case that the energy storage means 360 has lower energy levels than that of the rectified voltage 461, the rectified voltage may be selectively coupled to the device power line 460 by multiplexor 466 and to the amplifier power line 462 by multiplexor 469 such that the load modulator 473 and the amplifier 477 can perform passive load modulation and passive transmission of electrostatic signals in a passive mode. Additionally if it is desirable to conserve power or more efficiently charge the energy storage means, multiplexor 466 or 469 can operate as switches decoupling the device power line 460 or the amplifier power line 462 from any power source. After selecting a power source where the power switch 422 couples the high level power supply 451 or the rectified voltage 461 with the device power line 460, circuitry within the active electrostatic transceiver goes into a power on reset sequence controlled by the power on resetor 426. When out of the power on reset sequence, the active electrostatic transceiver 104 can go through a communication cycle with the electrostatic reader 101 while in the read range and the sleep timer 424 starts counting or the analog delay cycle of the analog delay block 464 begins. If the active electrostatic transceiver remains in the electrostatic field (i.e. read range) and the sleep timer 424 reaches its predetermined count value or the analog delay block completes the predetermined RC delay time, a receive signal is indicated on signal line 423 to the power switch 422. The active electrostatic transceiver 104 continues to listen for signals from reader 101 or other sources that communicate on the carrier frequency. If the active electrostatic transceiver 104 is removed from the electrostatic field, the detector/receiver 420 resets and a sleep signal is indicated on signal line 427. Upon receiving the sleep signal, the power switch 422 selectively disconnects the high level voltage supply 451 from the device power line 460 so that components coupled to the device power line 460 become powered off and enter the sleep mode. In this manner when the active electrostatic transceiver 104 is outside the electrostatic field (i.e. read range) it goes into its low power sleep mode.

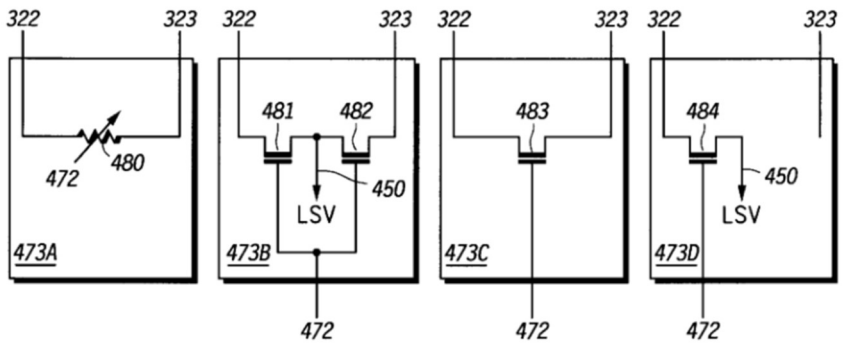
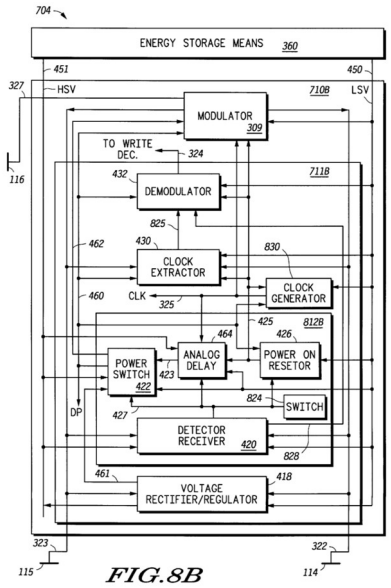
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 12:60–13:6 Modulator 309 is coupled to the power switch 422 through the device power line 460, the energy storage means 360 through the low level power supply 450, the electrostatic electrodes 114-116 respectively through signal lines 322, 323 and 327, power on resetor 426 through signal line 425, and the clock extractor 430 through clock signal line 325. Modulator 309 includes a load modulator for electrostatic electrodes 114-115 and an active power amplifier in order to amplify signals for the extra transmission distance to the reader over the electrostatic electrode 116. A passive electrostatic transceiver may not function properly at large read ranges because of weak signals. The electrostatic reader's receiver may require increased sensitivity in order to receive signals from large read ranges. Vega at 13:7–14:10 Referring now to FIG. 4D, a block diagram is illustrated of the components within the modulator 309 for active and passive load modulation and active transmission. Active and passive load modulation are accomplished by the modulator controller and the load modulator. Active load modulation occurs when the energy storage means 360 is coupled to the device power line 460 and the circuitry of the modulator controller 471. Passive load modulation occurs when the DC voltage rectifier/regulator within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the device power line 460 and the modulator controller 471. Load modulation is accomplished by varying the impedance between the electrostatic electrodes 114 and 115. Varying the impedance between the electrostatic electrodes, that are capacitively coupled with the electrostatic electrodes of the reader 101, causes the excitation signal generated by the reader 101 to be reflected back. A data signal and a carrier signal is input into the modulator controller 471 at line 474 and 476 respectively to control the load modulator 473. The carrier signal 476 is commonly referred to as the data carrier and has a carrier frequency. Preferably the carrier frequency of the data carrier is 62.5 K Hz or one-half the power carrier frequency. FIG. 4E illustrates a few load modulators 473A-473D. Load modulator 473A consists of a variable impedance 480 coupled between the electrostatic electrodes 114 and 115 that has its impedance varied or switched by control signal 472 from the modulator controller 471. Load modulator 473B includes transistors 481 and 482, each coupled respectively between an electrostatic electrode and the low level supply voltage 450. The transistors are preferably turned ON and OFF by having their gates switched by a digital drive signal supplied on control signal 472. Load modulator 473C includes transistor 483 coupled between the electrostatic electrodes 114 and 115. Transistor 483 is preferably turned ON and OFF by having its gate switched by a digital drive signal supplied on control signal 472. Load modulator 473D includes transistor 484 coupled between one electrostatic electrode 322 and the low level supply

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	voltage 450. This is an asymmetrical load modulation technique where circuitry within a rectifier provides the return path through the opposite electrostatic electrode 323. Referring back to FIG. 4D, active and passive transmission is accomplished by the modulator controller 471 and amplifier 477. Amplifier 477 is preferably a CMOS fully complementary inverter or buffer with its VDD input connected to the amplifier power line 462 and its VSS connection coupled to the low level power supply 450. Active transmission occurs when power is coupled from the high level power supply 451 through the power switch and onto the amplifier power line 462 by multiplexor 469. Passive transmission occurs when the DC voltage rectifier/regulator 418 within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the amplifier power line 462 by multiplexor 469. Multiplexor 469 and 466 can further operate as a switch to selectively turn power OFF to circuitry connected to the device power line 460 or the amplifier power line 462 by turning OFF both of the transistor switches 467-468 or 470 and 475. Data 474 input into the modulator controller 471 is modulated with the input carrier signal 476 to generate the data signal on line 478. Signal line 478 is separate from signal line 472 such that the load modulator 473 and the amplifier 477 can be enabled or disabled independent from one another. Disabling the load modulator 473 or the amplifier 477 may be performed by setting the signal on line 472 or 478 respectively to a high or low DC logic level. The signal on signal line 478 is input into the amplifier 477. The amplifier 477 amplifies the signal on line 478 and transmits the information electrostatically over the electrostatic electrode 116. In active mode, after the transmit time has occurred, the power to the amplifier 477 may be turned OFF to conserve power. Vega at 15:20–37 The analog interface module 711 generally performs the power management function for the active electrostatic transceiver 704. Additionally, it generates its own clock from a free running low power clock oscillator. This generated clock is provided to other components of the active electrostatic transceiver 704 which require a clock including the bitrate generator 303. The analog interface module 711 also demodulates the received signal to generate a received data stream. The analog interface module 711 also analyzes the received data stream in order to determine if the active electrostatic transceiver 704 should perform some operation such as a read operation or a write operation and communicates the results of the analysis to the controller 307 and the write decoder 304. It preferably performs this analysis by searching for predetermined gaps in the received data stream. Modulator 309 as previously described in detail communicates information from the active electrostatic transceiver to a reader. Vega at 15:38–61

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Now referring to FIG. 8A, selected details of the analog interface module 711 within the active electrostatic transceiver 704 are illustrated. The active electrostatic transceiver 704 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 710, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including a battery or capacitor, preferably it is a thin foil battery to conform to a form factor for a smart card, tag, or badge. The transceiver circuit 710 as illustrated in FIG. 8A shows the relevant components for the second embodiment of the present invention. In FIG. 8A, the transceiver circuit 710 includes the analog interface module 711 and modulator 309. Components of the analog interface module 711 include a DC voltage rectifier/regulator 418, a power manager 812A, a clock extractor 430, a clock generator 830, a demodulator 432, and a modulator 309. The power manager 812A includes a detector/receiver 420, a power switch 422, a sleep timer 424, a power-on-resetor (POR) 426, and a manual switch 824. Except as otherwise described below, like numbered components of the transceiver circuit 710 operate similar to the similarly numbered components of the transceiver circuit 300 of the active electrostatic transceiver 104. Vega at 16:36–48 Power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 704 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 704. In FIG. 8A the reset signal line 425 is coupled to the sleep timer 424, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. In FIG. 8B, the reset signal line 425 is coupled to the analog delay block 464, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. Vega at 16:53–17:8 The present invention has many advantages over the prior art. The present invention provides a larger read range over passive RFID communication systems and therefore increases the applicability of electrostatic communication systems. Additionally, the present invention provides for greater flexibility in choosing components for an electrostatic transceiver. Also, the present invention provides greater operational functionality in an electrostatic transceiver because the available power is greater. Furthermore, the present invention provides for greater integration in circuitry and reduces the amount space utilized for an active electrostatic transceiver. Additionally the present invention in its second embodiment reduces the interference and noise in an electrostatic communication system so that it may be used in environments

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	requiring low noise emission. The present invention provides for lower cost RFID transceivers such that disposable applications are possible. Furthermore, the present invention provides the capability to operate an active electrostatic transceiver in an active mode operating under the power of an energy storage means or in a passive mode under the power generated by a voltage rectifier/regulator when the energy storage means power is too low or if in the case of a desirable low-power operational mode. *See also* [1c] above. To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
6. The mobile device of claim 5 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Vega discloses or renders obvious "[t]he mobile device of claim 5 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." *See* claim 2 above. *See also* claim 5 above.
7. The mobile device of claim 5 wherein the smartcard controller is coupled to be powered by the mobile device.	Vega discloses or renders obvious "[t]he mobile device of claim 5 wherein the smartcard controller is coupled to be powered by the mobile device." *See* claim 3 above. *See also* claim 5 above.
8. The mobile device of claim 5 wherein the transmit circuit comprises a load modulation circuit.	Vega discloses or renders obvious "[t]he mobile device of claim 5 wherein the transmit circuit comprises a load modulation circuit." For example: Vega at Figure 3

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG.3* Vega at Figure 4D  *FIG.4D*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 4E  *FIG.4E* Vega at Figure 8B  *FIG.8B*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 4:17–18 FIG. 4E are schematic diagrams of load modulation circuitry of the load modulator. Vega at 6:1–22 FIG. 1 illustrates the advantage that an active electrostatic transceiver 104 has over a passive electrostatic transceiver 102. The distance between an electrostatic transceiver and an electrostatic reader where communication may start to occur is referred to as the read range. In FIG. 1 the passive read range 125 between passive ES transceiver 102 and ES reader 101 is significantly smaller than the active read range 126 between active ES transceiver 104 and ES reader 101. This is because an energy storage means within the active electrostatic transceiver 104 allows for active transmission of signals using an amplifier. Because of its passive nature, the passive electrostatic transceiver 102 relies on a load modulation technique for communication of signals by reflecting back the energy of the excitation signal to the electrostatic reader 101. The reflection of the excitation signal requires that the passive electrostatic transceiver 102 be nearer the reader 101. The larger read range provided by reflected ES signals using load modulation or transmitted ES signals using an active transmitter allows the active electrostatic transceiver 104 to be used in other applications of RFID communication systems where a passive electrostatic transceiver 102 would not. Vega at 7:14–56 In general, electrostatic reader 101 generates an electrostatic (electrical) field for use both as a power source for the passive electrostatic transceiver 102 and for transferring information between electrostatic reader 101 and passive electrostatic transceiver 102 or active electrostatic transceiver 104. As such, electrostatic reader 101 electrostatically generates and transmits an excitation signal to the surrounding air, gas, atmosphere or non-electrically conductive medium via the reader's electrostatic electrodes, except for the return path in a monopole system. The excitation signal is an AC signal which activates the passive electrostatic transceiver 102 when it is comes within the capacitance coupling range of reader 101. Upon being sufficiently energized, the passive electrostatic transceiver 102 may respond by electrostatically transmitting a read data signal carrying the information stored in its memory to electrostatic reader 101 (as part of a read operation). Active electrostatic transceiver 104 includes an energy storage means such that it may not require the excitation signal to become sufficiently energized. In accordance to the present invention, reader 101 may also electrostatically couple a write signal to communicate and write information to the passive electrostatic transceiver 102 or active ES transceiver(as part of a write operation). Alternatively, such programming or charging can be carried out by a separate ES programming, ES encoding or electrostatic charger unit (not illustrated). It is to be appreciated that the

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	excitation signal must be generated and transmitted by electrostatic reader 101 to excite the passive electrostatic transceiver 102 or charge the active electrostatic transceiver 104. The excitation signal is an AC energy source and can be a continuous waveform or a varying waveform (i.e. amplitude, frequency, time, etc. of the waveform may vary). Alternatively a user could manually cause the electrostatic reader 101 or a charger to generate the excitation signal to charge or communicate with the passive electrostatic transceiver 102 or active electrostatic transceiver 104 by selecting a button or switch. The reader 101 usually has available a larger power source than the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Thus, the reader 101 has very sensitive receiving and high energy transmission when compared with the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Vega at 7:57–8:17 Reference is now made to FIG. 3 illustrating in greater detail the components of a first embodiment of the active electrostatic transceiver 104. As shown in FIG. 3, transceiver 104 may include a circuit 300 having an analog interface module 301, a bitrate generator 303, a write decoder 304, an optional charge pump 305, an input register 306, a controller 307, a mode register 308, a modulator 309, a memory 310, and electrostatic electrodes 114-116. As previously discussed, electrostatic electrodes 114 and 115 receive electrostatic signals from the electrostatic reader 101 and may communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 116 and 115 may also communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 114 and electrostatic electrode 115 are coupled to the analog interface module 301 over the bidirectional signal lines 322 and 333 respectively. The analog interface module 301 couples to the bitrate generator 303 through the clock signal line 325. Analog interface module 301 couples to the controller 307 through the control signal lines 326 and to the write decoder 304 through the data in signal line 324. The modulator 309 couples to the electrostatic electrode 114 and electrostatic electrode 115 by signal lines 322 and 333 respectively. Additionally, the modulator 309 couples to the electrostatic electrode 116 by signal line 327. For optimum electrostatic performance, it is desirable to keep the parasitic capacitance measured between signal lines 322 and 323 as small as possible. Vega at 9:30–60 Now referring to FIG. 4A, a detailed block diagram of components of the analog interface module 301 within the active transceiver 104 is illustrated including digital timing elements. The active electrostatic transceiver 104 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 300, and an energy storage means 360. The energy

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	storage means 360 can be any type of energy storage means, including an electrochemical storage cell, such as a rechargeable battery or a non-rechargeable battery, or a capacitor, but is preferably a thin foil battery to conform to a form factor of a smart card, tag, or badge. The transceiver circuit 300A as illustrated in FIG. 4A shows the relevant components in the first embodiment of the present invention. In FIG. 4A, the transceiver circuit 300A is illustrated as including the analog interface module 301 and the modulator 309. In FIG. 4A, the relevant components of the analog interface module 301 include a power manager 412A, a DC voltage rectifier/regulator 418, a clock extractor 430, and a demodulator 432. The power manager 412A includes a detector/receiver 420, a power switch 422, a sleep timer 424, and a power-on-resetor (POR) 426. The DC voltage rectifier/regulator 418 includes a rectifier, a voltage regulator and voltage control functionality such that a DC voltage and energy source may be generated from the excitation signal or other signals received by the active electrostatic transceiver 104 and selectively used to power the transceiver 104 or charge the energy storage means 360. The DC voltage rectifier/regulator 418 couples to the power switch 422 for selection and to the energy storage means 360 for charging. Vega at 9:61–10:33 The detector/receiver 420 in the active electrostatic transceiver 104 may receive power directly from the energy storage means 360 in order to be actively listening for an excitation signal from an electrostatic reader 101. Alternatively, the detector/receiver 420 may have passive components sufficient to detect and receive signals when the energy storage means has insufficient energy to power active components. The detector/receiver 420 may have an amplifier for receiving and amplifying the incoming electrostatic signals, a bandpass filter for filtering unwanted frequencies outside a range of the carrier frequency, and a detector for detecting the presence of the carrier frequency in an excitation signal indicating that the transceiver is within the read range of an electrostatic reader 101. The detector may detect a number of oscillations in the received waveform at the carrier frequency indicating that it is not a noise source generating the waveform. In the preferred embodiment, if the detector detects any signal in the band of the carrier it provides an indication signal. Upon detection of the excitation signal, the detector/receiver 420 generates a wakeup signal on signal line 427 indicating that the active electrostatic transceiver 104 is within range of an electrostatic field and that the active electrostatic transceiver 104 needs to go through its wake up procedure. When outside the range of an electrostatic field, the signal line 427 indicates a go to-sleep signal so that the transceiver may go into a low power sleep state. The wakeup signal 427 is provided to the power on resetor 426, the sleep timer 424, the power switch 422 and clock extractor 430. Upon receiving the wakeup signal 427, power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 104

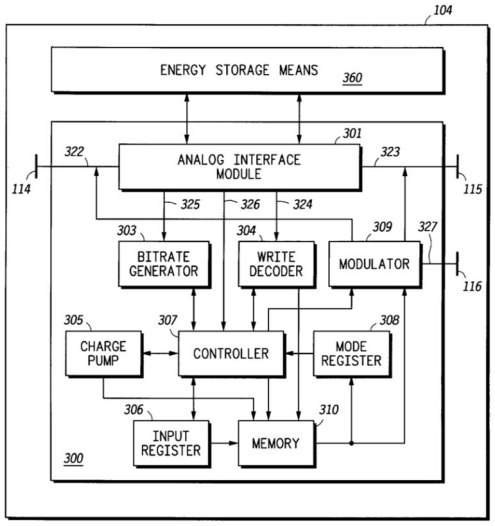
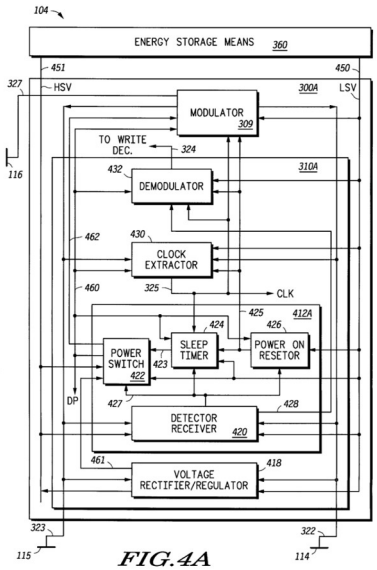
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 104. In FIG. 4A the reset signal line 425 is coupled to the sleep timer 424, the clock extractor 430, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 104. Vega at 10:34–52 The sleep timer 424 of the active electrostatic transceiver of FIG. 4A is a digital counter that counts to a predetermined count value using the clock signal on clock line 325 received from the clock extractor 430. Upon reaching the predetermined count value, the sleep timer 424 turns off active components within the modulator 309. While the sleep timer 424 is counting a transmit signal is indicated on signal line 423. When the sleep timer 424 reaches the predetermined count value, signal line 423 indicates a receive signal and the active electrostatic transceiver powers off the active components within the modulator 309. While in this mode, the transceiver may still use passive components and the load modulators within the modulator 309 to communicate with a reader. Further, while in this mode, the transceiver may receive and respond to encoded write data transmitted by the reader. The predetermined count value is determined based on the time, in number of clock cycles, that it takes for the active electrostatic transceiver to complete a transmission cycle with an electrostatic reader 101. Vega at 11:7–12:16 Power switch 422 is coupled to the detector/receiver 420 through the signal line 427 and to the sleep timer 424 or the analog delay block 464 through the signal line 423. The power switch 422 controls the switching of the high level power supply voltage 451 from the energy storage means 360 or the rectified voltage 461 and provides the analog interface module 301 with the means to manage power consumption. These energy sources may be coupled to the device power line 460 feeding power to other components of the active electrostatic transceiver 104. FIG. 4C illustrates the basic components of the power switch 422 that provide power selection for the active electrostatic transceiver 104. These components include the power analyzer 465, the multiplexor 466 and the multiplexor 469. Multiplexor 469 may optionally be a switch with one end connected to the amplifier power line 462 and another end connected to the device power line 460. Power analyzer 465 performs an analysis on the energy provided by the DC voltage rectifier/regulator 418 with that supplied by the energy storage means 360. The power analyzer 465 receives the rectified voltage 461, the high level supply voltage 451 and the low level supply voltage 450 in order to perform the analysis. Additionally, control signals 423, 427 and any other control signals are received by the power analyzer 465 to further control the multiplexor 466 and multiplexor 469. Signal

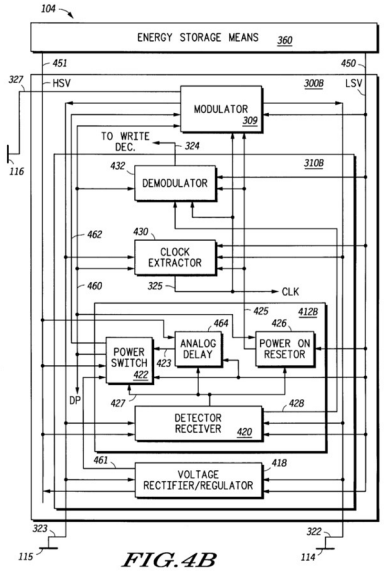
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	lines 423 and 427 are exemplary control signals input into the power analyzer 465. Typically, if the energy storage means 360 has higher energy levels it is selectively coupled to the device power line 460 and the amplifier power line 462 when signal line 427 indicates a transmit signal. Optionally when the transceiver 104 is in an active mode for active transmission by amplifier 477 and when signal line 427 indicates a receive signal, the energy storage means may be selectively decoupled from the amplifier power line 462, have the rectified voltage 461 coupled to the amplifier power line 462 or alternatively have no power source coupled to the amplifier power line 462 powering OFF the circuitry of amplifier 477 in each case conserving power in the energy storage means. If it is the case that the energy storage means 360 has lower energy levels than that of the rectified voltage 461, the rectified voltage may be selectively coupled to the device power line 460 by multiplexor 466 and to the amplifier power line 462 by multiplexor 469 such that the load modulator 473 and the amplifier 477 can perform passive load modulation and passive transmission of electrostatic signals in a passive mode. Additionally if it is desirable to conserve power or more efficiently charge the energy storage means, multiplexor 466 or 469 can operate as switches decoupling the device power line 460 or the amplifier power line 462 from any power source. After selecting a power source where the power switch 422 couples the high level power supply 451 or the rectified voltage 461 with the device power line 460, circuitry within the active electrostatic transceiver goes into a power on reset sequence controlled by the power on resetor 426. When out of the power on reset sequence, the active electrostatic transceiver 104 can go through a communication cycle with the electrostatic reader 101 while in the read range and the sleep timer 424 starts counting or the analog delay cycle of the analog delay block 464 begins. If the active electrostatic transceiver remains in the electrostatic field (i.e. read range) and the sleep timer 424 reaches its predetermined count value or the analog delay block completes the predetermined RC delay time, a receive signal is indicated on signal line 423 to the power switch 422. The active electrostatic transceiver 104 continues to listen for signals from reader 101 or other sources that communicate on the carrier frequency. If the active electrostatic transceiver 104 is removed from the electrostatic field, the detector/receiver 420 resets and a sleep signal is indicated on signal line 427. Upon receiving the sleep signal, the power switch 422 selectively disconnects the high level voltage supply 451 from the device power line 460 so that components coupled to the device power line 460 become powered off and enter the sleep mode. In this manner when the active electrostatic transceiver 104 is outside the electrostatic field (i.e. read range) it goes into its low power sleep mode. Vega at 12:60–13:6 Modulator 309 is coupled to the power switch 422 through the device power line 460, the energy storage means 360 through the low level power supply 450, the electrostatic electrodes 114-116 respectively

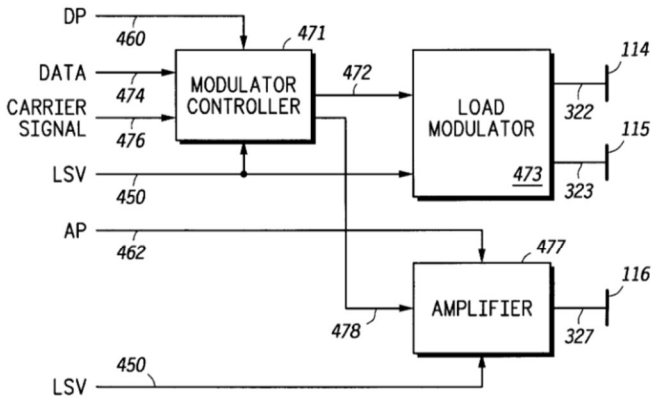
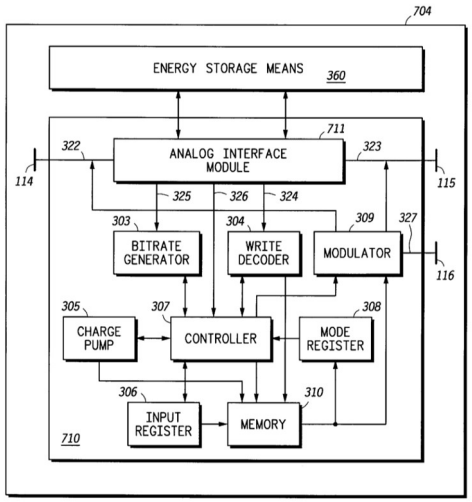
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	through signal lines 322, 323 and 327, power on resetor 426 through signal line 425, and the clock extractor 430 through clock signal line 325. Modulator 309 includes a load modulator for electrostatic electrodes 114-115 and an active power amplifier in order to amplify signals for the extra transmission distance to the reader over the electrostatic electrode 116. A passive electrostatic transceiver may not function properly at large read ranges because of weak signals. The electrostatic reader's receiver may require increased sensitivity in order to receive signals from large read ranges. Vega at 13:7–14:10 Referring now to FIG. 4D, a block diagram is illustrated of the components within the modulator 309 for active and passive load modulation and active transmission. Active and passive load modulation are accomplished by the modulator controller and the load modulator. Active load modulation occurs when the energy storage means 360 is coupled to the device power line 460 and the circuitry of the modulator controller 471. Passive load modulation occurs when the DC voltage rectifier/regulator within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the device power line 460 and the modulator controller 471. Load modulation is accomplished by varying the impedance between the electrostatic electrodes 114 and 115. Varying the impedance between the electrostatic electrodes, that are capacitively coupled with the electrostatic electrodes of the reader 101, causes the excitation signal generated by the reader 101 to be reflected back. A data signal and a carrier signal is input into the modulator controller 471 at line 474 and 476 respectively to control the load modulator 473. The carrier signal 476 is commonly referred to as the data carrier and has a carrier frequency. Preferably the carrier frequency of the data carrier is 62.5 K Hz or one-half the power carrier frequency. FIG. 4E illustrates a few load modulators 473A-473D. Load modulator 473A consists of a variable impedance 480 coupled between the electrostatic electrodes 114 and 115 that has its impedance varied or switched by control signal 472 from the modulator controller 471. Load modulator 473B includes transistors 481 and 482, each coupled respectively between an electrostatic electrode and the low level supply voltage 450. The transistors are preferably turned ON and OFF by having their gates switched by a digital drive signal supplied on control signal 472. Load modulator 473C includes transistor 483 coupled between the electrostatic electrodes 114 and 115. Transistor 483 is preferably turned ON and OFF by having its gate switched by a digital drive signal supplied on control signal 472. Load modulator 473D includes transistor 484 coupled between one electrostatic electrode 322 and the low level supply voltage 450. This is an asymmetrical load modulation technique where circuitry within a rectifier provides the return path through the opposite electrostatic electrode 323. Referring back to FIG. 4D, active and passive transmission is accomplished by the modulator controller 471 and amplifier 477. Amplifier 477 is preferably a CMOS fully complementary inverter or buffer with its VDD input connected to the amplifier

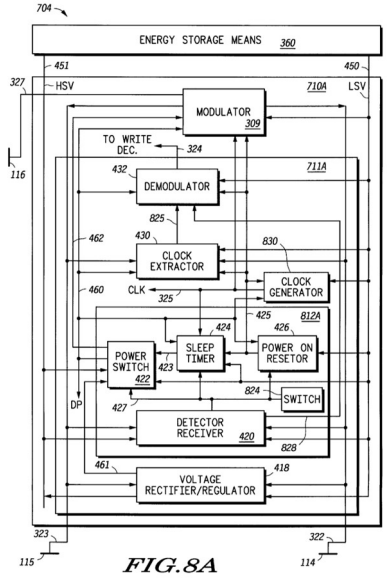
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	power line 462 and its VSS connection coupled to the low level power supply 450. Active transmission occurs when power is coupled from the high level power supply 451 through the power switch and onto the amplifier power line 462 by multiplexor 469. Passive transmission occurs when the DC voltage rectifier/regulator 418 within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the amplifier power line 462 by multiplexor 469. Multiplexor 469 and 466 can further operate as a switch to selectively turn power OFF to circuitry connected to the device power line 460 or the amplifier power line 462 by turning OFF both of the transistor switches 467-468 or 470 and 475. Data 474 input into the modulator controller 471 is modulated with the input carrier signal 476 to generate the data signal on line 478. Signal line 478 is separate from signal line 472 such that the load modulator 473 and the amplifier 477 can be enabled or disabled independent from one another. Disabling the load modulator 473 or the amplifier 477 may be performed by setting the signal on line 472 or 478 respectively to a high or low DC logic level. The signal on signal line 478 is input into the amplifier 477. The amplifier 477 amplifies the signal on line 478 and transmits the information electrostatically over the electrostatic electrode 116. In active mode, after the transmit time has occurred, the power to the amplifier 477 may be turned OFF to conserve power. Vega at 14:11–44 Now referring to FIG. 5, a waveform diagram illustrates the exemplary current consumption for the active electrostatic transceiver 104 in various power managed levels. In FIG. 5 the logarithm of current consumption 500 is plotted against time 501. The idealized waveform 502 illustrates the current consumption from the energy storage means 360 during various operating conditions and states of the active electrostatic transceiver 104. In an out of range or out of electrostatic field state during time 503, the active electrostatic transceiver is in a sleep state which is its lowest current consumption state at current level 504. In this condition nearly all circuitry in the active transceiver 104 is turned off except for the detector/receiver 420. In sleep mode, the current consumption of current level 504 is preferably on the order of eight hundred nanoamps. When in the read range or the range of the electrostatic field during time 513, the current consumption level is at least at level 508 which is at all times greater than the out of read range mode illustrated during time 503. During a communication cycle of transmission and reception by the active electrostatic transceiver, such as time 513, the current consumption is relatively large compared to the sleep mode when outside of the read range. During periods of transmission, such as time 507, current consumption is at its highest level 510. During the receive time period, such as time 509, current consumption is at level 508 which is less than that of the transmission current consumption level 510. Time period 507 is exemplary of the predetermined count value for the sleep timer 424 or the RC delay time of the analog delay block 464. After performing a transmission phase during time 507, the

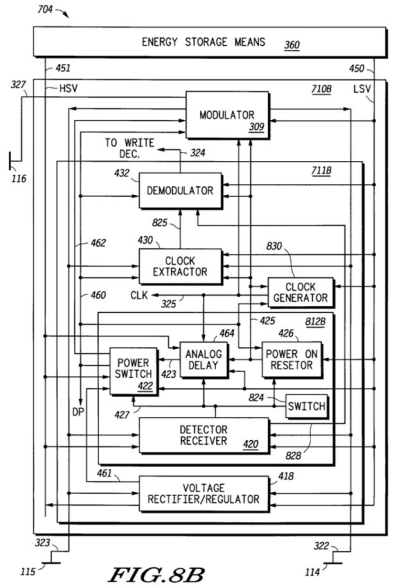
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	active electrostatic transceiver goes into a receive phase during time 509. If transceiver is closely coupled to reader, transceiver data can be detected by reader when the active transceiver is passively load modulating. *See also* Vega at 16:53–17:8. To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 5 above.
9. The mobile device of claim 5 wherein the transmit circuit comprises an active transmit driver.	Vega discloses or renders obvious "[t]he mobile device of claim 5 wherein the transmit circuit comprises an active transmit driver." For example: Vega at Abstract An active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise sources are better filtered out. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Each embodiment of the transceiver circuit has power management features so that power is conserved. Additionally, each transceiver circuit has the ability to operate in a passive mode, when there is insufficient charge in the energy storage means or a lower power mode is desirable. Vega at Figure 3

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG.3* Vega at Figure 4A  *FIG.4A*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 4B  FIG.4B Vega at Figure 4D

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 FIG. 4D Vega at Figure 7  FIG. 7

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 8A  FIG.8A Vega at Figure 8B

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG.8B* Vega at 3:28–45 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that can decrease power consumption. Vega at 4:14–16 FIG. 4D is a block diagram of components of the modulator block within the active electrostatic transceiver of FIG. 3.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 4:17–18 FIG. 4E are schematic diagrams of load modulation circuitry of the load modulator. Vega at 4:51–5:7 The present invention includes a method, apparatus and system for providing electrostatic communication utilizing capacitance-based technology with active and passive electrostatic transceivers. Passive electrostatic transceivers derive their power from electrostatic signals being transmitted by an electrostatic reader or other electrostatic signal source. An active electrostatic transceiver has its own internal power source and need not rely on an electrostatic signal source from an electrostatic reader or other source to power up and perform certain functions. Electrostatic communication is accomplished through capacitive coupling which requires no physical contact or wires between a reader and an electrostatic transceiver (a.k.a. electrostatic tag or electrostatic transponder). In the electrostatic communication system, the voltage applied to the capacitively coupled plates is an AC voltage generated by an electric field (i.e. an electrostatic ("ES") field is developed) as opposed to an electromagnetic ("EM") field in order for a charge or signal to be communicated. In short, an electrostatic field is an energy (electrical) field created between two electrodes having a voltage differential. An electrostatic transceiver needs to be in the proximity of the reader, referred to as the read range, in order to have sufficient capacitive coupling to transceive electrostatic signals. Vega at 5:8–25 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means, such as a battery, and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that improve power conservation. Vega at 6:1–22

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	FIG. 1 illustrates the advantage that an active electrostatic transceiver 104 has over a passive electrostatic transceiver 102. The distance between an electrostatic transceiver and an electrostatic reader where communication may start to occur is referred to as the read range. In FIG. 1 the passive read range 125 between passive ES transceiver 102 and ES reader 101 is significantly smaller than the active read range 126 between active ES transceiver 104 and ES reader 101. This is because an energy storage means within the active electrostatic transceiver 104 allows for active transmission of signals using an amplifier. Because of its passive nature, the passive electrostatic transceiver 102 relies on a load modulation technique for communication of signals by reflecting back the energy of the excitation signal to the electrostatic reader 101. The reflection of the excitation signal requires that the passive electrostatic transceiver 102 be nearer the reader 101. The larger read range provided by reflected ES signals using load modulation or transmitted ES signals using an active transmitter allows the active electrostatic transceiver 104 to be used in other applications of RFID communication systems where a passive electrostatic transceiver 102 would not. Vega at 6:23–33 An active electrostatic transceiver 104 is not simply formed by adding an energy storage means to the passive electrostatic transceiver 102. Components of a passive electrostatic transceiver require modification, particularly in the area of power management. The power or energy of an energy storage means must be conserved and properly managed in order for the active electrostatic transceiver to have greater utility. Additionally noise must be properly filtered out to avoid false signal detection and power inadvertently being applied to circuits within the active electrostatic transceiver in order to more properly conserve power. Vega at 7:14–56 In general, electrostatic reader 101 generates an electrostatic (electrical) field for use both as a power source for the passive electrostatic transceiver 102 and for transferring information between electrostatic reader 101 and passive electrostatic transceiver 102 or active electrostatic transceiver 104. As such, electrostatic reader 101 electrostatically generates and transmits an excitation signal to the surrounding air, gas, atmosphere or non-electrically conductive medium via the reader's electrostatic electrodes, except for the return path in a monopole system. The excitation signal is an AC signal which activates the passive electrostatic transceiver 102 when it is comes within the capacitance coupling range of reader 101. Upon being sufficiently energized, the passive electrostatic transceiver 102 may respond by electrostatically transmitting a read data signal carrying the information stored in its memory to electrostatic reader 101 (as part of a read operation). Active electrostatic transceiver 104 includes an energy storage means such that it

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	may not require the excitation signal to become sufficiently energized. In accordance to the present invention, reader 101 may also electrostatically couple a write signal to communicate and write information to the passive electrostatic transceiver 102 or active ES transceiver(as part of a write operation). Alternatively, such programming or charging can be carried out by a separate ES programming, ES encoding or electrostatic charger unit (not illustrated). It is to be appreciated that the excitation signal must be generated and transmitted by electrostatic reader 101 to excite the passive electrostatic transceiver 102 or charge the active electrostatic transceiver 104. The excitation signal is an AC energy source and can be a continuous waveform or a varying waveform (i.e. amplitude, frequency, time, etc. of the waveform may vary). Alternatively a user could manually cause the electrostatic reader 101 or a charger to generate the excitation signal to charge or communicate with the passive electrostatic transceiver 102 or active electrostatic transceiver 104 by selecting a button or switch. The reader 101 usually has available a larger power source than the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Thus, the reader 101 has very sensitive receiving and high energy transmission when compared with the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Vega at 7:57–8:17 Reference is now made to FIG. 3 illustrating in greater detail the components of a first embodiment of the active electrostatic transceiver 104. As shown in FIG. 3, transceiver 104 may include a circuit 300 having an analog interface module 301, a bitrate generator 303, a write decoder 304, an optional charge pump 305, an input register 306, a controller 307, a mode register 308, a modulator 309, a memory 310, and electrostatic electrodes 114-116. As previously discussed, electrostatic electrodes 114 and 115 receive electrostatic signals from the electrostatic reader 101 and may communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 116 and 115 may also communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 114 and electrostatic electrode 115 are coupled to the analog interface module 301 over the bidirectional signal lines 322 and 333 respectively. The analog interface module 301 couples to the bitrate generator 303 through the clock signal line 325. Analog interface module 301 couples to the controller 307 through the control signal lines 326 and to the write decoder 304 through the data in signal line 324. The modulator 309 couples to the electrostatic electrode 114 and electrostatic electrode 115 by signal lines 322 and 333 respectively. Additionally, the modulator 309 couples to the electrostatic electrode 116 by signal line 327. For optimum electrostatic performance, it is desirable to keep the parasitic capacitance measured between signal lines 322 and 323 as small as possible.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 8:18–45 Controller 307 controls the functionality of the transceiver 104 in conjunction with the analog interface module 301. Controller 307 couples to nearly all components of the active electrostatic transceiver 104 except for the electrostatic electrodes and pads. Memory 310 may be a volatile memory requiring a constant supply of energy or a non-volatile memory such as an EEPROM memory or ferro-electric memory that retains its information when power is no longer supplied. In the case of EEPROM memory, the optional charge pump 305 may be required in order to boost the power supply voltage to write data into the EEPROM memory. Input register 306 temporarily stores information that is to be written into memory 310. It may need to store the information due to a delay in the write cycle caused by the charge pump 305 pumping up or other reasons. In any case, storing data into the input register 306 allows the controller 307 to process other information for the transceiver 104. Mode register 308 reads configuration information for the active electrostatic transceiver 104 from memory 310 and provides this to the controller 307. Write decoder 304 analyzes a data sequence being received by the electrostatic transceiver 104 and determines whether the transceiver should go into a write mode or whether it needs to remain in a receive mode. Modulator 309 prepares data read from memory 310 for communication by the active electrostatic transceiver 104. Modulator 309 can encode and modulate data read from memory 310 in a number of ways for communication with the reader 101. Vega at 8:46–62 When in proximity of a reader 101, the active electrostatic transceiver 104 first detects the excitation signal being emitted by an electrostatic reader 101. The excitation signal is generated by reader 101 at a carrier frequency, commonly referred to as a power carrier frequency or exciter frequency. The power carrier frequency, which may be modulated with data, is preferably 125 k Hz. After detecting the excitation signal, the first embodiment of the active electrostatic transceiver 104 goes through a power management sequence and powers up in order to derive a square wave based on the excitation signal at the carrier frequency which is used as a clock signal for the active transceiver. In this manner of generating a clock signal, information received by the active electrostatic transceiver 104 is synchronized with the clock signal. This alleviates generating a clock with a clock oscillator and synchronizing the data and clock using phase-locked loop techniques. Vega at 9:30–60 Now referring to FIG. 4A, a detailed block diagram of components of the analog interface module 301 within the active transceiver 104 is illustrated including digital timing elements. The active electrostatic transceiver 104 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	third electrostatic electrode 116, the transceiver circuit 300, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including an electrochemical storage cell, such as a rechargeable battery or a non-rechargeable battery, or a capacitor, but is preferably a thin foil battery to conform to a form factor of a smart card, tag, or badge. The transceiver circuit 300A as illustrated in FIG. 4A shows the relevant components in the first embodiment of the present invention. In FIG. 4A, the transceiver circuit 300A is illustrated as including the analog interface module 301 and the modulator 309. In FIG. 4A, the relevant components of the analog interface module 301 include a power manager 412A, a DC voltage rectifier/regulator 418, a clock extractor 430, and a demodulator 432. The power manager 412A includes a detector/receiver 420, a power switch 422, a sleep timer 424, and a power-on-resetor (POR) 426. The DC voltage rectifier/regulator 418 includes a rectifier, a voltage regulator and voltage control functionality such that a DC voltage and energy source may be generated from the excitation signal or other signals received by the active electrostatic transceiver 104 and selectively used to power the transceiver 104 or charge the energy storage means 360. The DC voltage rectifier/regulator 418 couples to the power switch 422 for selection and to the energy storage means 360 for charging. Vega at 9:61–10:33 The detector/receiver 420 in the active electrostatic transceiver 104 may receive power directly from the energy storage means 360 in order to be actively listening for an excitation signal from an electrostatic reader 101. Alternatively, the detector/receiver 420 may have passive components sufficient to detect and receive signals when the energy storage means has insufficient energy to power active components. The detector/receiver 420 may have an amplifier for receiving and amplifying the incoming electrostatic signals, a bandpass filter for filtering unwanted frequencies outside a range of the carrier frequency, and a detector for detecting the presence of the carrier frequency in an excitation signal indicating that the transceiver is within the read range of an electrostatic reader 101. The detector may detect a number of oscillations in the received waveform at the carrier frequency indicating that it is not a noise source generating the waveform. In the preferred embodiment, if the detector detects any signal in the band of the carrier it provides an indication signal. Upon detection of the excitation signal, the detector/receiver 420 generates a wakeup signal on signal line 427 indicating that the active electrostatic transceiver 104 is within range of an electrostatic field and that the active electrostatic transceiver 104 needs to go through its wake up procedure. When outside the range of an electrostatic field, the signal line 427 indicates a go to-sleep signal so that the transceiver may go into a low power sleep state. The wakeup signal 427 is provided to the power on resetor 426, the sleep timer 424, the power switch 422 and clock extractor 430. Upon receiving the wakeup signal 427, power on resetor 426 monitors the device power line 460 to be

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	sure that sufficient power is available to other components within the active electrostatic transceiver 104 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 104. In FIG. 4A the reset signal line 425 is coupled to the sleep timer 424, the clock extractor 430, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 104. Vega at 10:34–52 The sleep timer 424 of the active electrostatic transceiver of FIG. 4A is a digital counter that counts to a predetermined count value using the clock signal on clock line 325 received from the clock extractor 430. Upon reaching the predetermined count value, the sleep timer 424 turns off active components within the modulator 309. While the sleep timer 424 is counting a transmit signal is indicated on signal line 423. When the sleep timer 424 reaches the predetermined count value, signal line 423 indicates a receive signal and the active electrostatic transceiver powers off the active components within the modulator 309. While in this mode, the transceiver may still use passive components and the load modulators within the modulator 309 to communicate with a reader. Further, while in this mode, the transceiver may receive and respond to encoded write data transmitted by the reader. The predetermined count value is determined based on the time, in number of clock cycles, that it takes for the active electrostatic transceiver to complete a transmission cycle with an electrostatic reader 101. Vega at 10:53–11:6 Referring to FIG. 4B, the power manager 412B includes the detector/receiver 420, the power switch 422, an analog delay block 464, and the power-on-resetor (POR) 426. The digital sleep timer 424 of FIG. 4A is replaced with the analog delay block 464 within the power manager block 412B while other blocks function similar to the description of FIG. 4A. Analog delay block 464 provides an analog delay by using resistor and capacitor elements in conjunction with a threshold detector or comparator. The analog delay block is preferably designed to provide a lengthy delay such as a couple of seconds. The circuitry of the analog delay block is simpler than that of the sleep timer 424. Upon detection of a received signal, the wakeup signal on signal line 427 causes the analog delay block to initiate the RC delay. The transmit signal on signal line 423 is coupled to the power switch 422 and causes it to select power, if available, from the energy storage means 360 for the active transmitter of the modulator 309. Upon completion of the RC delay, a receive signal is indicated on signal line 423 causing the power switch 422 to disconnect power from the active transmitter of the modulator 309. Vega at 11:7–12:16

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Power switch 422 is coupled to the detector/receiver 420 through the signal line 427 and to the sleep timer 424 or the analog delay block 464 through the signal line 423. The power switch 422 controls the switching of the high level power supply voltage 451 from the energy storage means 360 or the rectified voltage 461 and provides the analog interface module 301 with the means to manage power consumption. These energy sources may be coupled to the device power line 460 feeding power to other components of the active electrostatic transceiver 104. FIG. 4C illustrates the basic components of the power switch 422 that provide power selection for the active electrostatic transceiver 104. These components include the power analyzer 465, the multiplexor 466 and the multiplexor 469. Multiplexor 469 may optionally be a switch with one end connected to the amplifier power line 462 and another end connected to the device power line 460. Power analyzer 465 performs an analysis on the energy provided by the DC voltage rectifier/regulator 418 with that supplied by the energy storage means 360. The power analyzer 465 receives the rectified voltage 461, the high level supply voltage 451 and the low level supply voltage 450 in order to perform the analysis. Additionally, control signals 423, 427 and any other control signals are received by the power analyzer 465 to further control the multiplexor 466 and multiplexor 469. Signal lines 423 and 427 are exemplary control signals input into the power analyzer 465. Typically, if the energy storage means 360 has higher energy levels it is selectively coupled to the device power line 460 and the amplifier power line 462 when signal line 427 indicates a transmit signal. Optionally when the transceiver 104 is in an active mode for active transmission by amplifier 477 and when signal line 427 indicates a receive signal, the energy storage means may be selectively decoupled from the amplifier power line 462, have the rectified voltage 461 coupled to the amplifier power line 462 or alternatively have no power source coupled to the amplifier power line 462 powering OFF the circuitry of amplifier 477 in each case conserving power in the energy storage means. If it is the case that the energy storage means 360 has lower energy levels than that of the rectified voltage 461, the rectified voltage may be selectively coupled to the device power line 460 by multiplexor 466 and to the amplifier power line 462 by multiplexor 469 such that the load modulator 473 and the amplifier 477 can perform passive load modulation and passive transmission of electrostatic signals in a passive mode. Additionally if it is desirable to conserve power or more efficiently charge the energy storage means, multiplexor 466 or 469 can operate as switches decoupling the device power line 460 or the amplifier power line 462 from any power source. After selecting a power source where the power switch 422 couples the high level power supply 451 or the rectified voltage 461 with the device power line 460, circuitry within the active electrostatic transceiver goes into a power on reset sequence controlled by the power on resetor 426. When out of the power on reset sequence, the active electrostatic transceiver 104 can go through a communication cycle with the electrostatic reader 101 while in the read range and the sleep timer 424 starts counting or the analog delay cycle of the analog delay block 464 begins. If the active electrostatic

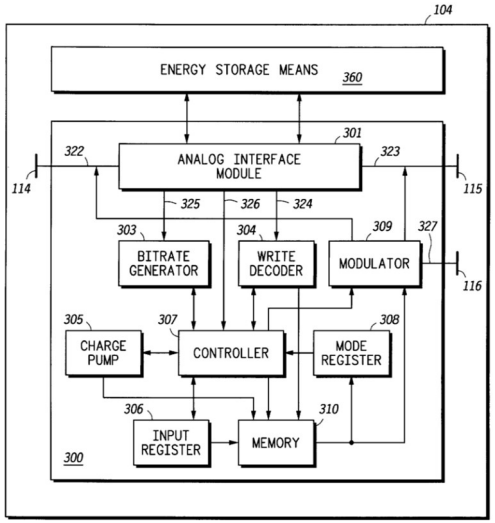
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	transceiver remains in the electrostatic field (i.e. read range) and the sleep timer 424 reaches its predetermined count value or the analog delay block completes the predetermined RC delay time, a receive signal is indicated on signal line 423 to the power switch 422. The active electrostatic transceiver 104 continues to listen for signals from reader 101 or other sources that communicate on the carrier frequency. If the active electrostatic transceiver 104 is removed from the electrostatic field, the detector/receiver 420 resets and a sleep signal is indicated on signal line 427. Upon receiving the sleep signal, the power switch 422 selectively disconnects the high level voltage supply 451 from the device power line 460 so that components coupled to the device power line 460 become powered off and enter the sleep mode. In this manner when the active electrostatic transceiver 104 is outside the electrostatic field (i.e. read range) it goes into its low power sleep mode. Vega at 12:60–13:6 Modulator 309 is coupled to the power switch 422 through the device power line 460, the energy storage means 360 through the low level power supply 450, the electrostatic electrodes 114-116 respectively through signal lines 322, 323 and 327, power on resetor 426 through signal line 425, and the clock extractor 430 through clock signal line 325. Modulator 309 includes a load modulator for electrostatic electrodes 114-115 and an active power amplifier in order to amplify signals for the extra transmission distance to the reader over the electrostatic electrode 116. A passive electrostatic transceiver may not function properly at large read ranges because of weak signals. The electrostatic reader's receiver may require increased sensitivity in order to receive signals from large read ranges. Vega at 13:7–14:10 Referring now to FIG. 4D, a block diagram is illustrated of the components within the modulator 309 for active and passive load modulation and active transmission. Active and passive load modulation are accomplished by the modulator controller and the load modulator. Active load modulation occurs when the energy storage means 360 is coupled to the device power line 460 and the circuitry of the modulator controller 471. Passive load modulation occurs when the DC voltage rectifier/regulator within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the device power line 460 and the modulator controller 471. Load modulation is accomplished by varying the impedance between the electrostatic electrodes 114 and 115. Varying the impedance between the electrostatic electrodes, that are capacitively coupled with the electrostatic electrodes of the reader 101, causes the excitation signal generated by the reader 101 to be reflected back. A data signal and a carrier signal is input into the modulator controller 471 at line 474 and 476 respectively to control the load modulator 473. The carrier signal 476 is commonly referred to as the data carrier and has a carrier

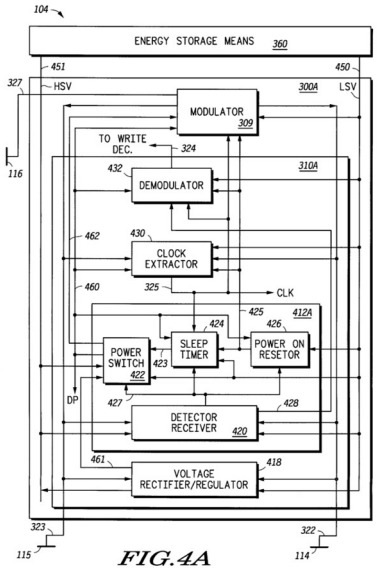
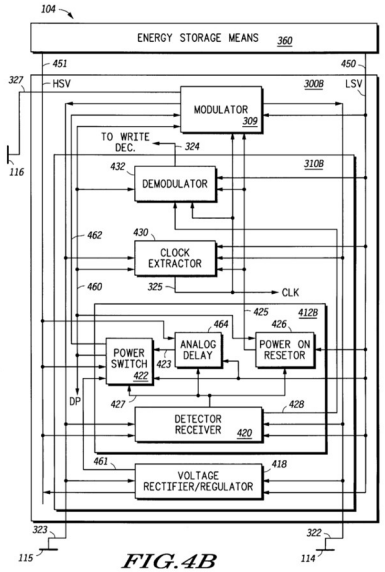
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	frequency. Preferably the carrier frequency of the data carrier is 62.5 K Hz or one-half the power carrier frequency. FIG. 4E illustrates a few load modulators 473A-473D. Load modulator 473A consists of a variable impedance 480 coupled between the electrostatic electrodes 114 and 115 that has its impedance varied or switched by control signal 472 from the modulator controller 471. Load modulator 473B includes transistors 481 and 482, each coupled respectively between an electrostatic electrode and the low level supply voltage 450. The transistors are preferably turned ON and OFF by having their gates switched by a digital drive signal supplied on control signal 472. Load modulator 473C includes transistor 483 coupled between the electrostatic electrodes 114 and 115. Transistor 483 is preferably turned ON and OFF by having its gate switched by a digital drive signal supplied on control signal 472. Load modulator 473D includes transistor 484 coupled between one electrostatic electrode 322 and the low level supply voltage 450. This is an asymmetrical load modulation technique where circuitry within a rectifier provides the return path through the opposite electrostatic electrode 323. Referring back to FIG. 4D, active and passive transmission is accomplished by the modulator controller 471 and amplifier 477. Amplifier 477 is preferably a CMOS fully complementary inverter or buffer with its VDD input connected to the amplifier power line 462 and its VSS connection coupled to the low level power supply 450. Active transmission occurs when power is coupled from the high level power supply 451 through the power switch and onto the amplifier power line 462 by multiplexor 469. Passive transmission occurs when the DC voltage rectifier/regulator 418 within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the amplifier power line 462 by multiplexor 469. Multiplexor 469 and 466 can further operate as a switch to selectively turn power OFF to circuitry connected to the device power line 460 or the amplifier power line 462 by turning OFF both of the transistor switches 467-468 or 470 and 475. Data 474 input into the modulator controller 471 is modulated with the input carrier signal 476 to generate the data signal on line 478. Signal line 478 is separate from signal line 472 such that the load modulator 473 and the amplifier 477 can be enabled or disabled independent from one another. Disabling the load modulator 473 or the amplifier 477 may be performed by setting the signal on line 472 or 478 respectively to a high or low DC logic level. The signal on signal line 478 is input into the amplifier 477. The amplifier 477 amplifies the signal on line 478 and transmits the information electrostatically over the electrostatic electrode 116. In active mode, after the transmit time has occurred, the power to the amplifier 477 may be turned OFF to conserve power. Vega at 15:20–37 The analog interface module 711 generally performs the power management function for the active electrostatic transceiver 704. Additionally, it generates its own clock from a free running low power clock oscillator. This generated clock is provided to other components of the active electrostatic transceiver 704

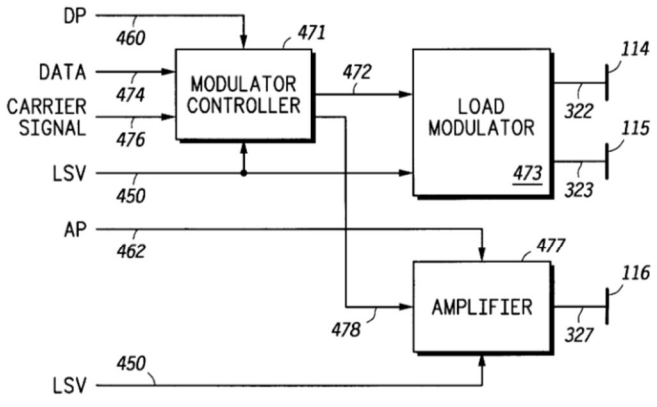
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	which require a clock including the bitrate generator 303. The analog interface module 711 also demodulates the received signal to generate a received data stream. The analog interface module 711 also analyzes the received data stream in order to determine if the active electrostatic transceiver 704 should perform some operation such as a read operation or a write operation and communicates the results of the analysis to the controller 307 and the write decoder 304. It preferably performs this analysis by searching for predetermined gaps in the received data stream. Modulator 309 as previously described in detail communicates information from the active electrostatic transceiver to a reader. Vega at 15:38–61 Now referring to FIG. 8A, selected details of the analog interface module 711 within the active electrostatic transceiver 704 are illustrated. The active electrostatic transceiver 704 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 710, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including a battery or capacitor, preferably it is a thin foil battery to conform to a form factor for a smart card, tag, or badge. The transceiver circuit 710 as illustrated in FIG. 8A shows the relevant components for the second embodiment of the present invention. In FIG. 8A, the transceiver circuit 710 includes the analog interface module 711 and modulator 309. Components of the analog interface module 711 include a DC voltage rectifier/regulator 418, a power manager 812A, a clock extractor 430, a clock generator 830, a demodulator 432, and a modulator 309. The power manager 812A includes a detector/receiver 420, a power switch 422, a sleep timer 424, a power-on-resetor (POR) 426, and a manual switch 824. Except as otherwise described below, like numbered components of the transceiver circuit 710 operate similar to the similarly numbered components of the transceiver circuit 300 of the active electrostatic transceiver 104. Vega at 15:62–16:8 In the second embodiment of the present invention the active electrostatic transceiver 704 may not receive an excitation signal from which to extract a clock signal, particularly when coupled to the reader 601 of FIG. 6A. Thus, the transceiver circuit 710 includes its own clock generator 830. A clock extractor 430 is retained to generate an extracted clock 825 for demodulation of signals that may be received from readers other than reader 601. Clock generator 830 receives power by coupling to the device power line 460 and the low level power supply 450. Clock generator 830 has its own low power clock oscillator in order to generate a clock. The clock signal on clock line 325 is provided to the sleep timer 424 amongst other components of the transceiver circuit 710. Vega at 16:36–48

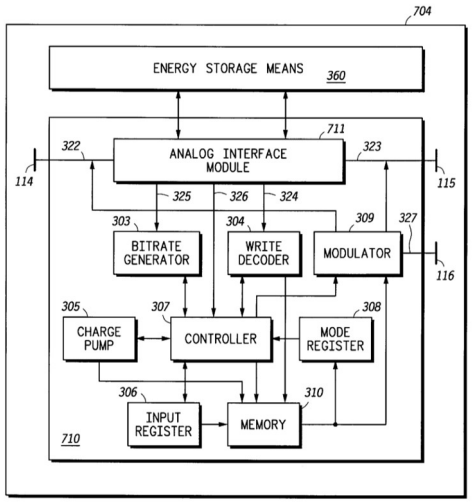
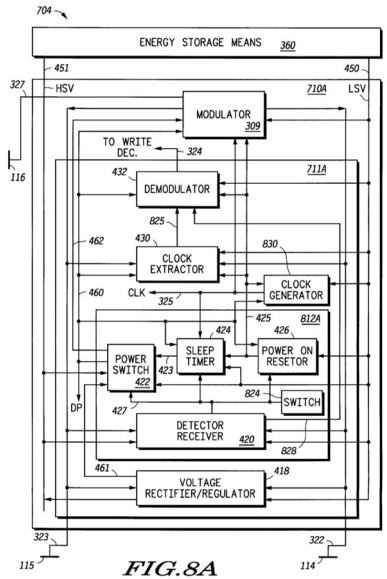
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 704 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 704. In FIG. 8A the reset signal line 425 is coupled to the sleep timer 424, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. In FIG. 8B, the reset signal line 425 is coupled to the analog delay block 464, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. Vega at 16:53–17:8 The present invention has many advantages over the prior art. The present invention provides a larger read range over passive RFID communication systems and therefore increases the applicability of electrostatic communication systems. Additionally, the present invention provides for greater flexibility in choosing components for an electrostatic transceiver. Also, the present invention provides greater operational functionality in an electrostatic transceiver because the available power is greater. Furthermore, the present invention provides for greater integration in circuitry and reduces the amount space utilized for an active electrostatic transceiver. Additionally the present invention in its second embodiment reduces the interference and noise in an electrostatic communication system so that it may be used in environments requiring low noise emission. The present invention provides for lower cost RFID transceivers such that disposable applications are possible. Furthermore, the present invention provides the capability to operate an active electrostatic transceiver in an active mode operating under the power of an energy storage means or in a passive mode under the power generated by a voltage rectifier/regulator when the energy storage means power is too low or if in the case of a desirable low-power operational mode. To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 5 above.
10. The mobile device of claim 5 wherein the mobile device comprises a mobile phone.	Vega discloses or renders obvious "[t]he mobile device of claim 5 wherein the mobile device comprises a mobile phone." *See* claim 4 above. *See also* claim 5 above.

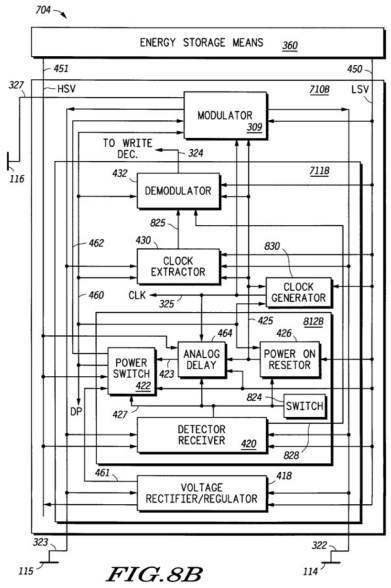
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
11[pre]. A mobile device comprising:	By providing this disclosure, Defendants does not take a position on whether the preamble is a claim limitation. Vega discloses or renders obvious "[a] mobile device." *See* 1[pre] above.
[11a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Vega discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." *See* [1a] above. To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[11b] an antenna tuned to operate at 13.56 MHz;	Vega discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." *See* [1b] above.
[11c] an amplifier coupled to be powered by the mobile device, wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller; and	Vega discloses or renders obvious "an amplifier coupled to be powered by the mobile device, wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller." *See* [5c] above.
[11d] an active transmit driver circuit coupled between the smartcard controller and the antenna, wherein the active transmit driver circuit is coupled to be powered by the mobile device.	Vega discloses or renders obvious "an active transmit driver circuit coupled between the smartcard controller and the antenna, wherein the active transmit driver circuit is coupled to be powered by the mobile device." For example: Vega at Abstract An active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise sources are better filtered out. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Each embodiment of the transceiver circuit has power management features so that power is conserved. Additionally, each transceiver circuit has the ability to operate in a passive mode, when there is insufficient charge in the energy storage means or a lower power mode is desirable. Vega at Figure 3  *FIG.3* Vega at Figure 4A

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 FIG.4A Vega at Figure 4B  FIG.4B

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 4D  FIG. 4D Vega at Figure 7

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 *FIG. 7* Vega at Figure 8A  *FIG. 8A*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 8B  FIG.8B Vega at 3:28–45 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that can decrease power consumption. Vega at 4:14–16

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	FIG. 4D is a block diagram of components of the modulator block within the active electrostatic transceiver of FIG. 3. Vega at 4:17–18 FIG. 4E are schematic diagrams of load modulation circuitry of the load modulator. Vega at 4:51–5:7 The present invention includes a method, apparatus and system for providing electrostatic communication utilizing capacitance-based technology with active and passive electrostatic transceivers. Passive electrostatic transceivers derive their power from electrostatic signals being transmitted by an electrostatic reader or other electrostatic signal source. An active electrostatic transceiver has its own internal power source and need not rely on an electrostatic signal source from an electrostatic reader or other source to power up and perform certain functions. Electrostatic communication is accomplished through capacitive coupling which requires no physical contact or wires between a reader and an electrostatic transceiver (a.k.a. electrostatic tag or electrostatic transponder). In the electrostatic communication system, the voltage applied to the capacitively coupled plates is an AC voltage generated by an electric field (i.e. an electrostatic ("ES") field is developed) as opposed to an electromagnetic ("EM") field in order for a charge or signal to be communicated. In short, an electrostatic field is an energy (electrical) field created between two electrodes having a voltage differential. An electrostatic transceiver needs to be in the proximity of the reader, referred to as the read range, in order to have sufficient capacitive coupling to transceive electrostatic signals. Vega at 5:8–25 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means, such as a battery, and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that improve power conservation.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 6:1–22 FIG. 1 illustrates the advantage that an active electrostatic transceiver 104 has over a passive electrostatic transceiver 102. The distance between an electrostatic transceiver and an electrostatic reader where communication may start to occur is referred to as the read range. In FIG. 1 the passive read range 125 between passive ES transceiver 102 and ES reader 101 is significantly smaller than the active read range 126 between active ES transceiver 104 and ES reader 101. This is because an energy storage means within the active electrostatic transceiver 104 allows for active transmission of signals using an amplifier. Because of its passive nature, the passive electrostatic transceiver 102 relies on a load modulation technique for communication of signals by reflecting back the energy of the excitation signal to the electrostatic reader 101. The reflection of the excitation signal requires that the passive electrostatic transceiver 102 be nearer the reader 101. The larger read range provided by reflected ES signals using load modulation or transmitted ES signals using an active transmitter allows the active electrostatic transceiver 104 to be used in other applications of RFID communication systems where a passive electrostatic transceiver 102 would not. Vega at 6:23–33 An active electrostatic transceiver 104 is not simply formed by adding an energy storage means to the passive electrostatic transceiver 102. Components of a passive electrostatic transceiver require modification, particularly in the area of power management. The power or energy of an energy storage means must be conserved and properly managed in order for the active electrostatic transceiver to have greater utility. Additionally noise must be properly filtered out to avoid false signal detection and power inadvertently being applied to circuits within the active electrostatic transceiver in order to more properly conserve power. Vega at 7:14–56 In general, electrostatic reader 101 generates an electrostatic (electrical) field for use both as a power source for the passive electrostatic transceiver 102 and for transferring information between electrostatic reader 101 and passive electrostatic transceiver 102 or active electrostatic transceiver 104. As such, electrostatic reader 101 electrostatically generates and transmits an excitation signal to the surrounding air, gas, atmosphere or non-electrically conductive medium via the reader's electrostatic electrodes, except for the return path in a monopole system. The excitation signal is an AC signal which activates the passive electrostatic transceiver 102 when it is comes within the capacitance coupling range of reader 101. Upon being sufficiently energized, the passive electrostatic transceiver 102 may respond by electrostatically transmitting a read data signal carrying the information stored in its memory to electrostatic reader 101 (as

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	part of a read operation). Active electrostatic transceiver 104 includes an energy storage means such that it may not require the excitation signal to become sufficiently energized. In accordance to the present invention, reader 101 may also electrostatically couple a write signal to communicate and write information to the passive electrostatic transceiver 102 or active ES transceiver(as part of a write operation). Alternatively, such programming or charging can be carried out by a separate ES programming, ES encoding or electrostatic charger unit (not illustrated). It is to be appreciated that the excitation signal must be generated and transmitted by electrostatic reader 101 to excite the passive electrostatic transceiver 102 or charge the active electrostatic transceiver 104. The excitation signal is an AC energy source and can be a continuous waveform or a varying waveform (i.e. amplitude, frequency, time, etc. of the waveform may vary). Alternatively a user could manually cause the electrostatic reader 101 or a charger to generate the excitation signal to charge or communicate with the passive electrostatic transceiver 102 or active electrostatic transceiver 104 by selecting a button or switch. The reader 101 usually has available a larger power source than the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Thus, the reader 101 has very sensitive receiving and high energy transmission when compared with the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Vega at 7:57–8:17 Reference is now made to FIG. 3 illustrating in greater detail the components of a first embodiment of the active electrostatic transceiver 104. As shown in FIG. 3, transceiver 104 may include a circuit 300 having an analog interface module 301, a bitrate generator 303, a write decoder 304, an optional charge pump 305, an input register 306, a controller 307, a mode register 308, a modulator 309, a memory 310, and electrostatic electrodes 114-116. As previously discussed, electrostatic electrodes 114 and 115 receive electrostatic signals from the electrostatic reader 101 and may communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 116 and 115 may also communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 114 and electrostatic electrode 115 are coupled to the analog interface module 301 over the bidirectional signal lines 322 and 333 respectively. The analog interface module 301 couples to the bitrate generator 303 through the clock signal line 325. Analog interface module 301 couples to the controller 307 through the control signal lines 326 and to the write decoder 304 through the data in signal line 324. The modulator 309 couples to the electrostatic electrode 114 and electrostatic electrode 115 by signal lines 322 and 333 respectively. Additionally, the modulator 309 couples to the electrostatic electrode 116 by signal line 327. For optimum electrostatic performance, it is desirable to keep the parasitic capacitance measured between signal lines 322 and 323 as small as possible.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 8:18–45 Controller 307 controls the functionality of the transceiver 104 in conjunction with the analog interface module 301. Controller 307 couples to nearly all components of the active electrostatic transceiver 104 except for the electrostatic electrodes and pads. Memory 310 may be a volatile memory requiring a constant supply of energy or a non-volatile memory such as an EEPROM memory or ferro-electric memory that retains its information when power is no longer supplied. In the case of EEPROM memory, the optional charge pump 305 may be required in order to boost the power supply voltage to write data into the EEPROM memory. Input register 306 temporarily stores information that is to be written into memory 310. It may need to store the information due to a delay in the write cycle caused by the charge pump 305 pumping up or other reasons. In any case, storing data into the input register 306 allows the controller 307 to process other information for the transceiver 104. Mode register 308 reads configuration information for the active electrostatic transceiver 104 from memory 310 and provides this to the controller 307. Write decoder 304 analyzes a data sequence being received by the electrostatic transceiver 104 and determines whether the transceiver should go into a write mode or whether it needs to remain in a receive mode. Modulator 309 prepares data read from memory 310 for communication by the active electrostatic transceiver 104. Modulator 309 can encode and modulate data read from memory 310 in a number of ways for communication with the reader 101. Vega at 8:46–62 When in proximity of a reader 101, the active electrostatic transceiver 104 first detects the excitation signal being emitted by an electrostatic reader 101. The excitation signal is generated by reader 101 at a carrier frequency, commonly referred to as a power carrier frequency or exciter frequency. The power carrier frequency, which may be modulated with data, is preferably 125 k Hz. After detecting the excitation signal, the first embodiment of the active electrostatic transceiver 104 goes through a power management sequence and powers up in order to derive a square wave based on the excitation signal at the carrier frequency which is used as a clock signal for the active transceiver. In this manner of generating a clock signal, information received by the active electrostatic transceiver 104 is synchronized with the clock signal. This alleviates generating a clock with a clock oscillator and synchronizing the data and clock using phase-locked loop techniques. Vega at 9:30–60 Now referring to FIG. 4A, a detailed block diagram of components of the analog interface module 301 within the active transceiver 104 is illustrated including digital timing elements. The active electrostatic transceiver 104 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	third electrostatic electrode 116, the transceiver circuit 300, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including an electrochemical storage cell, such as a rechargeable battery or a non-rechargeable battery, or a capacitor, but is preferably a thin foil battery to conform to a form factor of a smart card, tag, or badge. The transceiver circuit 300A as illustrated in FIG. 4A shows the relevant components in the first embodiment of the present invention. In FIG. 4A, the transceiver circuit 300A is illustrated as including the analog interface module 301 and the modulator 309. In FIG. 4A, the relevant components of the analog interface module 301 include a power manager 412A, a DC voltage rectifier/regulator 418, a clock extractor 430, and a demodulator 432. The power manager 412A includes a detector/receiver 420, a power switch 422, a sleep timer 424, and a power-on-resetor (POR) 426. The DC voltage rectifier/regulator 418 includes a rectifier, a voltage regulator and voltage control functionality such that a DC voltage and energy source may be generated from the excitation signal or other signals received by the active electrostatic transceiver 104 and selectively used to power the transceiver 104 or charge the energy storage means 360. The DC voltage rectifier/regulator 418 couples to the power switch 422 for selection and to the energy storage means 360 for charging. Vega at 9:61–10:33 The detector/receiver 420 in the active electrostatic transceiver 104 may receive power directly from the energy storage means 360 in order to be actively listening for an excitation signal from an electrostatic reader 101. Alternatively, the detector/receiver 420 may have passive components sufficient to detect and receive signals when the energy storage means has insufficient energy to power active components. The detector/receiver 420 may have an amplifier for receiving and amplifying the incoming electrostatic signals, a bandpass filter for filtering unwanted frequencies outside a range of the carrier frequency, and a detector for detecting the presence of the carrier frequency in an excitation signal indicating that the transceiver is within the read range of an electrostatic reader 101. The detector may detect a number of oscillations in the received waveform at the carrier frequency indicating that it is not a noise source generating the waveform. In the preferred embodiment, if the detector detects any signal in the band of the carrier it provides an indication signal. Upon detection of the excitation signal, the detector/receiver 420 generates a wakeup signal on signal line 427 indicating that the active electrostatic transceiver 104 is within range of an electrostatic field and that the active electrostatic transceiver 104 needs to go through its wake up procedure. When outside the range of an electrostatic field, the signal line 427 indicates a go to-sleep signal so that the transceiver may go into a low power sleep state. The wakeup signal 427 is provided to the power on resetor 426, the sleep timer 424, the power switch 422 and clock extractor 430. Upon receiving the wakeup signal 427, power on resetor 426 monitors the device power line 460 to be

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	sure that sufficient power is available to other components within the active electrostatic transceiver 104 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 104. In FIG. 4A the reset signal line 425 is coupled to the sleep timer 424, the clock extractor 430, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 104. Vega at 10:34–52 The sleep timer 424 of the active electrostatic transceiver of FIG. 4A is a digital counter that counts to a predetermined count value using the clock signal on clock line 325 received from the clock extractor 430. Upon reaching the predetermined count value, the sleep timer 424 turns off active components within the modulator 309. While the sleep timer 424 is counting a transmit signal is indicated on signal line 423. When the sleep timer 424 reaches the predetermined count value, signal line 423 indicates a receive signal and the active electrostatic transceiver powers off the active components within the modulator 309. While in this mode, the transceiver may still use passive components and the load modulators within the modulator 309 to communicate with a reader. Further, while in this mode, the transceiver may receive and respond to encoded write data transmitted by the reader. The predetermined count value is determined based on the time, in number of clock cycles, that it takes for the active electrostatic transceiver to complete a transmission cycle with an electrostatic reader 101. Vega at 10:53–11:6 Referring to FIG. 4B, the power manager 412B includes the detector/receiver 420, the power switch 422, an analog delay block 464, and the power-on-resetor (POR) 426. The digital sleep timer 424 of FIG. 4A is replaced with the analog delay block 464 within the power manager block 412B while other blocks function similar to the description of FIG. 4A. Analog delay block 464 provides an analog delay by using resistor and capacitor elements in conjunction with a threshold detector or comparator. The analog delay block is preferably designed to provide a lengthy delay such as a couple of seconds. The circuitry of the analog delay block is simpler than that of the sleep timer 424. Upon detection of a received signal, the wakeup signal on signal line 427 causes the analog delay block to initiate the RC delay. The transmit signal on signal line 423 is coupled to the power switch 422 and causes it to select power, if available, from the energy storage means 360 for the active transmitter of the modulator 309. Upon completion of the RC delay, a receive signal is indicated on signal line 423 causing the power switch 422 to disconnect power from the active transmitter of the modulator 309. Vega at 11:7–12:16

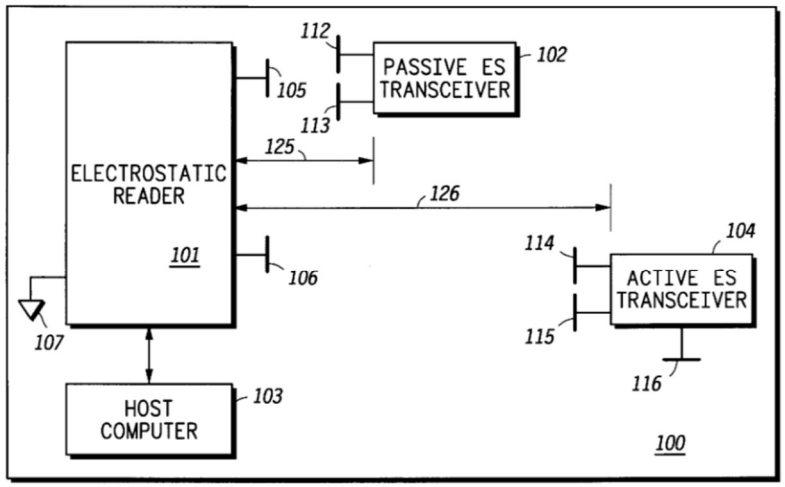
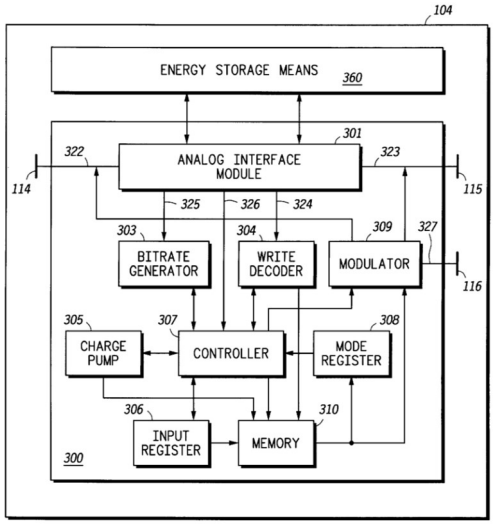
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Power switch 422 is coupled to the detector/receiver 420 through the signal line 427 and to the sleep timer 424 or the analog delay block 464 through the signal line 423. The power switch 422 controls the switching of the high level power supply voltage 451 from the energy storage means 360 or the rectified voltage 461 and provides the analog interface module 301 with the means to manage power consumption. These energy sources may be coupled to the device power line 460 feeding power to other components of the active electrostatic transceiver 104. FIG. 4C illustrates the basic components of the power switch 422 that provide power selection for the active electrostatic transceiver 104. These components include the power analyzer 465, the multiplexor 466 and the multiplexor 469. Multiplexor 469 may optionally be a switch with one end connected to the amplifier power line 462 and another end connected to the device power line 460. Power analyzer 465 performs an analysis on the energy provided by the DC voltage rectifier/regulator 418 with that supplied by the energy storage means 360. The power analyzer 465 receives the rectified voltage 461, the high level supply voltage 451 and the low level supply voltage 450 in order to perform the analysis. Additionally, control signals 423, 427 and any other control signals are received by the power analyzer 465 to further control the multiplexor 466 and multiplexor 469. Signal lines 423 and 427 are exemplary control signals input into the power analyzer 465. Typically, if the energy storage means 360 has higher energy levels it is selectively coupled to the device power line 460 and the amplifier power line 462 when signal line 427 indicates a transmit signal. Optionally when the transceiver 104 is in an active mode for active transmission by amplifier 477 and when signal line 427 indicates a receive signal, the energy storage means may be selectively decoupled from the amplifier power line 462, have the rectified voltage 461 coupled to the amplifier power line 462 or alternatively have no power source coupled to the amplifier power line 462 powering OFF the circuitry of amplifier 477 in each case conserving power in the energy storage means. If it is the case that the energy storage means 360 has lower energy levels than that of the rectified voltage 461, the rectified voltage may be selectively coupled to the device power line 460 by multiplexor 466 and to the amplifier power line 462 by multiplexor 469 such that the load modulator 473 and the amplifier 477 can perform passive load modulation and passive transmission of electrostatic signals in a passive mode. Additionally if it is desirable to conserve power or more efficiently charge the energy storage means, multiplexor 466 or 469 can operate as switches decoupling the device power line 460 or the amplifier power line 462 from any power source. After selecting a power source where the power switch 422 couples the high level power supply 451 or the rectified voltage 461 with the device power line 460, circuitry within the active electrostatic transceiver goes into a power on reset sequence controlled by the power on resetor 426. When out of the power on reset sequence, the active electrostatic transceiver 104 can go through a communication cycle with the electrostatic reader 101 while in the read range and the sleep timer 424 starts counting or the analog delay cycle of the analog delay block 464 begins. If the active electrostatic

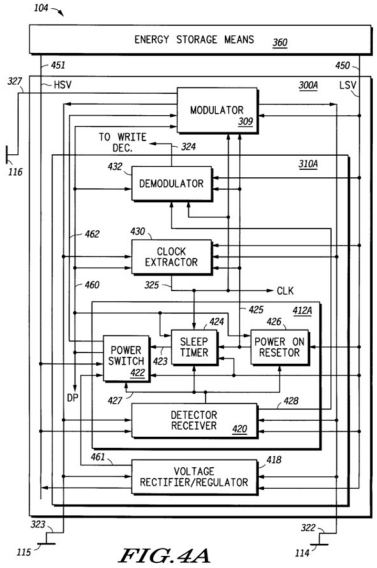
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	transceiver remains in the electrostatic field (i.e. read range) and the sleep timer 424 reaches its predetermined count value or the analog delay block completes the predetermined RC delay time, a receive signal is indicated on signal line 423 to the power switch 422. The active electrostatic transceiver 104 continues to listen for signals from reader 101 or other sources that communicate on the carrier frequency. If the active electrostatic transceiver 104 is removed from the electrostatic field, the detector/receiver 420 resets and a sleep signal is indicated on signal line 427. Upon receiving the sleep signal, the power switch 422 selectively disconnects the high level voltage supply 451 from the device power line 460 so that components coupled to the device power line 460 become powered off and enter the sleep mode. In this manner when the active electrostatic transceiver 104 is outside the electrostatic field (i.e. read range) it goes into its low power sleep mode. Vega at 12:60–13:6 Modulator 309 is coupled to the power switch 422 through the device power line 460, the energy storage means 360 through the low level power supply 450, the electrostatic electrodes 114-116 respectively through signal lines 322, 323 and 327, power on resetor 426 through signal line 425, and the clock extractor 430 through clock signal line 325. Modulator 309 includes a load modulator for electrostatic electrodes 114-115 and an active power amplifier in order to amplify signals for the extra transmission distance to the reader over the electrostatic electrode 116. A passive electrostatic transceiver may not function properly at large read ranges because of weak signals. The electrostatic reader's receiver may require increased sensitivity in order to receive signals from large read ranges. Vega at 13:7–14:10 Referring now to FIG. 4D, a block diagram is illustrated of the components within the modulator 309 for active and passive load modulation and active transmission. Active and passive load modulation are accomplished by the modulator controller and the load modulator. Active load modulation occurs when the energy storage means 360 is coupled to the device power line 460 and the circuitry of the modulator controller 471. Passive load modulation occurs when the DC voltage rectifier/regulator within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the device power line 460 and the modulator controller 471. Load modulation is accomplished by varying the impedance between the electrostatic electrodes 114 and 115. Varying the impedance between the electrostatic electrodes, that are capacitively coupled with the electrostatic electrodes of the reader 101, causes the excitation signal generated by the reader 101 to be reflected back. A data signal and a carrier signal is input into the modulator controller 471 at line 474 and 476 respectively to control the load modulator 473. The carrier signal 476 is commonly referred to as the data carrier and has a carrier

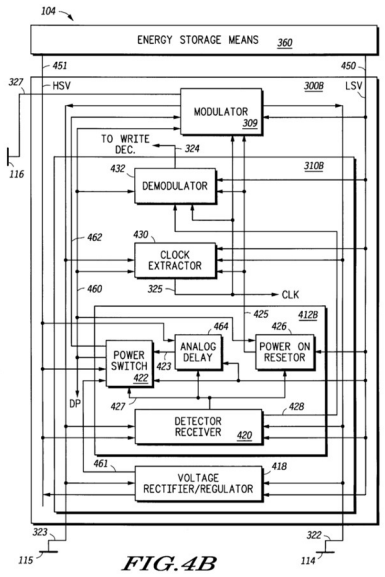
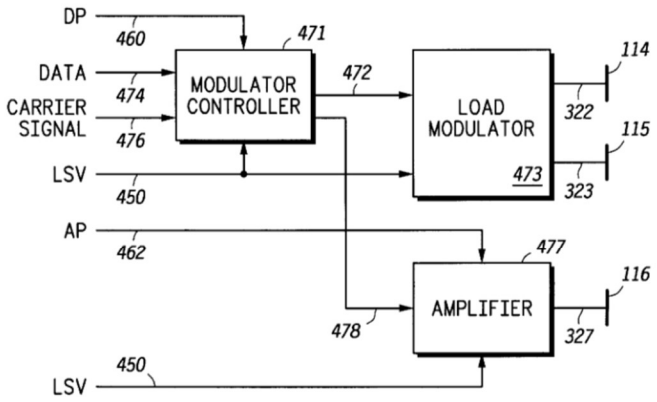
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	frequency. Preferably the carrier frequency of the data carrier is 62.5 K Hz or one-half the power carrier frequency. FIG. 4E illustrates a few load modulators 473A-473D. Load modulator 473A consists of a variable impedance 480 coupled between the electrostatic electrodes 114 and 115 that has its impedance varied or switched by control signal 472 from the modulator controller 471. Load modulator 473B includes transistors 481 and 482, each coupled respectively between an electrostatic electrode and the low level supply voltage 450. The transistors are preferably turned ON and OFF by having their gates switched by a digital drive signal supplied on control signal 472. Load modulator 473C includes transistor 483 coupled between the electrostatic electrodes 114 and 115. Transistor 483 is preferably turned ON and OFF by having its gate switched by a digital drive signal supplied on control signal 472. Load modulator 473D includes transistor 484 coupled between one electrostatic electrode 322 and the low level supply voltage 450. This is an asymmetrical load modulation technique where circuitry within a rectifier provides the return path through the opposite electrostatic electrode 323. Referring back to FIG. 4D, active and passive transmission is accomplished by the modulator controller 471 and amplifier 477. Amplifier 477 is preferably a CMOS fully complementary inverter or buffer with its VDD input connected to the amplifier power line 462 and its VSS connection coupled to the low level power supply 450. Active transmission occurs when power is coupled from the high level power supply 451 through the power switch and onto the amplifier power line 462 by multiplexor 469. Passive transmission occurs when the DC voltage rectifier/regulator 418 within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the amplifier power line 462 by multiplexor 469. Multiplexor 469 and 466 can further operate as a switch to selectively turn power OFF to circuitry connected to the device power line 460 or the amplifier power line 462 by turning OFF both of the transistor switches 467-468 or 470 and 475. Data 474 input into the modulator controller 471 is modulated with the input carrier signal 476 to generate the data signal on line 478. Signal line 478 is separate from signal line 472 such that the load modulator 473 and the amplifier 477 can be enabled or disabled independent from one another. Disabling the load modulator 473 or the amplifier 477 may be performed by setting the signal on line 472 or 478 respectively to a high or low DC logic level. The signal on signal line 478 is input into the amplifier 477. The amplifier 477 amplifies the signal on line 478 and transmits the information electrostatically over the electrostatic electrode 116. In active mode, after the transmit time has occurred, the power to the amplifier 477 may be turned OFF to conserve power. Vega at 15:20–37 The analog interface module 711 generally performs the power management function for the active electrostatic transceiver 704. Additionally, it generates its own clock from a free running low power clock oscillator. This generated clock is provided to other components of the active electrostatic transceiver 704

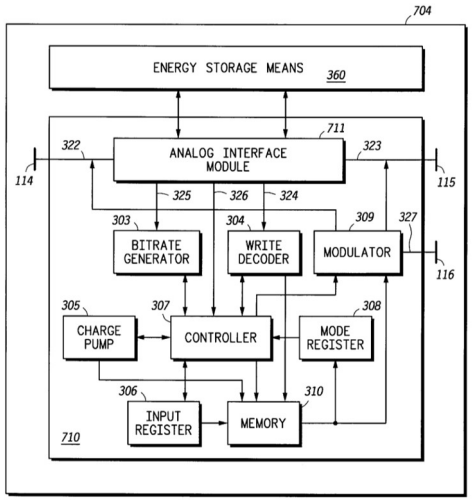
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	which require a clock including the bitrate generator 303. The analog interface module 711 also demodulates the received signal to generate a received data stream. The analog interface module 711 also analyzes the received data stream in order to determine if the active electrostatic transceiver 704 should perform some operation such as a read operation or a write operation and communicates the results of the analysis to the controller 307 and the write decoder 304. It preferably performs this analysis by searching for predetermined gaps in the received data stream. Modulator 309 as previously described in detail communicates information from the active electrostatic transceiver to a reader. Vega at 15:38–61 Now referring to FIG. 8A, selected details of the analog interface module 711 within the active electrostatic transceiver 704 are illustrated. The active electrostatic transceiver 704 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 710, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including a battery or capacitor, preferably it is a thin foil battery to conform to a form factor for a smart card, tag, or badge. The transceiver circuit 710 as illustrated in FIG. 8A shows the relevant components for the second embodiment of the present invention. In FIG. 8A, the transceiver circuit 710 includes the analog interface module 711 and modulator 309. Components of the analog interface module 711 include a DC voltage rectifier/regulator 418, a power manager 812A, a clock extractor 430, a clock generator 830, a demodulator 432, and a modulator 309. The power manager 812A includes a detector/receiver 420, a power switch 422, a sleep timer 424, a power-on-resetor (POR) 426, and a manual switch 824. Except as otherwise described below, like numbered components of the transceiver circuit 710 operate similar to the similarly numbered components of the transceiver circuit 300 of the active electrostatic transceiver 104. Vega at 15:62–16:8 In the second embodiment of the present invention the active electrostatic transceiver 704 may not receive an excitation signal from which to extract a clock signal, particularly when coupled to the reader 601 of FIG. 6A. Thus, the transceiver circuit 710 includes its own clock generator 830. A clock extractor 430 is retained to generate an extracted clock 825 for demodulation of signals that may be received from readers other than reader 601. Clock generator 830 receives power by coupling to the device power line 460 and the low level power supply 450. Clock generator 830 has its own low power clock oscillator in order to generate a clock. The clock signal on clock line 325 is provided to the sleep timer 424 amongst other components of the transceiver circuit 710. Vega at 16:36–48

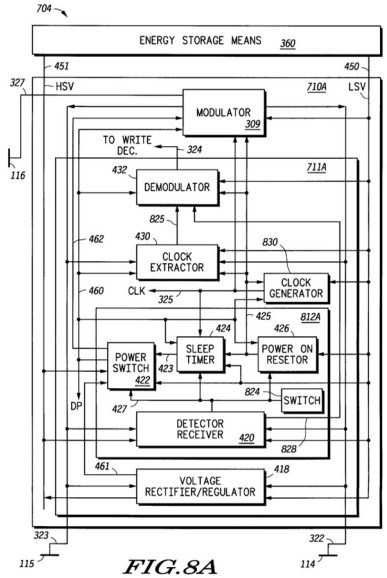
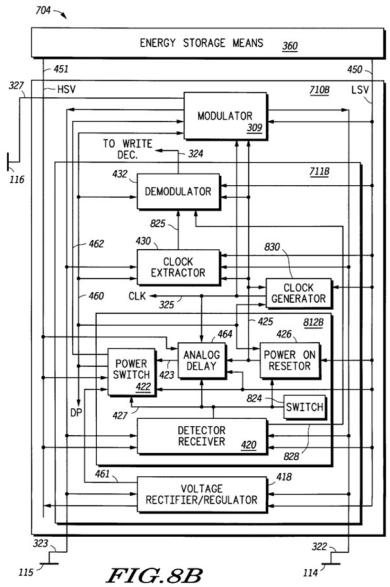
Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 704 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 704. In FIG. 8A the reset signal line 425 is coupled to the sleep timer 424, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. In FIG. 8B, the reset signal line 425 is coupled to the analog delay block 464, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 704. Vega at 16:53–17:8 The present invention has many advantages over the prior art. The present invention provides a larger read range over passive RFID communication systems and therefore increases the applicability of electrostatic communication systems. Additionally, the present invention provides for greater flexibility in choosing components for an electrostatic transceiver. Also, the present invention provides greater operational functionality in an electrostatic transceiver because the available power is greater. Furthermore, the present invention provides for greater integration in circuitry and reduces the amount space utilized for an active electrostatic transceiver. Additionally the present invention in its second embodiment reduces the interference and noise in an electrostatic communication system so that it may be used in environments requiring low noise emission. The present invention provides for lower cost RFID transceivers such that disposable applications are possible. Furthermore, the present invention provides the capability to operate an active electrostatic transceiver in an active mode operating under the power of an energy storage means or in a passive mode under the power generated by a voltage rectifier/regulator when the energy storage means power is too low or if in the case of a desirable low-power operational mode. *See also* [5d] and claim 9 above. To the extent this limitation is not disclosed by Vega, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Vega, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
12. The mobile device of claim 11 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller	Vega discloses or renders obvious "[t]he mobile device of claim 11 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." Vega at Figure 1

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
from the interrogating radio frequency (RF) field.	 *FIG.1* Vega at Figure 3  *FIG.3*

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 4A  FIG.4A Vega at Figure 4B

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 FIG.4B Vega at Figure 4D  FIG.4D

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at Figure 7  *FIG. 7* Vega at Figure 8A

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	 FIG.8A Vega at Figure 8B  FIG.8B

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 2:4–26 In contrast, conventional RFID technology is inductance-based. More precisely, conventional RFID technology uses near field electromagnetic waves which are also known as induction waves. Unlike radio waves, the field strength of induction waves is proportional to the inverse square of the distance involved. In inductance-based RFID technology, an electromagnetic field is generated for use both as a power source for the transponder and for transferring information between the reader and transponder. Inductance waves are generated using closed circuit alternating current coils that have multiple turns. Inductance coils are required to optimally transmit and receive electromagnetic signals are usually a wire wound or etched metal coil. Using inductance coils adversely impacts the costs, manufacturability, and packaging flexibility of inductance-based RFID technology particularly when used with high number of RFID tags usually required in a system. Due to the prohibitive costs and high degree of manufacturing difficulty, electromagnetic RFID technology is not practical in high volume and low cost applications such as in disposable applications. The bulky packaging, which is typical for electromagnetic RFID, further limits its application to those where thickness is not of primary importance. Vega at 2:27–40 Traditionally electromagnetic transponders in electromagnetic RFID systems derive their power from the electromagnetic signals being transmitted by an electromagnetic reader through induction coupling and have no power storage device. These electromagnetic transponders are often referred to as passive electromagnetic transponders. Because they require inductive coupling, the distance for communication between an electromagnetic reader and a passive electromagnetic transponder, referred to as the read range, is limited. The read range is limited because a sufficient amount of charge to power up the components within a passive electromagnetic transponder is required and is only available within certain distances from the electromagnetic reader. Vega at 2:41–52 Additionally, only certain amounts of power are available for components within a passive electromagnetic transponder. This limited amount of power constrains the choices of components used within a passive electromagnetic transponder. For example amplifiers may be restricted in their power consumption and gain or they may not be used at all within a passive electromagnetic transponder. Additionally certain passive components are often used due to the limited power and take up larger amounts of space than otherwise might be required. Furthermore the limited of amount of available power in a passive electromagnetic transponder reduces the available functionality and operation of a transponder.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Vega at 2:66–3:9 In certain applications it is desirable to have an RFID communication system with larger read range than available with passive electromagnetic transponders. Typical read range for passive electromagnetic transponders is on the order of four inches to thirty inches. An exemplary application for larger read range is a ticket admittance system. It may be desirable to have a reader be quite a distance away, such as five to eight feet, when a ticket holder passes through an entrance of the ticket admittance system. In cases such as this, it is difficult to bring an electromagnetic transponder within the passive read range. Vega at 3:28–45 Briefly, an active electrostatic transceiver is provided that has electrostatic electrodes, an energy storage means such as a battery and a transceiver circuit for communication within an electrostatic RFID communication system. The transceiver circuit includes power management features so that the energy storage means is not quickly depleted. Additionally the transceiver circuit includes amplifiers and filters so that the read range is further increased and noise filtering is improved. In a first embodiment, the transceiver circuit has a clock extractor that extracts a clock from the incoming data signal such that the clock and the data signal are synchronized so that demodulating the data from the data signal is simplified. In a second embodiment, the transceiver circuit has its own clock generator for initiating transmission of signals so that a reader need not have an exciter to generate an excitation signal. Both embodiments of the transceiver circuit have power management features that can decrease power consumption. Vega at 4:51–5:7 The present invention includes a method, apparatus and system for providing electrostatic communication utilizing capacitance-based technology with active and passive electrostatic transceivers. Passive electrostatic transceivers derive their power from electrostatic signals being transmitted by an electrostatic reader or other electrostatic signal source. An active electrostatic transceiver has its own internal power source and need not rely on an electrostatic signal source from an electrostatic reader or other source to power up and perform certain functions. Electrostatic communication is accomplished through capacitive coupling which requires no physical contact or wires between a reader and an electrostatic transceiver (a.k.a. electrostatic tag or electrostatic transponder). In the electrostatic communication system, the voltage applied to the capacitively coupled plates is an AC voltage generated by an electric field (i.e. an electrostatic ("ES") field is developed) as opposed to an electromagnetic ("EM") field in order for a charge or signal to be communicated. In short, an electrostatic field is an energy (electrical) field created between two electrodes having a voltage differential. An electrostatic transceiver needs to be in the

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	proximity of the reader, referred to as the read range, in order to have sufficient capacitive coupling to transceive electrostatic signals. Vega at 5:26–68 FIG. 1 illustrates the preferred embodiment of the combined electrostatic communication system 100 which includes an electrostatic reader 101, a passive electrostatic transceiver 102, host computer system 103 and an active electrostatic transceiver 104. Electrostatic reader 101, illustrated in a monopole configuration, includes an electrostatic electrode 105 for transmission of an excitation signal and modulated data signals on a carrier by means of electrostatic energy. The signals are transmitted by the reader to either an electrostatic transceiver, transponder, tag, badge, smart card, or other such RFID transceiver such as passive electrostatic transceiver 102 or active electrostatic transceiver 104. Electrostatic reader 101 includes an electrostatic electrode 106 for receiving data signals on a carrier by means of electrostatic energy. The data signals are communicated by either a passive electrostatic transceiver such as passive electrostatic transceiver 102 or active electrostatic transceiver 104. The passive electrostatic transceiver 102 includes at least two electrostatic electrodes 112 and 113 in order to communicate using electrostatic signals. The electrostatic electrodes 112 and 113 may have differing shapes and be made of different materials. Some of the shapes for the electrostatic electrodes 112 and 113 include flat rectangular plates and bow tie shaped plates. The active electrostatic transceiver 104 includes at least two electrostatic electrodes 114 and 115 in order to receive electrostatic energy and communicate using electrostatic signals. As illustrated in FIG. 1, active electrostatic transceiver 104 includes an additional electrostatic electrode 116 for transmitting electrostatic signals. The electrostatic electrodes may also be referred to as antenna, capacitor plates, contactless electrodes, wireless electrodes or isolation electrodes. These electrostatic electrodes provide for the antenna, contactless, wireless and the somewhat isolated functionality of an electrostatic system which requires no physical contact between the electrostatic electrodes in order to communicate. Passive electrostatic transceiver 102 and active electrostatic transceiver 104 can communicate information to/from the electrostatic reader 101 by means of electrostatic signals and capacitive coupling. Host computer 103 is coupled to the electrostatic reader 101 and may couple to other electrostatic readers, electromagnetic readers or electrostatic readers (not shown in FIG. 1) in order to have other points of communication. Vega at 6:34–52 Electrostatic electrodes 112 and 113 of passive ES transceiver 102 and ES electrodes 114 and 115 of active transceiver 104 are one part of the capacitive plates for capacitive coupling in order to receive electrostatic charges and communications. The other part of the capacitive plates are provided by the

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	electrostatic reader 101 or other ES source. The space between the coupled electrostatic electrodes defines the dielectric medium between the two parts of the capacitive plates. The capacitive plates of the electrostatic reader 101 can be in either a monopole or a dipole configuration. In a monopole configuration, only one set of coupling plates is used. Earth ground acts as a low impedance return path. The electrostatic transceiver may couple to earth ground through a human body or other relatively low impedance that couples to one or the other of the electrostatic electrodes. In a dipole configuration the reader had two electrostatic electrodes for receiving and two electrostatic electrodes for transmitting and none of the electrostatic electrodes has a preferential coupling path to earth ground. Vega at 7:14–56 In general, electrostatic reader 101 generates an electrostatic (electrical) field for use both as a power source for the passive electrostatic transceiver 102 and for transferring information between electrostatic reader 101 and passive electrostatic transceiver 102 or active electrostatic transceiver 104. As such, electrostatic reader 101 electrostatically generates and transmits an excitation signal to the surrounding air, gas, atmosphere or non-electrically conductive medium via the reader's electrostatic electrodes, except for the return path in a monopole system. The excitation signal is an AC signal which activates the passive electrostatic transceiver 102 when it is comes within the capacitance coupling range of reader 101. Upon being sufficiently energized, the passive electrostatic transceiver 102 may respond by electrostatically transmitting a read data signal carrying the information stored in its memory to electrostatic reader 101 (as part of a read operation). Active electrostatic transceiver 104 includes an energy storage means such that it may not require the excitation signal to become sufficiently energized. In accordance to the present invention, reader 101 may also electrostatically couple a write signal to communicate and write information to the passive electrostatic transceiver 102 or active ES transceiver(as part of a write operation). Alternatively, such programming or charging can be carried out by a separate ES programming, ES encoding or electrostatic charger unit (not illustrated). It is to be appreciated that the excitation signal must be generated and transmitted by electrostatic reader 101 to excite the passive electrostatic transceiver 102 or charge the active electrostatic transceiver 104. The excitation signal is an AC energy source and can be a continuous waveform or a varying waveform (i.e. amplitude, frequency, time, etc. of the waveform may vary). Alternatively a user could manually cause the electrostatic reader 101 or a charger to generate the excitation signal to charge or communicate with the passive electrostatic transceiver 102 or active electrostatic transceiver 104 by selecting a button or switch. The reader 101 usually has available a larger power source than the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Thus, the reader 101 has very sensitive receiving and high energy

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	transmission when compared with the passive electrostatic transceiver 102 or active electrostatic transceiver 104. Vega at 7:57–8:17 Reference is now made to FIG. 3 illustrating in greater detail the components of a first embodiment of the active electrostatic transceiver 104. As shown in FIG. 3, transceiver 104 may include a circuit 300 having an analog interface module 301, a bitrate generator 303, a write decoder 304, an optional charge pump 305, an input register 306, a controller 307, a mode register 308, a modulator 309, a memory 310, and electrostatic electrodes 114-116. As previously discussed, electrostatic electrodes 114 and 115 receive electrostatic signals from the electrostatic reader 101 and may communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 116 and 115 may also communicate electrostatic signals back to the electrostatic reader 101. Electrostatic electrode 114 and electrostatic electrode 115 are coupled to the analog interface module 301 over the bidirectional signal lines 322 and 333 respectively. The analog interface module 301 couples to the bitrate generator 303 through the clock signal line 325. Analog interface module 301 couples to the controller 307 through the control signal lines 326 and to the write decoder 304 through the data in signal line 324. The modulator 309 couples to the electrostatic electrode 114 and electrostatic electrode 115 by signal lines 322 and 333 respectively. Additionally, the modulator 309 couples to the electrostatic electrode 116 by signal line 327. For optimum electrostatic performance, it is desirable to keep the parasitic capacitance measured between signal lines 322 and 323 as small as possible. Vega at 9:30–60 Now referring to FIG. 4A, a detailed block diagram of components of the analog interface module 301 within the active transceiver 104 is illustrated including digital timing elements. The active electrostatic transceiver 104 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 300, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including an electrochemical storage cell, such as a rechargeable battery or a non-rechargeable battery, or a capacitor, but is preferably a thin foil battery to conform to a form factor of a smart card, tag, or badge. The transceiver circuit 300A as illustrated in FIG. 4A shows the relevant components in the first embodiment of the present invention. In FIG. 4A, the transceiver circuit 300A is illustrated as including the analog interface module 301 and the modulator 309. In FIG. 4A, the relevant components of the analog interface module 301 include a power manager 412A, a DC voltage rectifier/regulator 418, a clock extractor 430, and a demodulator 432. The power manager 412A includes a detector/receiver 420, a power switch 422, a sleep timer 424, and a

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	power-on-resetor (POR) 426. The DC voltage rectifier/regulator 418 includes a rectifier, a voltage regulator and voltage control functionality such that a DC voltage and energy source may be generated from the excitation signal or other signals received by the active electrostatic transceiver 104 and selectively used to power the transceiver 104 or charge the energy storage means 360. The DC voltage rectifier/regulator 418 couples to the power switch 422 for selection and to the energy storage means 360 for charging. Vega at 9:61–10:33 The detector/receiver 420 in the active electrostatic transceiver 104 may receive power directly from the energy storage means 360 in order to be actively listening for an excitation signal from an electrostatic reader 101. Alternatively, the detector/receiver 420 may have passive components sufficient to detect and receive signals when the energy storage means has insufficient energy to power active components. The detector/receiver 420 may have an amplifier for receiving and amplifying the incoming electrostatic signals, a bandpass filter for filtering unwanted frequencies outside a range of the carrier frequency, and a detector for detecting the presence of the carrier frequency in an excitation signal indicating that the transceiver is within the read range of an electrostatic reader 101. The detector may detect a number of oscillations in the received waveform at the carrier frequency indicating that it is not a noise source generating the waveform. In the preferred embodiment, if the detector detects any signal in the band of the carrier it provides an indication signal. Upon detection of the excitation signal, the detector/receiver 420 generates a wakeup signal on signal line 427 indicating that the active electrostatic transceiver 104 is within range of an electrostatic field and that the active electrostatic transceiver 104 needs to go through its wake up procedure. When outside the range of an electrostatic field, the signal line 427 indicates a go to-sleep signal so that the transceiver may go into a low power sleep state. The wakeup signal 427 is provided to the power on resetor 426, the sleep timer 424, the power switch 422 and clock extractor 430. Upon receiving the wakeup signal 427, power on resetor 426 monitors the device power line 460 to be sure that sufficient power is available to other components within the active electrostatic transceiver 104 before de-asserting a reset signal 425. Once sufficient power is generated in the device power line 460, reset signal 425 is de-asserted and other components may start functioning within the active electrostatic transceiver 104. In FIG. 4A the reset signal line 425 is coupled to the sleep timer 424, the clock extractor 430, the demodulator 432, the modulator 309 and other components of the active electrostatic transceiver 104. Vega at 12:60–13:6

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	Modulator 309 is coupled to the power switch 422 through the device power line 460, the energy storage means 360 through the low level power supply 450, the electrostatic electrodes 114-116 respectively through signal lines 322, 323 and 327, power on resetor 426 through signal line 425, and the clock extractor 430 through clock signal line 325. Modulator 309 includes a load modulator for electrostatic electrodes 114-115 and an active power amplifier in order to amplify signals for the extra transmission distance to the reader over the electrostatic electrode 116. A passive electrostatic transceiver may not function properly at large read ranges because of weak signals. The electrostatic reader's receiver may require increased sensitivity in order to receive signals from large read ranges. Vega at 13:7–14:10 Referring now to FIG. 4D, a block diagram is illustrated of the components within the modulator 309 for active and passive load modulation and active transmission. Active and passive load modulation are accomplished by the modulator controller and the load modulator. Active load modulation occurs when the energy storage means 360 is coupled to the device power line 460 and the circuitry of the modulator controller 471. Passive load modulation occurs when the DC voltage rectifier/regulator within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the device power line 460 and the modulator controller 471. Load modulation is accomplished by varying the impedance between the electrostatic electrodes 114 and 115. Varying the impedance between the electrostatic electrodes, that are capacitively coupled with the electrostatic electrodes of the reader 101, causes the excitation signal generated by the reader 101 to be reflected back. A data signal and a carrier signal is input into the modulator controller 471 at line 474 and 476 respectively to control the load modulator 473. The carrier signal 476 is commonly referred to as the data carrier and has a carrier frequency. Preferably the carrier frequency of the data carrier is 62.5 K Hz or one-half the power carrier frequency. FIG. 4E illustrates a few load modulators 473A-473D. Load modulator 473A consists of a variable impedance 480 coupled between the electrostatic electrodes 114 and 115 that has its impedance varied or switched by control signal 472 from the modulator controller 471. Load modulator 473B includes transistors 481 and 482, each coupled respectively between an electrostatic electrode and the low level supply voltage 450. The transistors are preferably turned ON and OFF by having their gates switched by a digital drive signal supplied on control signal 472. Load modulator 473C includes transistor 483 coupled between the electrostatic electrodes 114 and 115. Transistor 483 is preferably turned ON and OFF by having its gate switched by a digital drive signal supplied on control signal 472. Load modulator 473D includes transistor 484 coupled between one electrostatic electrode 322 and the low level supply voltage 450. This is an asymmetrical load modulation technique where circuitry within a rectifier provides the return path through the opposite electrostatic electrode 323. Referring back to FIG. 4D, active and

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	passive transmission is accomplished by the modulator controller 471 and amplifier 477. Amplifier 477 is preferably a CMOS fully complementary inverter or buffer with its VDD input connected to the amplifier power line 462 and its VSS connection coupled to the low level power supply 450. Active transmission occurs when power is coupled from the high level power supply 451 through the power switch and onto the amplifier power line 462 by multiplexor 469. Passive transmission occurs when the DC voltage rectifier/regulator 418 within the transceiver 104 provides the rectified voltage and is coupled through the power switch to the amplifier power line 462 by multiplexor 469. Multiplexor 469 and 466 can further operate as a switch to selectively turn power OFF to circuitry connected to the device power line 460 or the amplifier power line 462 by turning OFF both of the transistor switches 467-468 or 470 and 475. Data 474 input into the modulator controller 471 is modulated with the input carrier signal 476 to generate the data signal on line 478. Signal line 478 is separate from signal line 472 such that the load modulator 473 and the amplifier 477 can be enabled or disabled independent from one another. Disabling the load modulator 473 or the amplifier 477 may be performed by setting the signal on line 472 or 478 respectively to a high or low DC logic level. The signal on signal line 478 is input into the amplifier 477. The amplifier 477 amplifies the signal on line 478 and transmits the information electrostatically over the electrostatic electrode 116. In active mode, after the transmit time has occurred, the power to the amplifier 477 may be turned OFF to conserve power. Vega at 15:38–61 Now referring to FIG. 8A, selected details of the analog interface module 711 within the active electrostatic transceiver 704 are illustrated. The active electrostatic transceiver 704 includes the first electrostatic electrode 114, the second electrostatic electrode 115, the third electrostatic electrode 116, the transceiver circuit 710, and an energy storage means 360. The energy storage means 360 can be any type of energy storage means, including a battery or capacitor, preferably it is a thin foil battery to conform to a form factor for a smart card, tag, or badge. The transceiver circuit 710 as illustrated in FIG. 8A shows the relevant components for the second embodiment of the present invention. In FIG. 8A, the transceiver circuit 710 includes the analog interface module 711 and modulator 309. Components of the analog interface module 711 include a DC voltage rectifier/regulator 418, a power manager 812A, a clock extractor 430, a clock generator 830, a demodulator 432, and a modulator 309. The power manager 812A includes a detector/receiver 420, a power switch 422, a sleep timer 424, a power-on-resetor (POR) 426, and a manual switch 824. Except as otherwise described below, like numbered components of the transceiver circuit 710 operate similar to the similarly numbered components of the transceiver circuit 300 of the active electrostatic transceiver 104.

Claim Element	Exemplary Citations to U.S. Pat. No. 6,282,407 ("Vega")
	See also Vega at Abstract, 5:8–25, 6:1–22, 8:18–45, and 16:53–17:8. *See* claim 2 above. *See also* claim 11 above.
13. The mobile device of claim 11 wherein the smartcard controller is coupled to be powered by the mobile device.	Vega discloses or renders obvious "[t]he mobile device of claim 11 wherein the smartcard controller is coupled to be powered by the mobile device." *See* claim 3 above. *See also* claim 11 above.
14. The mobile device of claim 11 wherein the mobile device comprises a mobile phone.	Vega discloses or renders obvious "[t]he mobile device of claim 11 wherein the mobile device comprises a mobile phone." *See* claim 4 above. *See also* claim 11 above.

DEFENDANTS' INVALIDITY CONTENTIONS FOR U.S. PAT. 9,483,722

EXHIBIT B05: Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

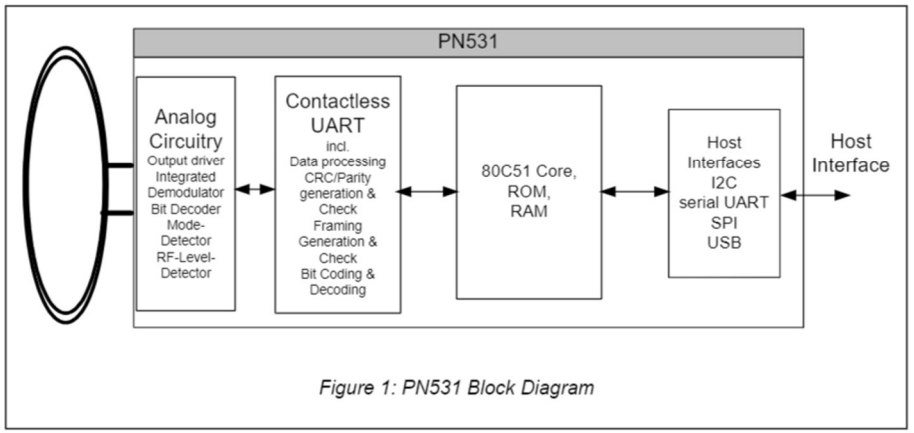
As demonstrated in the claim charts below, the claims of U.S. Patent No. 9,483,722 ("the '722 patent") are invalid (a) under one or more sections of 35 U.S.C. § 102 as anticipated by Philips Specification and (b) under 35 U.S.C. § 103(a) as obvious over Philips Specification standing alone and as set forth herein, and/or combined with the knowledge of a person of ordinary skill in the art, Applicant's Admitted Prior Art, and/or the additional prior art references discussed in Exhibit B and Exhibits B01–B05, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '722 patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

Defendants have conducted the invalidity analysis herein based at least in part and in some instance entirely upon Plaintiff's apparent application of the claims of the '722 patent. By charting the prior art against the claims and limitations herein, Defendants are not admitting or agreeing to Plaintiff's application of the claims at issue in this case, and these charts should not be interpreted as an admission or concession by Defendants that any particular construction or application of any claim limitation by Plaintiff is correct or proper. Additionally, these charts provide representative examples of portions of the charted references that disclose the indicated limitations of the claims; additional portions of these references other than the representative examples provided herein may also disclose the indicated limitation(s) and Defendants contend that the asserted claims are invalid in light of the charted reference(s) as a whole in its or their entirety. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well.

Claim Element	**Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")**
1[pre]. A mobile device comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is a claim limitation. Philips Specification discloses or renders obvious "[a] mobile device." For example: Philips Specification at 5 Typical devices to integrate the PN531 are • Mobile phones • PDAs • PCs • Intelligent remote controls • PC peripherals e.g. printers and mice • Consumer electronic devices like digital cameras

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Philips Specification discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." For example: Philips Specification at 3 The PN531 is a highly integrated transmission module for contactless communication at 13.56 MHz including µ-controller functionality based on an 80C51 core with 32 kbyte of ROM and 1 kbyte of RAM. This µc-based transmission module combines an outstanding modulation and demodulation concept completely integrated for different kinds of contactless communication methods and protocols at 13.56 MHz with an easy to use firmware for the different supported modes and the required host interfaces. Philips Specification at 3 The PN531 supports 3 different operating modes • Reader/writer mode for FeliCa™ and ISO14443A cards • Supports Card interface mode for FeliCa™ and ISO14443A/MIFARE® in combination with secure µC • NFC IP-1 mode Philips Specification at 3 In reader/ writer mode the PN531's internal transmitter part is able to drive a reader/writer antenna designed to communicate with ISO14443A /MIFARE® or FeliCa™ cards and transponders without additional active circuitry. The receiver part provides a robust and efficient implementation of a demodulation and decoding circuitry for signals from ISO14443A compatible cards and transponders. The digital part handles the complete ISO14443A framing and error detection (Parity & CRC). Philips Specification at 3 In card mode the PN531 is able to answer a reader/writer command either in FeliCa™ or ISO14443A/MIFARE® card mode. The PN531 generates the proper digital load modulated signals and with an external circuit, can respond to commands sent by the reader/writer.

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	Philips Specification at 4 • 80C51 microcontroller core with 32 kbyte ROM and 1 kbyte RAM • Highly integrated analog circuitry for transmission and reception • Output drivers to connect an antenna with minimum number of external components • Integrated RF Level detector • Integrated mode detector • Hardware and embedded Firmware support for • ISO 14443A reader/writer mode • MIFARE®Classic encryption and MIFARE® higher baudrate communication up to 424 kbit/s • Contactless communication according to the FeliCa™ scheme at 212 kbit/s and 424 kbit/s • NFC standard ECMA 340 and ISO 18092: NFC IP-1 interface and protocol • Host protocol on following interfaces • USB 2.0 full speed compliant device • SPI • I2C • High speed serial UART • Optional interrupt line to the host • Hard reset with low power function • Flexible Power down mode or power reduction mode per software • Internal oscillator to connect a 27.12 MHz quartz • Internal oscillator to connect a 4 MHz quartz for the USB interface • 2.5 - 3.6 V power supply • USB bus powered (In USB mode) • Specific IO ports and interrupt sources for external devices control Philips Specification at 5 The integrated microcontroller and embedded firmware of the PN 531 means a fast and easy integration in a contactless system. The high-level abstraction commands and the complete handling of RF communication protocols free the host CPU of all real time related constraints. Philips Specification at Figure 1

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	2 BLOCK DIAGRAM **2.1 Simplified PN531 Block Diagram**  *Figure 1: PN531 Block Diagram* Philips Specification at 6 The Analog circuitry handles the modulation and demodulation of the analog signals according to the card mode, reader /writer mode and NFC mode communication scheme. Philips Specification at 6 The microcontroller with its embedded firmware allows autonomous management of communication both on the RF interface and with the host. Philips Specification at Figure 3.2

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

3.2 Pin Description

Pin	Symbol	Type	Pad Ref Voltage	Description
1	DVSS	PWR		Digital Ground
2	LOADMOD	O	DVDD	Load Modulation output provides digital signal for FeliCa and MIFARE® card operating mode
3	TVSS1	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
4	TX1	O	TVDD	Transmitter 1: delivers the modulated 13.56 MHz energy carrier
5	TVDD	PWR		Transmitter power supply: supplies the output stage of TX1 and TX2
6	TX2	O	TVDD	Transmitter 2: delivers the modulated 13.56 MHz energy carrier
7	TVSS2	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
8	AVDD	PWR		Analog Power Supply
9	VMID	PWR	AVDD	Internal Reference Voltage: This pin delivers the internal reference voltage.
10	RX	I	AVDD	Receiver Input: Input pin for the reception signal, which is the load modulated 13.56 MHz energy carrier from the antenna circuit.
11	AVSS	PWR		Analog Ground
12	AUX1	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
13	AUX2	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
14	OSCIN	I	AVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator. This pin is also the input for an externally generated clock (fosc = 27.12 MHz).
15	OSCOUT	O	AVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator.
16	I0	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
17	I1	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
18	TESTEN	I	DVDD	Test enable pin: When set to 1 enable the test mode. When set to 0 reset the TCB and disable the access to the test mode.
19	OSC2OUT	O	DVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator for the USB clock.
20	OSC2IN	I	DVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator for the USB clock generation. This pin is also the input for an externally generated clock (f_{osc} =4 MHz). In test mode this signal is used as test clock input
21	P35	IO	DVDD	General purpose IO signal
22	P34	IO	SVDD	General purpose IO signal or clk signal for the SAM
23	SIGOUT	O	SVDD	Contactless communication interface output: delivers a serial data stream according to NFCIP-1 and output signal for the SAM. In test mode this signal is used as test signal output.
24	SIGIN	I	SVDD	Contactless communication interface input: accepts a digital, serial data stream according to NFCIP-1 and input signal from the SAM. In test mode

Philips Specification at Figure 3

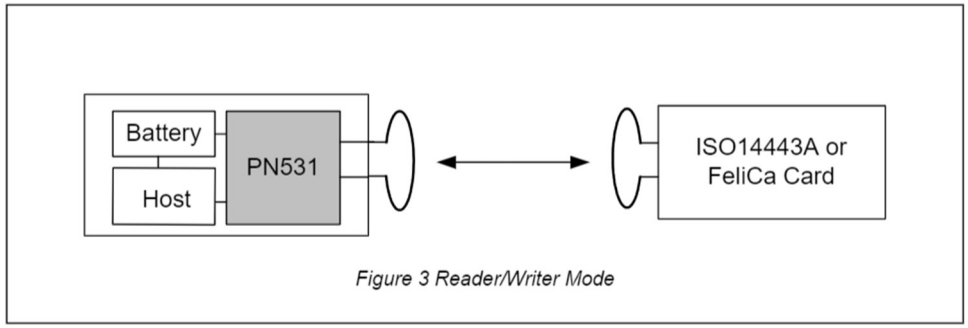
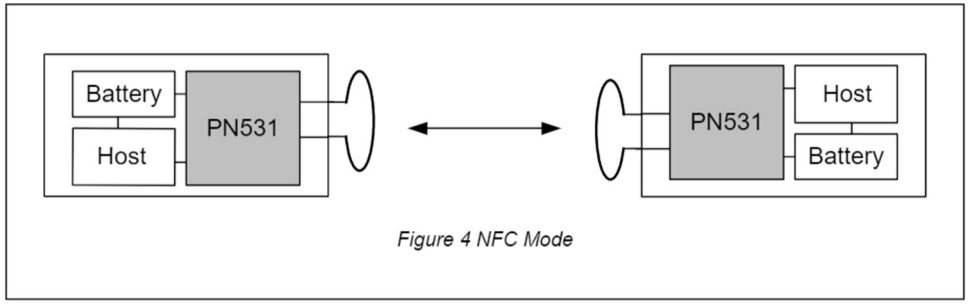


Figure 3 Reader/Writer Mode

Philips Specification at Figure 4

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 4 NFC Mode* Philips Specification at 11 NFC communication differentiates between an active and a passive communication. • Active NFC Mode means both the initiator and the target are using their own RF field for the communication. • Passive NFC Mode means that the target answers to an initiator command in a load modulation scheme. The initiator is active i.e. generating the RF field. Philips Specification at 11 • Initiator: generates RF field @ 13.56 MHz and starts the NFC communication • Target: responds to initiator commands either using load modulation scheme (RF field continuously generated by Initiator) or using modulation of self generated RF field (no RF field generated by initiator) Philips Specification at Figure 6

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

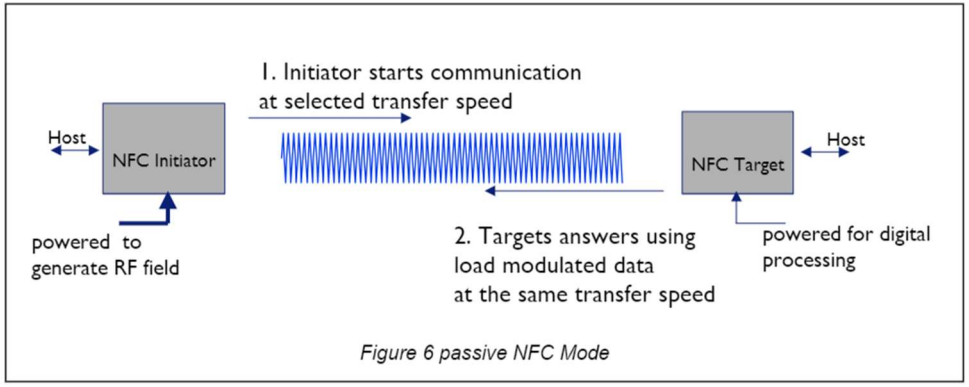


Figure 6 passive NFC Mode

Philips Specification at Figure 7

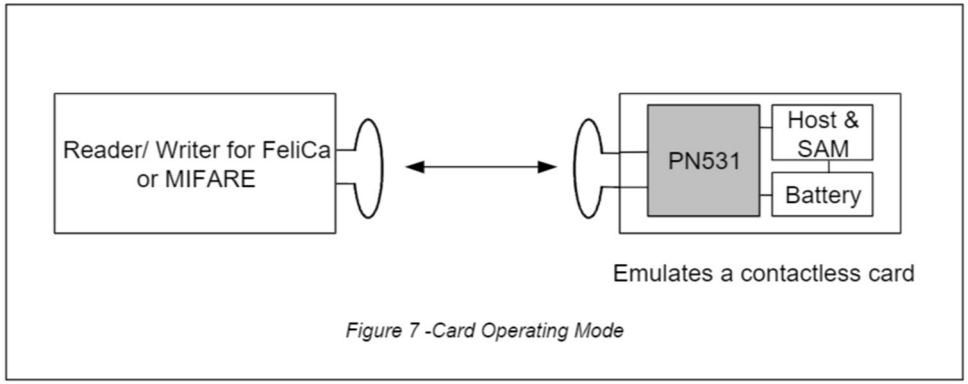
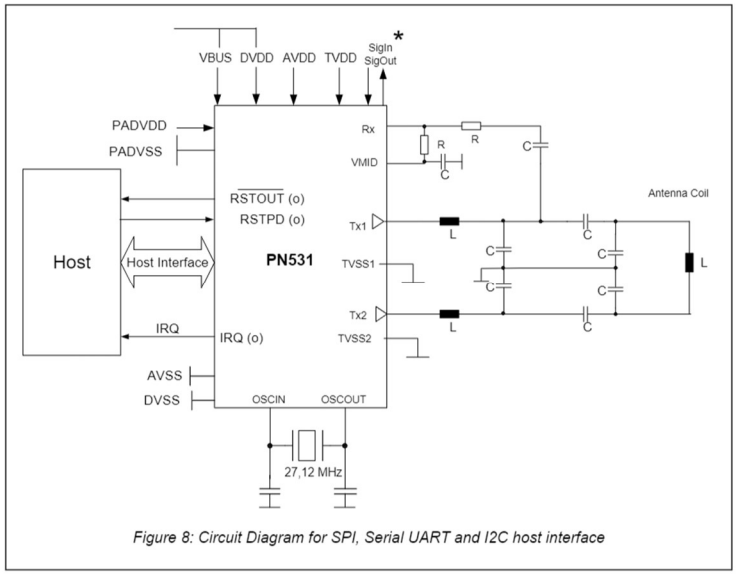


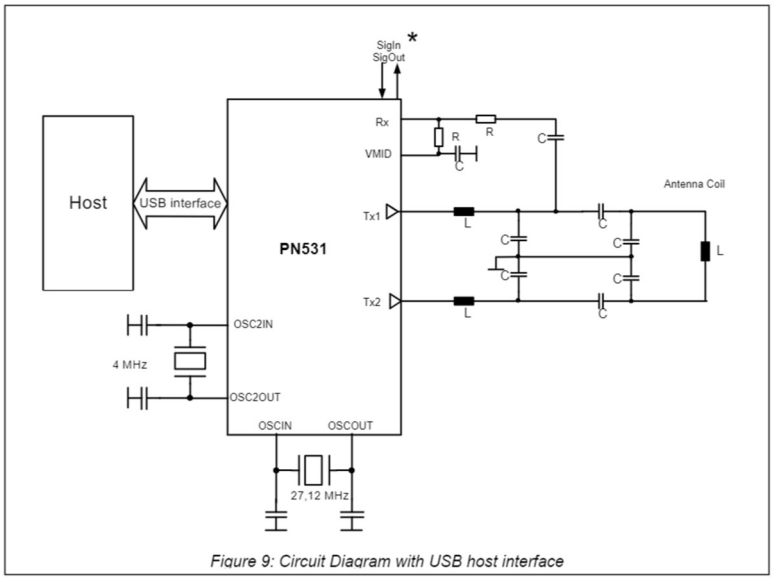
Figure 7 -Card Operating Mode

Philips Specification at 13

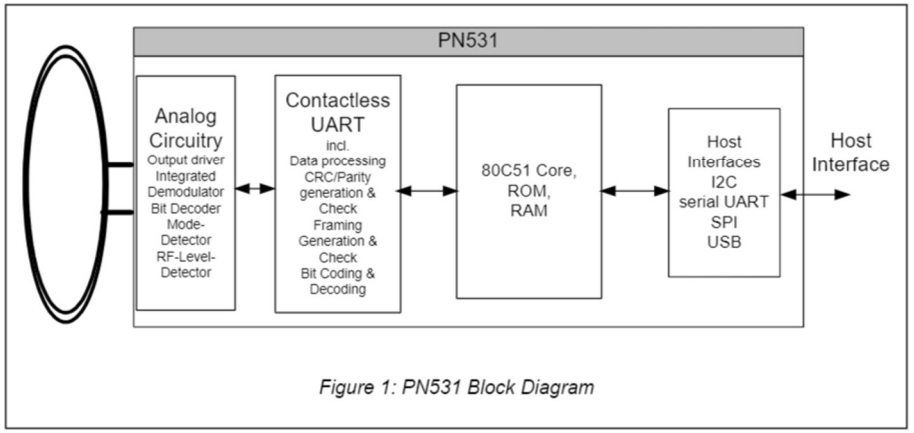
> The PN531 can be addressed like a FeliCa™ or ISO14443A/ MIFARE® card. This means that the PN531 in combination with a secure µC may acts as an ISO14443A /MIFARE® or FeliCa™ card.

Philips Specification at Figure 8

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 8: Circuit Diagram for SPI, Serial UART and I2C host interface* Philips Specification at 14 The figure below shows a typical application, where the antenna is directly connected to the PN531. The used host interface is SPI, Serial UART or I2C. Philips Specification at Figure 9

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 9: Circuit Diagram with USB host interface* To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1b] an antenna tuned to operate at 13.56 MHz; and	Philips Specification discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." For example: Philips Specification at 3 The PN531 is a highly integrated transmission module for contactless communication at 13.56 MHz including µ-controller functionality based on an 80C51 core with 32 kbyte of ROM and 1 kbyte of RAM. This µc-based transmission module combines an outstanding modulation and demodulation concept completely integrated for different kinds of contactless communication methods and protocols at 13.56 MHz with an easy to use firmware for the different supported modes and the required host interfaces. Philips Specification at 3 In reader/ writer mode the PN531's internal transmitter part is able to drive a reader/writer antenna designed to communicate with ISO14443A /MIFARE® or FeliCa™ cards and transponders without additional active circuitry. The receiver part provides a robust and efficient implementation of a

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	demodulation and decoding circuitry for signals from ISO14443A compatible cards and transponders. The digital part handles the complete ISO14443A framing and error detection (Parity & CRC). Philips Specification at 4 • 80C51 microcontroller core with 32 kbyte ROM and 1 kbyte RAM • Highly integrated analog circuitry for transmission and reception • Output drivers to connect an antenna with minimum number of external components • Integrated RF Level detector • Integrated mode detector • Hardware and embedded Firmware support for • ISO 14443A reader/writer mode • MIFARE®Classic encryption and MIFARE® higher baudrate communication up to 424 kbit/s • Contactless communication according to the FeliCa™ scheme at 212 kbit/s and 424 kbit/s • NFC standard ECMA 340 and ISO 18092: NFC IP-1 interface and protocol • Host protocol on following interfaces • USB 2.0 full speed compliant device • SPI • I2C • High speed serial UART • Optional interrupt line to the host • Hard reset with low power function • Flexible Power down mode or power reduction mode per software • Internal oscillator to connect a 27.12 MHz quartz • Internal oscillator to connect a 4 MHz quartz for the USB interface • 2.5 - 3.6 V power supply • USB bus powered (In USB mode) • Specific IO ports and interrupt sources for external devices control Philips Specification at 5 The PN531 is tailored to fulfil the requirements of various applications using contactless communication based on the ECMA340 (NFC IP-1) Interface and protocol standard, the ISO14443A reader and FeliCa reader protocol. NFC IP-1 is also standardised in ISO/IEC 18092.

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	Philips Specification at Figure 1 **2 BLOCK DIAGRAM** **2.1 Simplified PN531 Block Diagram**  *Figure 1: PN531 Block Diagram* Philips Specification at 6 The RF level detector detects the presence of an external RF field at 13.56 MHz. Philips Specification at Figure 3.2

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

3.2 Pin Description

Pin	Symbol	Type	Pad Ref Voltage	Description
1	DVSS	PWR		Digital Ground
2	LOADMOD	O	DVDD	Load Modulation output provides digital signal for FeliCa and MIFARE® card operating mode
3	TVSS1	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
4	TX1	O	TVDD	Transmitter 1: delivers the modulated 13.56 MHz energy carrier
5	TVDD	PWR		Transmitter power supply: supplies the output stage of TX1 and TX2
6	TX2	O	TVDD	Transmitter 2: delivers the modulated 13.56 MHz energy carrier
7	TVSS2	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
8	AVDD	PWR		Analog Power Supply
9	VMID	PWR	AVDD	Internal Reference Voltage: This pin delivers the internal reference voltage.
10	RX	I	AVDD	Receiver Input: Input pin for the reception signal, which is the load modulated 13.56 MHz energy carrier from the antenna circuit.
11	AVSS	PWR		Analog Ground
12	AUX1	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
13	AUX2	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
14	OSCIN	I	AVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator. This pin is also the input for an externally generated clock (fosc = 27.12 MHz).
15	OSCOUT	O	AVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator.
16	I0	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
17	I1	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
18	TESTEN	I	DVDD	Test enable pin: When set to 1 enable the test mode. When set to 0 reset the TCB and disable the access to the test mode.
19	OSC2OUT	O	DVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator for the USB clock.
20	OSC2IN	I	DVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator for the USB clock generation. This pin is also the input for an externally generated clock (f_{osc} =4 MHz). In test mode this signal is used as test clock input
21	P35	IO	DVDD	General purpose IO signal
22	P34	IO	SVDD	General purpose IO signal or clk signal for the SAM
23	SIGOUT	O	SVDD	Contactless communication interface output: delivers a serial data stream according to NFCIP-1 and output signal for the SAM. In test mode this signal is used as test signal output.
24	SIGIN	I	SVDD	Contactless communication interface input: accepts a digital, serial data stream according to NFCIP-1 and input signal from the SAM. In test mode

Philips Specification at Figure 3

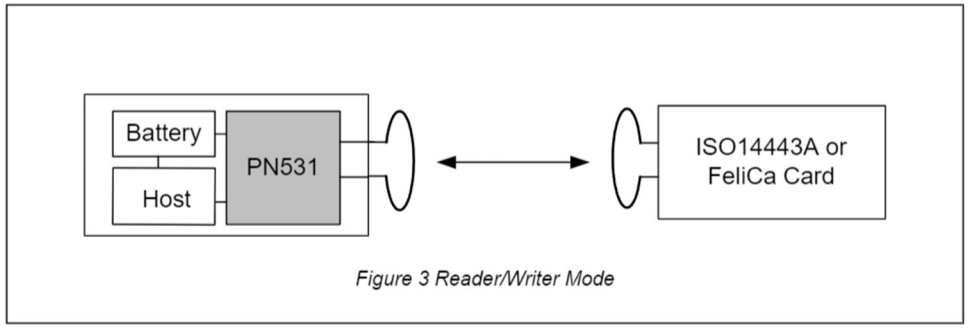
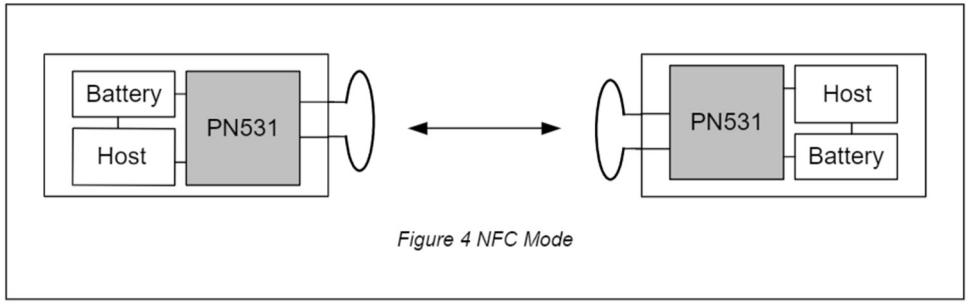
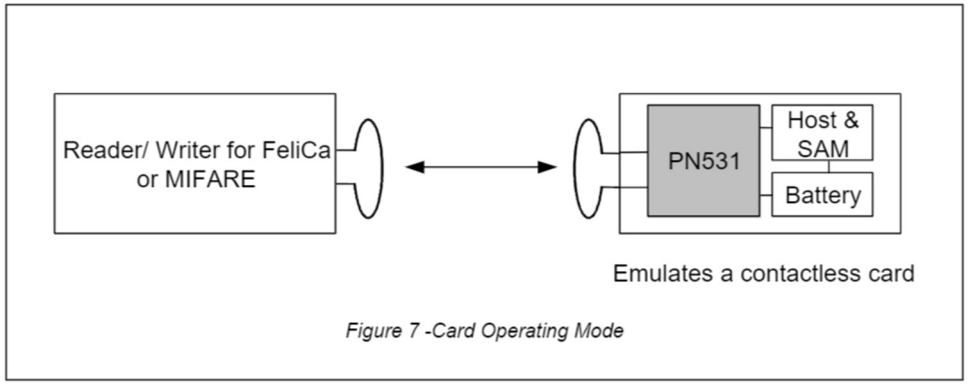
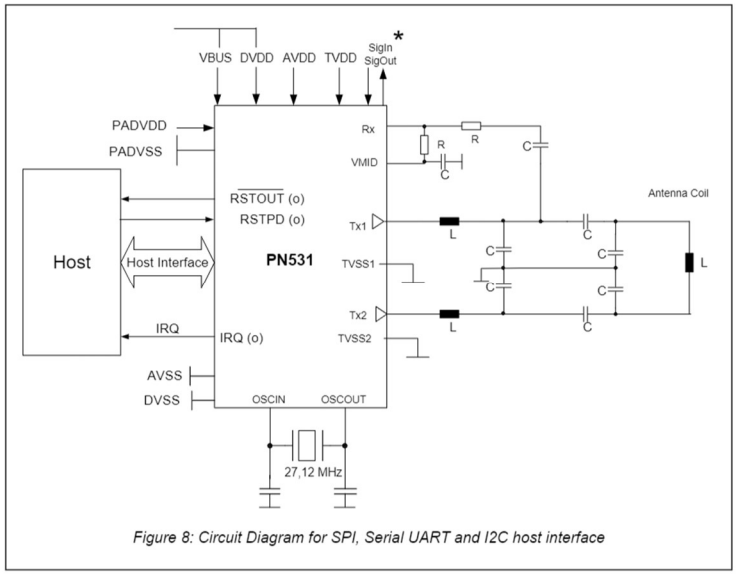
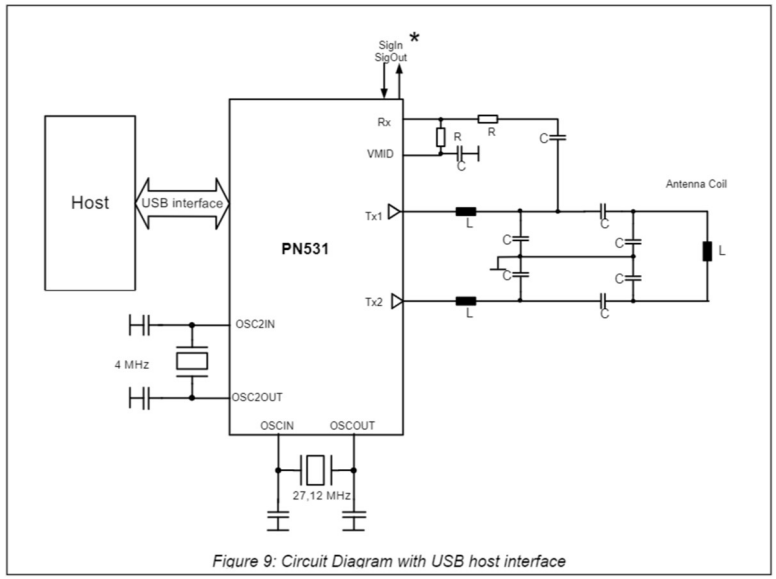


Figure 3 Reader/Writer Mode

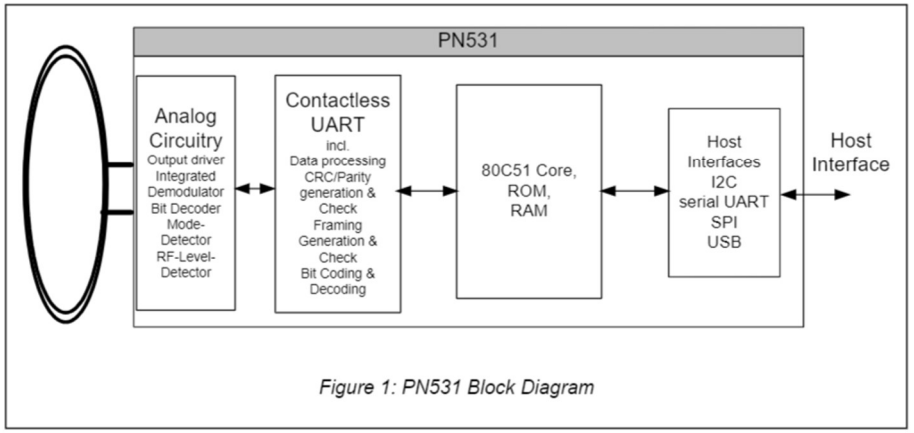
Philips Specification at Figure 4

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 4 NFC Mode* Philips Specification at 11 • Initiator: generates RF field @ 13.56 MHz and starts the NFC communication • Target: responds to initiator commands either using load modulation scheme (RF field continuously generated by Initiator) or using modulation of self generated RF field (no RF field generated by initiator) Philips Specification at Figure 7  *Figure 7 -Card Operating Mode* Philips Specification at Figure 8

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 8: Circuit Diagram for SPI, Serial UART and I2C host interface* Philips Specification at 14 The figure below shows a typical application, where the antenna is directly connected to the PN531. The used host interface is SPI, Serial UART or I2C. Philips Specification at Figure 9

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 9: Circuit Diagram with USB host interface* Philips Specification at 15 The figure below shows a typical application where the antenna is directly connected to the PN531. The host interface is USB. *See also* Philips Specification at 3, 6, 11, and Figure 6. To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1c] at least one active circuit coupled between the smartcard controller and the antenna, wherein the at least one active circuit includes an amplifier coupled to be powered by the mobile device, and wherein the amplifier is coupled to	Philips Specification discloses or renders obvious "at least one active circuit coupled between the smartcard controller and the antenna, wherein the at least one active circuit includes an amplifier coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller, and the at least one active circuit further includes a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna." For example:

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller, and the at least one active circuit further includes a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna.	Philips Specification at 3 In reader/ writer mode the PN531's internal transmitter part is able to drive a reader/writer antenna designed to communicate with ISO14443A /MIFARE® or FeliCa™ cards and transponders without additional active circuitry. The receiver part provides a robust and efficient implementation of a demodulation and decoding circuitry for signals from ISO14443A compatible cards and transponders. The digital part handles the complete ISO14443A framing and error detection (Parity & CRC). Philips Specification at 3 In card mode the PN531 is able to answer a reader/writer command either in FeliCa™ or ISO14443A/MIFARE® card mode. The PN531 generates the proper digital load modulated signals and with an external circuit, can respond to commands sent by the reader/writer. Philips Specification at 4 • 80C51 microcontroller core with 32 kbyte ROM and 1 kbyte RAM • Highly integrated analog circuitry for transmission and reception • Output drivers to connect an antenna with minimum number of external components • Integrated RF Level detector • Integrated mode detector • Hardware and embedded Firmware support for • ISO 14443A reader/writer mode • MIFARE®Classic encryption and MIFARE® higher baudrate communication up to 424 kbit/s • Contactless communication according to the FeliCa™ scheme at 212 kbit/s and 424 kbit/s • NFC standard ECMA 340 and ISO 18092: NFC IP-1 interface and protocol • Host protocol on following interfaces • USB 2.0 full speed compliant device • SPI • I2C • High speed serial UART • Optional interrupt line to the host • Hard reset with low power function • Flexible Power down mode or power reduction mode per software • Internal oscillator to connect a 27.12 MHz quartz

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	• Internal oscillator to connect a 4 MHz quartz for the USB interface • 2.5 - 3.6 V power supply • USB bus powered (In USB mode) • Specific IO ports and interrupt sources for external devices control Philips Specification at Figure 1 **2 BLOCK DIAGRAM** **2.1 Simplified PN531 Block Diagram**  *Figure 1: PN531 Block Diagram* Philips Specification at 6 The Analog circuitry handles the modulation and demodulation of the analog signals according to the card mode, reader /writer mode and NFC mode communication scheme. Philips Specification at 7 The device operates with six individual power supplies for best performance in terms of EMC behaviour and signal de-coupling. This gives outstanding RF performance and maximum flexibility to adapt to different operating voltages of digital and analog parts. Philips Specification at Figure 3.2

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

3.2 Pin Description

Pin	Symbol	Type	Pad Ref Voltage	Description
1	DVSS	PWR		Digital Ground
2	LOADMOD	O	DVDD	Load Modulation output provides digital signal for FeliCa and MIFARE® card operating mode
3	TVSS1	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
4	TX1	O	TVDD	Transmitter 1: delivers the modulated 13.56 MHz energy carrier
5	TVDD	PWR		Transmitter power supply: supplies the output stage of TX1 and TX2
6	TX2	O	TVDD	Transmitter 2: delivers the modulated 13.56 MHz energy carrier
7	TVSS2	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
8	AVDD	PWR		Analog Power Supply
9	VMID	PWR	AVDD	Internal Reference Voltage: This pin delivers the internal reference voltage.
10	RX	I	AVDD	Receiver Input: Input pin for the reception signal, which is the load modulated 13.56 MHz energy carrier from the antenna circuit.
11	AVSS	PWR		Analog Ground
12	AUX1	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
13	AUX2	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
14	OSCIN	I	AVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator. This pin is also the input for an externally generated clock (fosc = 27.12 MHz).
15	OSCOUT	O	AVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator.
16	I0	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
17	I1	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
18	TESTEN	I	DVDD	Test enable pin: When set to 1 enable the test mode. When set to 0 reset the TCB and disable the access to the test mode.
19	OSC2OUT	O	DVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator for the USB clock.
20	OSC2IN	I	DVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator for the USB clock generation. This pin is also the input for an externally generated clock (f_{osc} =4 MHz). In test mode this signal is used as test clock input
21	P35	IO	DVDD	General purpose IO signal
22	P34	IO	SVDD	General purpose IO signal or clk signal for the SAM
23	SIGOUT	O	SVDD	Contactless communication interface output: delivers a serial data stream according to NFCIP-1 and output signal for the SAM. In test mode this signal is used as test signal output.
24	SIGIN	I	SVDD	Contactless communication interface input: accepts a digital, serial data stream according to NFCIP-1 and input signal from the SAM. In test mode

Philips Specification at Figure 3

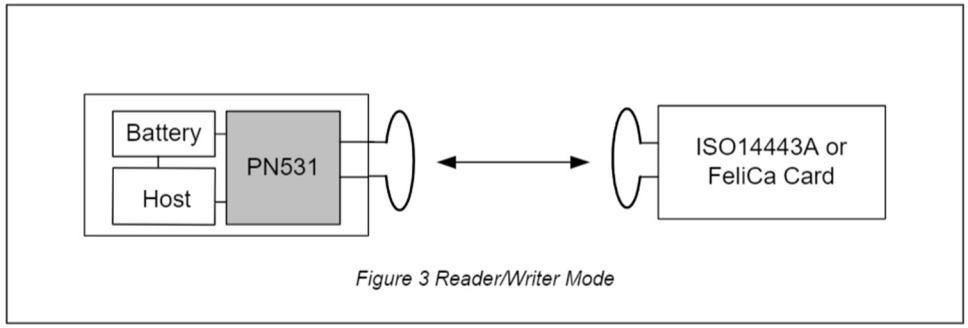
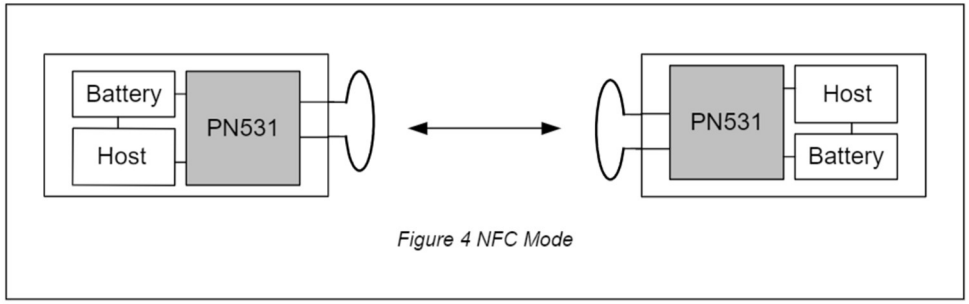
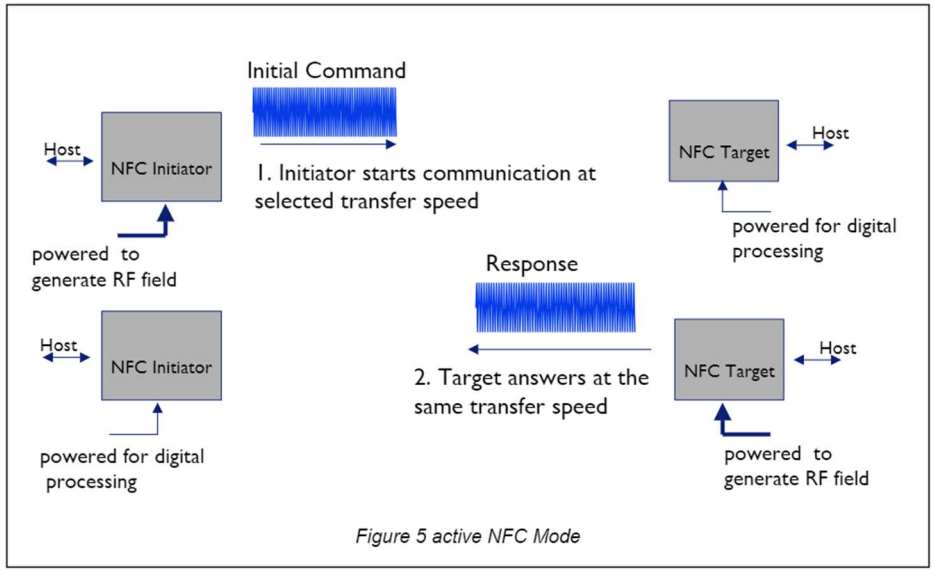
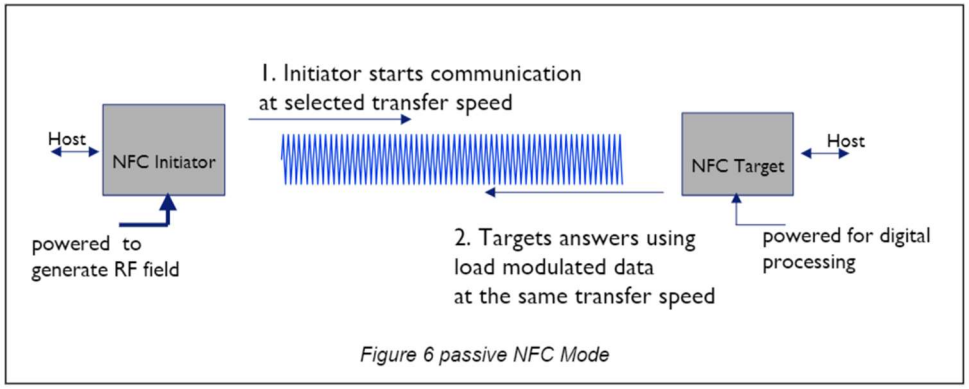


Figure 3 Reader/Writer Mode

Philips Specification at Figure 4

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 4 NFC Mode* Philips Specification at 11 NFC communication differentiates between an active and a passive communication. • Active NFC Mode means both the initiator and the target are using their own RF field for the communication. • Passive NFC Mode means that the target answers to an initiator command in a load modulation scheme. The initiator is active i.e. generating the RF field. Philips Specification at 11 • Initiator: generates RF field @ 13.56 MHz and starts the NFC communication • Target: responds to initiator commands either using load modulation scheme (RF field continuously generated by Initiator) or using modulation of self generated RF field (no RF field generated by initiator) Philips Specification at Figure 5

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 5 active NFC Mode* Philips Specification at Figure 6  *Figure 6 passive NFC Mode* Philips Specification at Figure 7

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

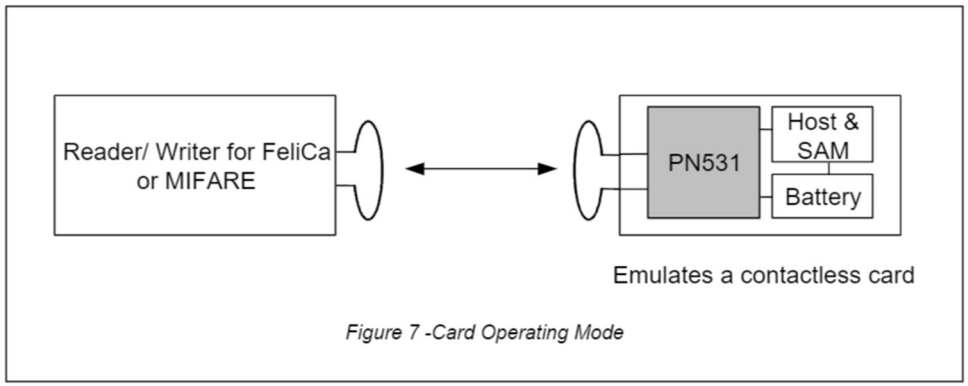


Figure 7 -Card Operating Mode

Philips Specification at Figure 8

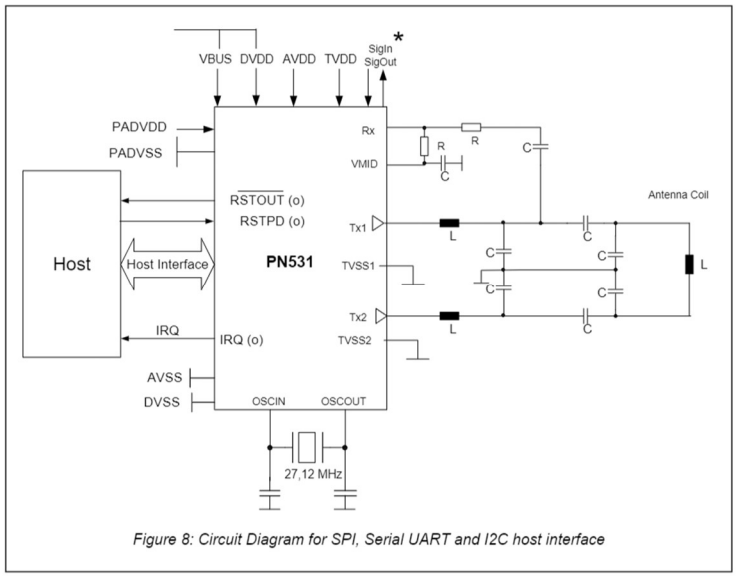


Figure 8: Circuit Diagram for SPI, Serial UART and I2C host interface

Philips Specification at 14

The figure below shows a typical application, where the antenna is directly connected to the PN531. The used host interface is SPI, Serial UART or I2C.

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	Philips Specification at Figure 9

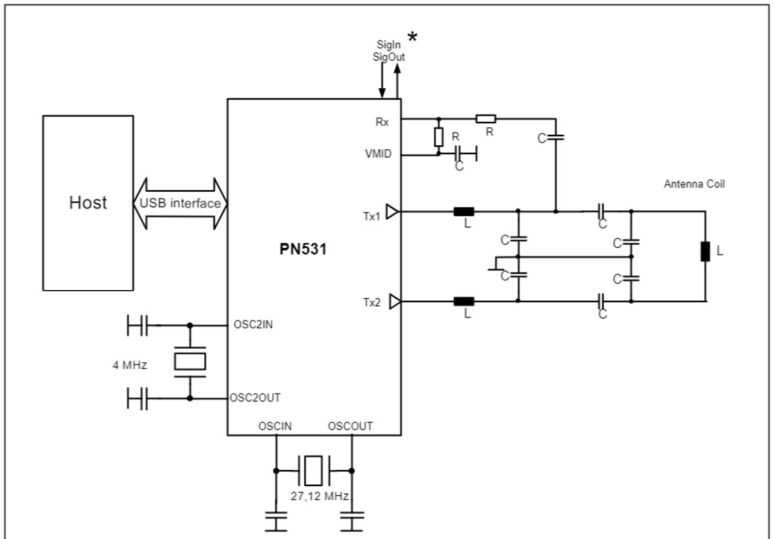


Figure 9: Circuit Diagram with USB host interface

Philips Specification at 15

> The figure below shows a typical application where the antenna is directly connected to the PN531. The host interface is USB.

Philips Specification at Table 6–1

6.1 Absolute Maximum Continuous Ratings

SYMBOL	PARAMETER	MIN	MAX	UNIT
AVDD DVDD PVDD SVDD TVDD	Supply Voltages	-0.5	4.0	V
VBUS	USB Supply Voltage	-0.5	5.5	V

Table 6-1: Absolute Maximum Continuous Ratings

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
2. The mobile device of claim 1 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
3. The mobile device of claim 1 wherein the smartcard controller is coupled to be powered by the mobile device.	Philips Specification discloses or renders obvious "[t]he mobile device of claim 1 wherein the smartcard controller is coupled to be powered by the mobile device." For example: Philips Specification at 4 • 80C51 microcontroller core with 32 kbyte ROM and 1 kbyte RAM • Highly integrated analog circuitry for transmission and reception • Output drivers to connect an antenna with minimum number of external components • Integrated RF Level detector • Integrated mode detector • Hardware and embedded Firmware support for • ISO 14443A reader/writer mode • MIFARE®Classic encryption and MIFARE® higher baudrate communication up to 424 kbit/s • Contactless communication according to the FeliCa™ scheme at 212 kbit/s and 424 kbit/s • NFC standard ECMA 340 and ISO 18092: NFC IP-1 interface and protocol • Host protocol on following interfaces • USB 2.0 full speed compliant device • SPI • I2C • High speed serial UART • Optional interrupt line to the host

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

- Hard reset with low power function
- Flexible Power down mode or power reduction mode per software
- Internal oscillator to connect a 27.12 MHz quartz
- Internal oscillator to connect a 4 MHz quartz for the USB interface
- 2.5 - 3.6 V power supply
- USB bus powered (In USB mode)
- Specific IO ports and interrupt sources for external devices control

Philips Specification at 7

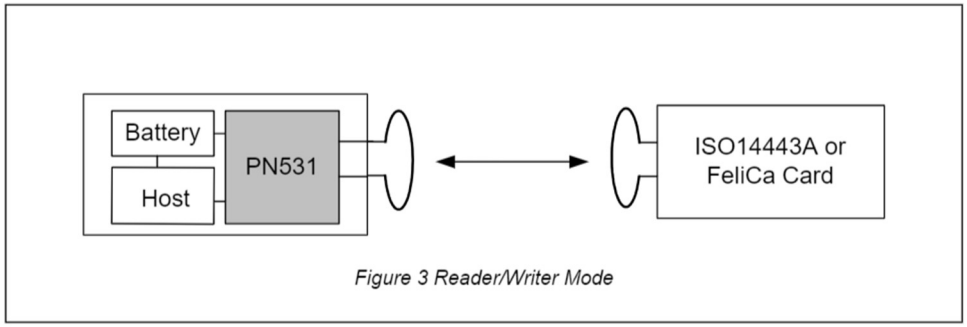
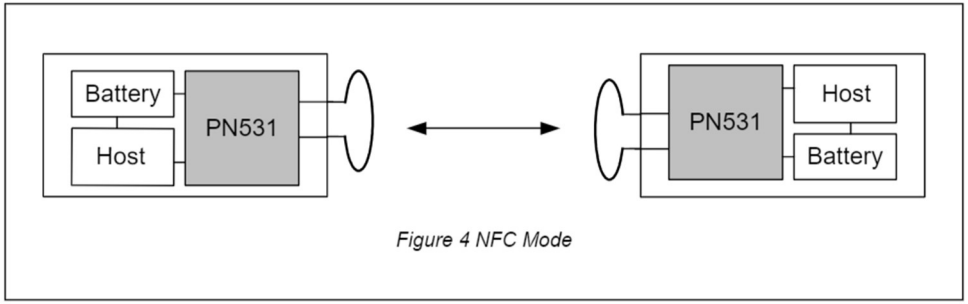
> The device operates with six individual power supplies for best performance in terms of EMC behaviour and signal de-coupling. This gives outstanding RF performance and maximum flexibility to adapt to different operating voltages of digital and analog parts.

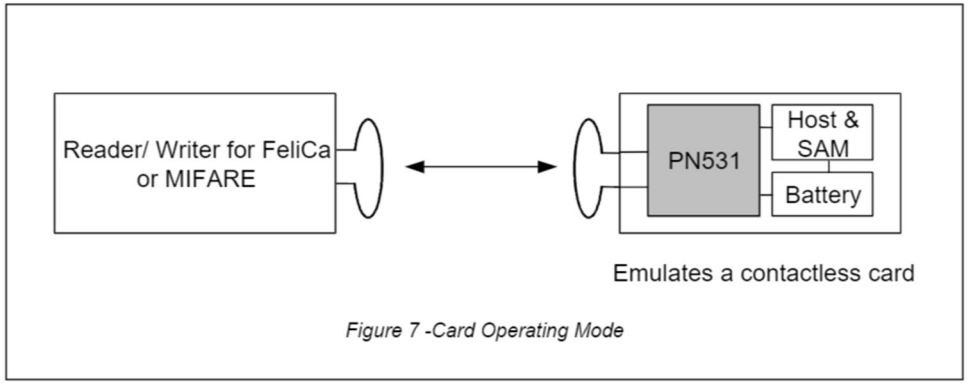
Philips Specification at Figure 3.2

3.2 Pin Description

Pin	Symbol	Type	Pad Ref Voltage	Description
1	DVSS	PWR		Digital Ground
2	LOADMOD	O	DVDD	Load Modulation output provides digital signal for FeliCa and MIFARE® card operating mode
3	TVSS1	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
4	TX1	O	TVDD	Transmitter 1: delivers the modulated 13.56 MHz energy carrier
5	TVDD	PWR		Transmitter power supply: supplies the output stage of TX1 and TX2
6	TX2	O	TVDD	Transmitter 2: delivers the modulated 13.56 MHz energy carrier
7	TVSS2	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
8	AVDD	PWR		Analog Power Supply
9	VMID	PWR	AVDD	Internal Reference Voltage: This pin delivers the internal reference voltage.
10	RX	I	AVDD	Receiver Input: Input pin for the reception signal, which is the load modulated 13.56 MHz energy carrier from the antenna circuit.
11	AVSS	PWR		Analog Ground
12	AUX1	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
13	AUX2	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
14	OSCIN	I	AVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator. This pin is also the input for an externally generated clock (fosc = 27.12 MHz).
15	OSCOUT	O	AVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator.
16	I0	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
17	I1	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
18	TESTEN	I	DVDD	Test enable pin: When set to 1 enable the test mode. When set to 0 reset the TCB and disable the access to the test mode.
19	OSC2OUT	O	DVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator for the USB clock.
20	OSC2IN	I	DVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator for the USB clock generation. This pin is also the input for an externally generated clock (f_{osc} =4 MHz). In test mode this signal is used as test clock input
21	P35	IO	DVDD	General purpose IO signal
22	P34	IO	SVDD	General purpose IO signal or clk signal for the SAM
23	SIGOUT	O	SVDD	Contactless communication interface output: delivers a serial data stream according to NFCIP-1 and output signal for the SAM. In test mode this signal is used as test signal output.
24	SIGIN	I	SVDD	Contactless communication interface input: accepts a digital, serial data stream according to NFCIP-1 and input signal from the SAM. In test mode

Philips Specification at Figure 3

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 3 Reader/Writer Mode* Philips Specification at Figure 4  *Figure 4 NFC Mode* Philips Specification at 11 • Initiator: generates RF field @ 13.56 MHz and starts the NFC communication • Target: responds to initiator commands either using load modulation scheme (RF field continuously generated by Initiator) or using modulation of self generated RF field (no RF field generated by initiator) Philips Specification at Figure 7

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 7 -Card Operating Mode* Philips Specification at Table 6–1 **6.1 Absolute Maximum Continuous Ratings** SYMBOL / PARAMETER / MIN / MAX / UNIT AVDD, DVDD, PVDD, SVDD, TVDD — Supply Voltages — -0.5 — 4.0 — V VBUS — USB Supply Voltage — -0.5 — 5.5 — V *Table 6-1: Absolute Maximum Continuous Ratings* To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
4. The mobile device of claim 1 wherein the mobile device comprises a mobile phone.	Philips Specification discloses or renders obvious "[t]he mobile device of claim 1 wherein the mobile device comprises a mobile phone." For example: Philips Specification at 5 Typical devices to integrate the PN531 are • Mobile phones

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	• PDAs • PCs • Intelligent remote controls • PC peripherals e.g. printers and mice • Consumer electronic devices like digital cameras To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 1 above.
5[pre]. A mobile device comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is a claim limitation. Philips Specification discloses or renders obvious "[a] mobile device." *See* 1[pre] above.
[5a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Philips Specification discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." *See* [1a] above.
[5b] an antenna tuned to operate at 13.56 MHz;	Philips Specification discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." *See* [1b] above.
[5c] an amplifier coupled between the smartcard controller and the antenna, wherein the amplifier is coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna	Philips Specification discloses or renders obvious "an amplifier coupled between the smartcard controller and the antenna, wherein the amplifier is coupled to be powered by the mobile device, and wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller." For example: *See* [1c] above. Philips Specification at 4

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
and to provide an amplified signal to the smartcard controller; and	• 80C51 microcontroller core with 32 kbyte ROM and 1 kbyte RAM • Highly integrated analog circuitry for transmission and reception • Output drivers to connect an antenna with minimum number of external components • Integrated RF Level detector • Integrated mode detector • Hardware and embedded Firmware support for • ISO 14443A reader/writer mode • MIFARE®Classic encryption and MIFARE® higher baudrate communication up to 424 kbit/s • Contactless communication according to the FeliCa™ scheme at 212 kbit/s and 424 kbit/s • NFC standard ECMA 340 and ISO 18092: NFC IP-1 interface and protocol • Host protocol on following interfaces • USB 2.0 full speed compliant device • SPI • I2C • High speed serial UART • Optional interrupt line to the host • Hard reset with low power function • Flexible Power down mode or power reduction mode per software • Internal oscillator to connect a 27.12 MHz quartz • Internal oscillator to connect a 4 MHz quartz for the USB interface • 2.5 - 3.6 V power supply • USB bus powered (In USB mode) • Specific IO ports and interrupt sources for external devices control Philips Specification at 7 The device operates with six individual power supplies for best performance in terms of EMC behaviour and signal de-coupling. This gives outstanding RF performance and maximum flexibility to adapt to different operating voltages of digital and analog parts. Philips Specification at Figure 3.2

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

3.2 Pin Description

Pin	Symbol	Type	Pad Ref Voltage	Description
1	DVSS	PWR		Digital Ground
2	LOADMOD	O	DVDD	Load Modulation output provides digital signal for FeliCa and MIFARE® card operating mode
3	TVSS1	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
4	TX1	O	TVDD	Transmitter 1: delivers the modulated 13.56 MHz energy carrier
5	TVDD	PWR		Transmitter power supply: supplies the output stage of TX1 and TX2
6	TX2	O	TVDD	Transmitter 2: delivers the modulated 13.56 MHz energy carrier
7	TVSS2	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
8	AVDD	PWR		Analog Power Supply
9	VMID	PWR	AVDD	Internal Reference Voltage: This pin delivers the internal reference voltage.
10	RX	I	AVDD	Receiver Input: Input pin for the reception signal, which is the load modulated 13.56 MHz energy carrier from the antenna circuit.
11	AVSS	PWR		Analog Ground
12	AUX1	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
13	AUX2	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
14	OSCIN	I	AVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator. This pin is also the input for an externally generated clock (fosc = 27.12 MHz).
15	OSCOUT	O	AVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator.
16	I0	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
17	I1	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
18	TESTEN	I	DVDD	Test enable pin: When set to 1 enable the test mode. When set to 0 reset the TCB and disable the access to the test mode.
19	OSC2OUT	O	DVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator for the USB clock.
20	OSC2IN	I	DVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator for the USB clock generation. This pin is also the input for an externally generated clock (f_{osc} =4 MHz). In test mode this signal is used as test clock input
21	P35	IO	DVDD	General purpose IO signal
22	P34	IO	SVDD	General purpose IO signal or clk signal for the SAM
23	SIGOUT	O	SVDD	Contactless communication interface output: delivers a serial data stream according to NFCIP-1 and output signal for the SAM. In test mode this signal is used as test signal output.
24	SIGIN	I	SVDD	Contactless communication interface input: accepts a digital, serial data stream according to NFCIP-1 and input signal from the SAM. In test mode

Philips Specification at Figure 3

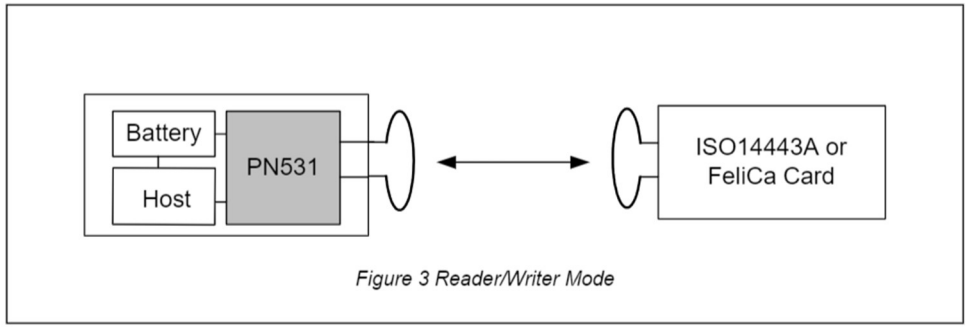


Figure 3 Reader/Writer Mode

Philips Specification at Figure 4

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

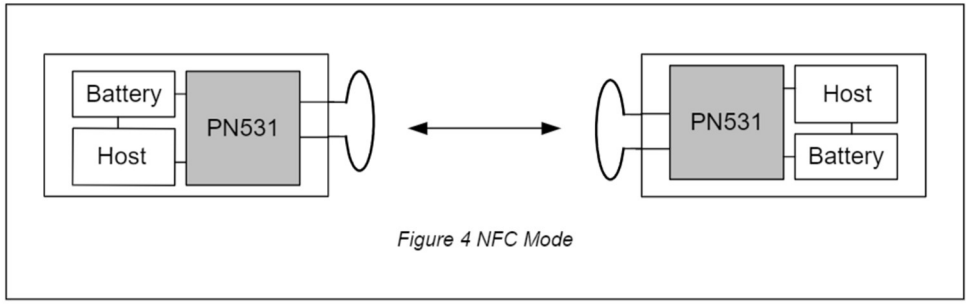


Figure 4 NFC Mode

Philips Specification at Figure 7

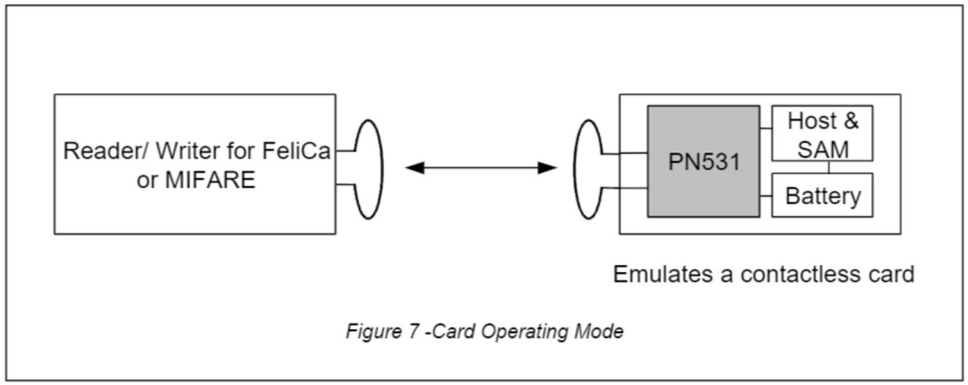


Figure 7 -Card Operating Mode

Philips Specification at Table 6–1

6.1 Absolute Maximum Continuous Ratings

SYMBOL	PARAMETER	MIN	MAX	UNIT
AVDD DVDD PVDD SVDD TVDD	Supply Voltages	-0.5	4.0	V
VBUS	USB Supply Voltage	-0.5	5.5	V

Table 6-1: Absolute Maximum Continuous Ratings

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[5d] a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna.	Philips Specification discloses or renders obvious "a transmit circuit coupled between the smartcard controller and the antenna that in operation forms a signal that mimics the at least one frequency sideband and wherein the signal drives the antenna." For example: *See* [1c] above. Philips Specification at 3 In reader/ writer mode the PN531's internal transmitter part is able to drive a reader/writer antenna designed to communicate with ISO14443A /MIFARE® or FeliCa™ cards and transponders without additional active circuitry. The receiver part provides a robust and efficient implementation of a demodulation and decoding circuitry for signals from ISO14443A compatible cards and transponders. The digital part handles the complete ISO14443A framing and error detection (Parity & CRC). Philips Specification at 3 In card mode the PN531 is able to answer a reader/writer command either in FeliCa™ or ISO14443A/MIFARE® card mode. The PN531 generates the proper digital load modulated signals and with an external circuit, can respond to commands sent by the reader/writer. Philips Specification at 4 • 80C51 microcontroller core with 32 kbyte ROM and 1 kbyte RAM • Highly integrated analog circuitry for transmission and reception • Output drivers to connect an antenna with minimum number of external components • Integrated RF Level detector • Integrated mode detector • Hardware and embedded Firmware support for • ISO 14443A reader/writer mode • MIFARE®Classic encryption and MIFARE® higher baudrate communication up to 424 kbit/s • Contactless communication according to the FeliCa™ scheme at 212 kbit/s and 424 kbit/s • NFC standard ECMA 340 and ISO 18092: NFC IP-1 interface and protocol

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

- Host protocol on following interfaces
  - USB 2.0 full speed compliant device
  - SPI
  - I2C
  - High speed serial UART
- Optional interrupt line to the host
- Hard reset with low power function
- Flexible Power down mode or power reduction mode per software
- Internal oscillator to connect a 27.12 MHz quartz
- Internal oscillator to connect a 4 MHz quartz for the USB interface
- 2.5 - 3.6 V power supply
- USB bus powered (In USB mode)
- Specific IO ports and interrupt sources for external devices control

Philips Specification at Figure 1

2 BLOCK DIAGRAM

2.1 Simplified PN531 Block Diagram

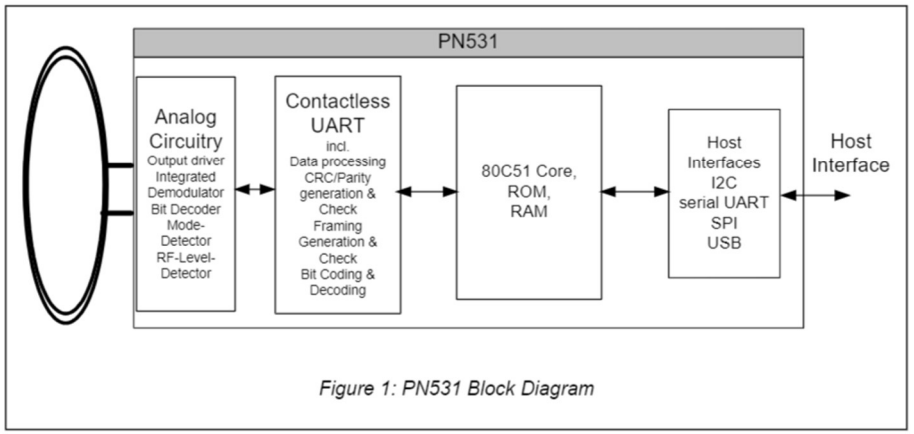


Figure 1: PN531 Block Diagram

Philips Specification at 6

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	The Analog circuitry handles the modulation and demodulation of the analog signals according to the card mode, reader /writer mode and NFC mode communication scheme. Philips Specification at Figure 3.2 3.2 Pin Description (table below) Philips Specification at 11 NFC communication differentiates between an active and a passive communication. • Active NFC Mode means both the initiator and the target are using their own RF field for the communication. • Passive NFC Mode means that the target answers to an initiator command in a load modulation scheme. The initiator is active i.e. generating the RF field. Philips Specification at 11 • Initiator: generates RF field @ 13.56 MHz and starts the NFC communication • Target: responds to initiator commands either using load modulation scheme (RF field continuously generated by Initiator) or using modulation of self generated RF field (no RF field generated by initiator)

Pin	Symbol	Type	Pad Ref Voltage	Description
1	DVSS	PWR		Digital Ground
2	LOADMOD	O	DVDD	Load Modulation output provides digital signal for FeliCa and MIFARE® card operating mode
3	TVSS1	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
4	TX1	O	TVDD	Transmitter 1: delivers the modulated 13.56 MHz energy carrier
5	TVDD	PWR		Transmitter power supply: supplies the output stage of TX1 and TX2
6	TX2	O	TVDD	Transmitter 2: delivers the modulated 13.56 MHz energy carrier
7	TVSS2	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
8	AVDD	PWR		Analog Power Supply
9	VMID	PWR	AVDD	Internal Reference Voltage: This pin delivers the internal reference voltage.
10	RX	I	AVDD	Receiver Input: Input pin for the reception signal, which is the load modulated 13.56 MHz energy carrier from the antenna circuit.
11	AVSS	PWR		Analog Ground
12	AUX1	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
13	AUX2	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
14	OSCIN	I	AVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator. This pin is also the input for an externally generated clock (fosc = 27.12 MHz).
15	OSCOUT	O	AVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator.
16	I0	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
17	I1	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
18	TESTEN	I	DVDD	Test enable pin: When set to 1 enable the test mode. When set to 0 reset the TCB and disable the access to the test mode.
19	OSC2OUT	O	DVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator for the USB clock.
20	OSC2IN	I	DVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator for the USB clock generation. This pin is also the input for an externally generated clock (f_{osc} =4 MHz). In test mode this signal is used as test clock input
21	P35	IO	DVDD	General purpose IO signal
22	P34	IO	SVDD	General purpose IO signal or clk signal for the SAM
23	SIGOUT	O	SVDD	Contactless communication interface output: delivers a serial data stream according to NFCIP-1 and output signal for the SAM. In test mode this signal is used as test signal output.
24	SIGIN	I	SVDD	Contactless communication interface input: accepts a digital, serial data stream according to NFCIP-1 and input signal from the SAM. In test mode

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	Philips Specification at Figure 5

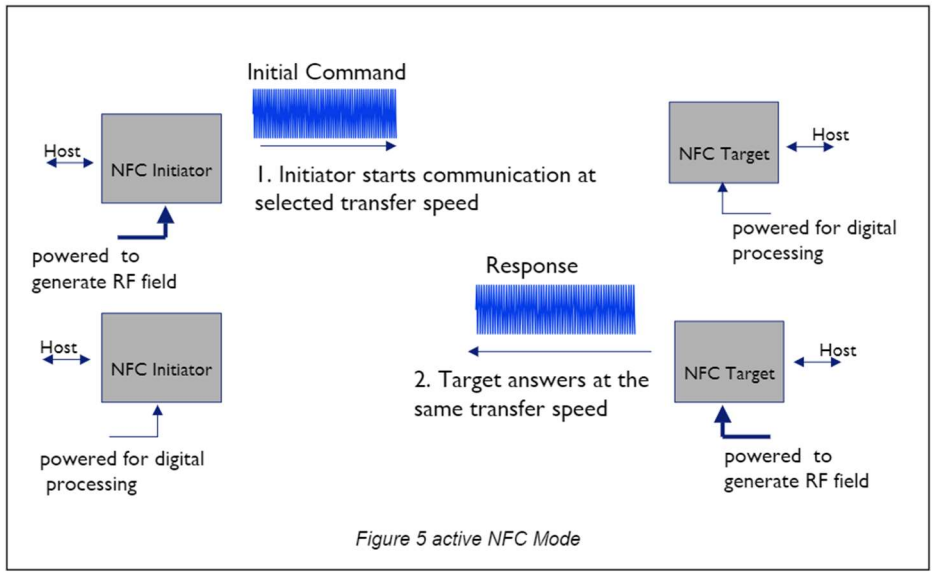


Figure 5 active NFC Mode

Philips Specification at Figure 6

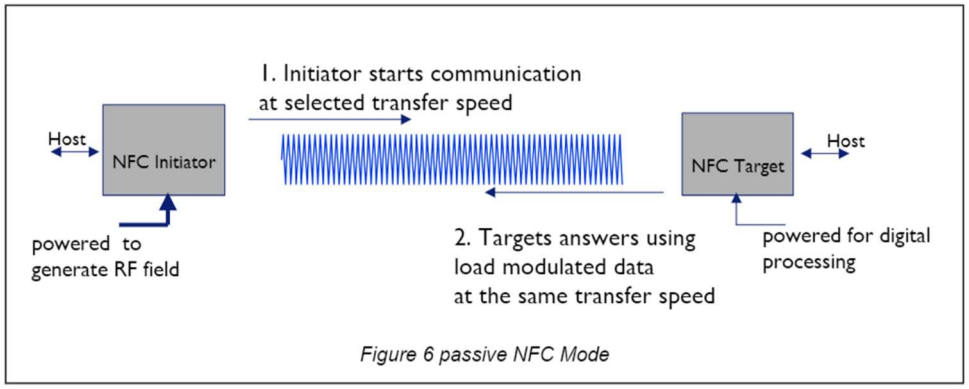
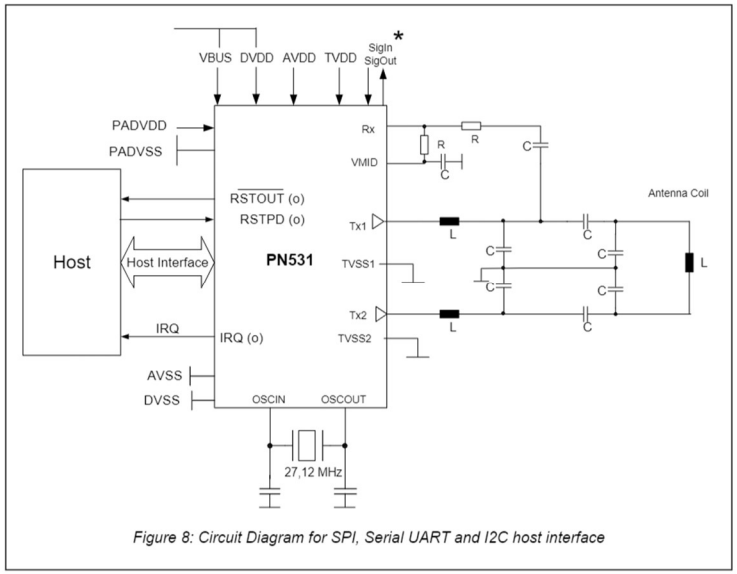
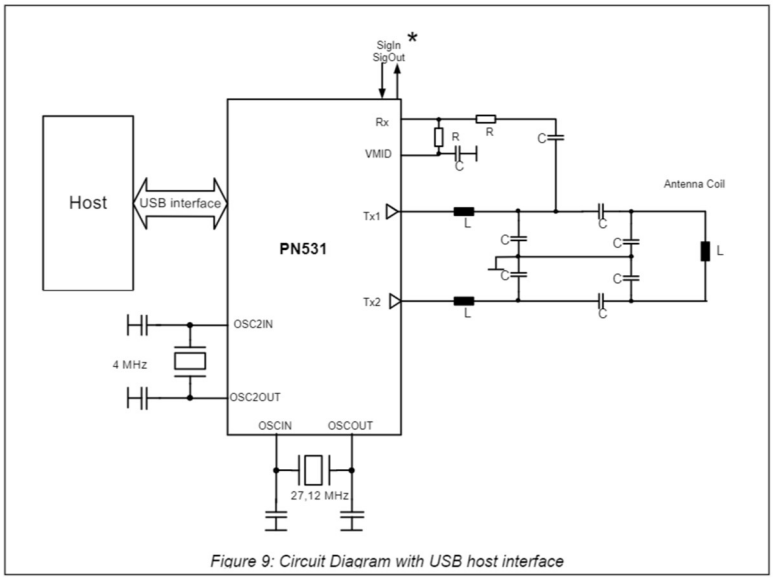


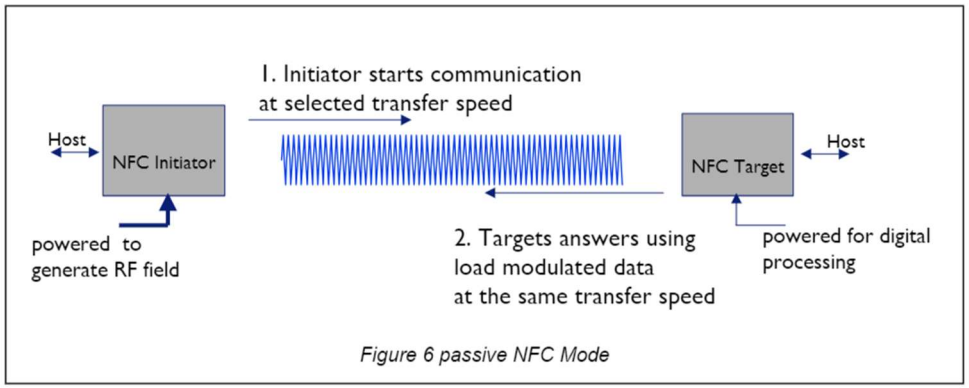
Figure 6 passive NFC Mode

Philips Specification at Figure 8

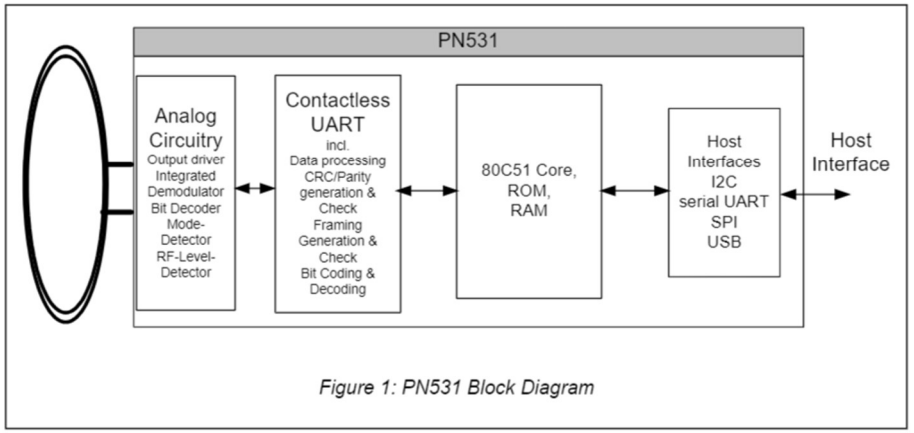
Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 8: Circuit Diagram for SPI, Serial UART and I2C host interface* Philips Specification at Figure 9

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 9: Circuit Diagram with USB host interface* To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
6. The mobile device of claim 5 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Philips Specification discloses or renders obvious "[t]he mobile device of claim 5 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." *See* claim 2 above. *See also* claim 5 above.
7. The mobile device of claim 5 wherein the smartcard controller is coupled to be powered by the mobile device.	Philips Specification discloses or renders obvious "[t]he mobile device of claim 5 wherein the smartcard controller is coupled to be powered by the mobile device." *See* claim 3 above. *See also* claim 5 above.

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
8. The mobile device of claim 5 wherein the transmit circuit comprises a load modulation circuit.	Philips Specification discloses or renders obvious "[t]he mobile device of claim 5 wherein the transmit circuit comprises a load modulation circuit." For example: Philips Specification at 3 In card mode the PN531 is able to answer a reader/writer command either in FeliCa™ or ISO14443A/MIFARE® card mode. The PN531 generates the proper digital load modulated signals and with an external circuit, can respond to commands sent by the reader/writer. Philips Specification at 6 The Analog circuitry handles the modulation and demodulation of the analog signals according to the card mode, reader /writer mode and NFC mode communication scheme. Philips Specification at Figure 3.2 3.2 Pin Description Pin / Symbol / Type / Pad Ref Voltage / Description 1 / DVSS / PWR / / Digital Ground 2 / LOADMOD / O / DVDD / Load Modulation output provides digital signal for FeliCa and MIFARE® card operating mode 3 / TVSS1 / PWR / / Transmitter Ground: supplies the output stage of TX1 and TX2 4 / TX1 / O / TVDD / Transmitter 1: delivers the modulated 13.56 MHz energy carrier 5 / TVDD / PWR / / Transmitter power supply: supplies the output stage of TX1 and TX2 6 / TX2 / O / TVDD / Transmitter 2: delivers the modulated 13.56 MHz energy carrier 7 / TVSS2 / PWR / / Transmitter Ground: supplies the output stage of TX1 and TX2 8 / AVDD / PWR / / Analog Power Supply 9 / VMID / PWR / AVDD / Internal Reference Voltage: This pin delivers the internal reference voltage. 10 / RX / I / AVDD / Receiver Input: Input pin for the reception signal, which is the load modulated 13.56 MHz energy carrier from the antenna circuit. 11 / AVSS / PWR / / Analog Ground 12 / AUX1 / O / DVDD / Auxiliary Output: This pin delivers analog and digital test signals. 13 / AUX2 / O / DVDD / Auxiliary Output: This pin delivers analog and digital test signals. 14 / OSCIN / I / AVDD / Crystal Oscillator Input: input to the inverting amplifier of the oscillator. This pin is also the input for an externally generated clock (fosc = 27.12 MHz). 15 / OSCOUT / O / AVDD / Crystal Oscillator output: Output of the inverting amplifier of the oscillator. 16 / I0 / I / DVDD / Interface mode lines: selects the used host interface. In test mode I0 is used as test signals. 17 / I1 / I / DVDD / Interface mode lines: selects the used host interface. In test mode I0 is used as test signals. 18 / TESTEN / I / DVDD / Test enable pin: When set to 1 enable the test mode. When set to 0 reset the TCB and disable the access to the test mode. 19 / OSC2OUT / O / DVDD / Crystal Oscillator output: Output of the inverting amplifier of the oscillator for the USB clock. 20 / OSC2IN / I / DVDD / Crystal Oscillator Input: input to the inverting amplifier of the oscillator for the USB clock generation. This pin is also the input for an externally generated clock (f_{osc} =4 MHz). In test mode this signal is used as test clock input 21 / P35 / IO / DVDD / General purpose IO signal 22 / P34 / IO / SVDD / General purpose IO signal or clk signal for the SAM 23 / SIGOUT / O / SVDD / Contactless communication interface output: delivers a serial data stream according to NFCIP-1 and output signal for the SAM. In test mode this signal is used as test signal output. 24 / SIGIN / I / SVDD / Contactless communication interface input: accepts a digital, serial data stream according to NFCIP-1 and input signal from the SAM. In test mode Philips Specification at 11 NFC communication differentiates between an active and a passive communication.

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	• Active NFC Mode means both the initiator and the target are using their own RF field for the communication. • Passive NFC Mode means that the target answers to an initiator command in a load modulation scheme. The initiator is active i.e. generating the RF field. Philips Specification at 11 • Initiator: generates RF field @ 13.56 MHz and starts the NFC communication • Target: responds to initiator commands either using load modulation scheme (RF field continuously generated by Initiator) or using modulation of self generated RF field (no RF field generated by initiator) Philips Specification at Figure 6  *Figure 6 passive NFC Mode* To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading. *See also* claim 5 above.
9. The mobile device of claim 5 wherein the transmit circuit comprises an active transmit driver.	Philips Specification discloses or renders obvious "[t]he mobile device of claim 5 wherein the transmit circuit comprises an active transmit driver." For example: Philips Specification at 3

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	In reader/ writer mode the PN531's internal transmitter part is able to drive a reader/writer antenna designed to communicate with ISO14443A /MIFARE® or FeliCa™ cards and transponders without additional active circuitry. The receiver part provides a robust and efficient implementation of a demodulation and decoding circuitry for signals from ISO14443A compatible cards and transponders. The digital part handles the complete ISO14443A framing and error detection (Parity & CRC). Philips Specification at 3 In card mode the PN531 is able to answer a reader/writer command either in FeliCa™ or ISO14443A/MIFARE® card mode. The PN531 generates the proper digital load modulated signals and with an external circuit, can respond to commands sent by the reader/writer. Philips Specification at 4 • 80C51 microcontroller core with 32 kbyte ROM and 1 kbyte RAM • Highly integrated analog circuitry for transmission and reception • Output drivers to connect an antenna with minimum number of external components • Integrated RF Level detector • Integrated mode detector • Hardware and embedded Firmware support for • ISO 14443A reader/writer mode • MIFARE®Classic encryption and MIFARE® higher baudrate communication up to 424 kbit/s • Contactless communication according to the FeliCa™ scheme at 212 kbit/s and 424 kbit/s • NFC standard ECMA 340 and ISO 18092: NFC IP-1 interface and protocol • Host protocol on following interfaces • USB 2.0 full speed compliant device • SPI • I2C • High speed serial UART • Optional interrupt line to the host • Hard reset with low power function • Flexible Power down mode or power reduction mode per software • Internal oscillator to connect a 27.12 MHz quartz • Internal oscillator to connect a 4 MHz quartz for the USB interface

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	• 2.5 - 3.6 V power supply • USB bus powered (In USB mode) • Specific IO ports and interrupt sources for external devices control Philips Specification at Figure 1 **2 BLOCK DIAGRAM** **2.1 Simplified PN531 Block Diagram**  *Figure 1: PN531 Block Diagram* Philips Specification at 6 The Analog circuitry handles the modulation and demodulation of the analog signals according to the card mode, reader /writer mode and NFC mode communication scheme. Philips Specification at 7 The device operates with six individual power supplies for best performance in terms of EMC behaviour and signal de-coupling. This gives outstanding RF performance and maximum flexibility to adapt to different operating voltages of digital and analog parts. Philips Specification at Figure 3.2

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

3.2 Pin Description

Pin	Symbol	Type	Pad Ref Voltage	Description
1	DVSS	PWR		Digital Ground
2	LOADMOD	O	DVDD	Load Modulation output provides digital signal for FeliCa and MIFARE® card operating mode
3	TVSS1	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
4	TX1	O	TVDD	Transmitter 1: delivers the modulated 13.56 MHz energy carrier
5	TVDD	PWR		Transmitter power supply: supplies the output stage of TX1 and TX2
6	TX2	O	TVDD	Transmitter 2: delivers the modulated 13.56 MHz energy carrier
7	TVSS2	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
8	AVDD	PWR		Analog Power Supply
9	VMID	PWR	AVDD	Internal Reference Voltage: This pin delivers the internal reference voltage.
10	RX	I	AVDD	Receiver Input: Input pin for the reception signal, which is the load modulated 13.56 MHz energy carrier from the antenna circuit.
11	AVSS	PWR		Analog Ground
12	AUX1	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
13	AUX2	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
14	OSCIN	I	AVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator. This pin is also the input for an externally generated clock (fosc = 27.12 MHz).
15	OSCOUT	O	AVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator.
16	I0	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
17	I1	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
18	TESTEN	I	DVDD	Test enable pin: When set to 1 enable the test mode. When set to 0 reset the TCB and disable the access to the test mode.
19	OSC2OUT	O	DVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator for the USB clock.
20	OSC2IN	I	DVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator for the USB clock generation. This pin is also the input for an externally generated clock (f_{osc} =4 MHz). In test mode this signal is used as test clock input
21	P35	IO	DVDD	General purpose IO signal
22	P34	IO	SVDD	General purpose IO signal or clk signal for the SAM
23	SIGOUT	O	SVDD	Contactless communication interface output: delivers a serial data stream according to NFCIP-1 and output signal for the SAM. In test mode this signal is used as test signal output.
24	SIGIN	I	SVDD	Contactless communication interface input: accepts a digital, serial data stream according to NFCIP-1 and input signal from the SAM. In test mode

Philips Specification at Figure 3

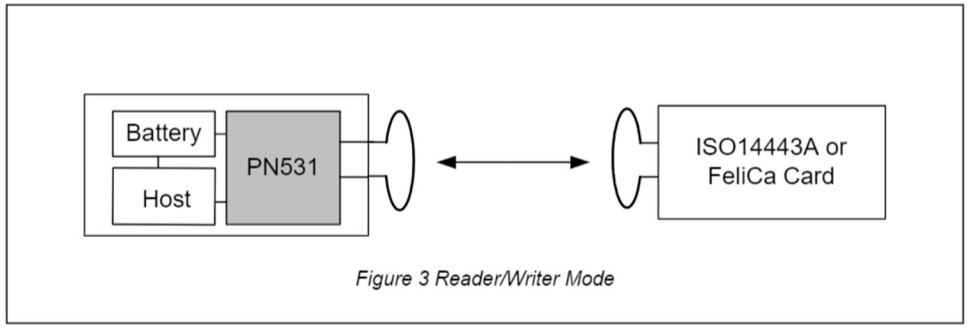
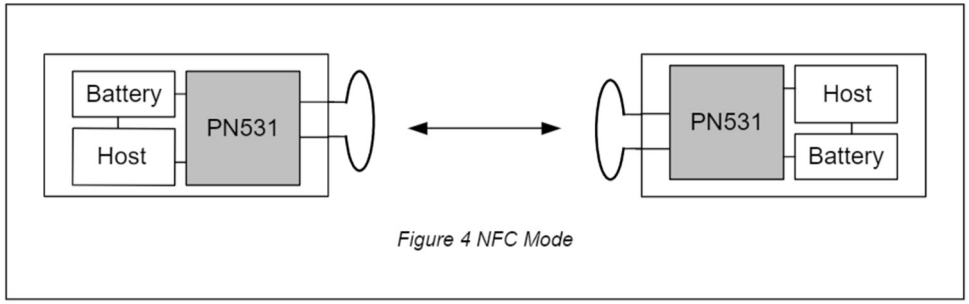
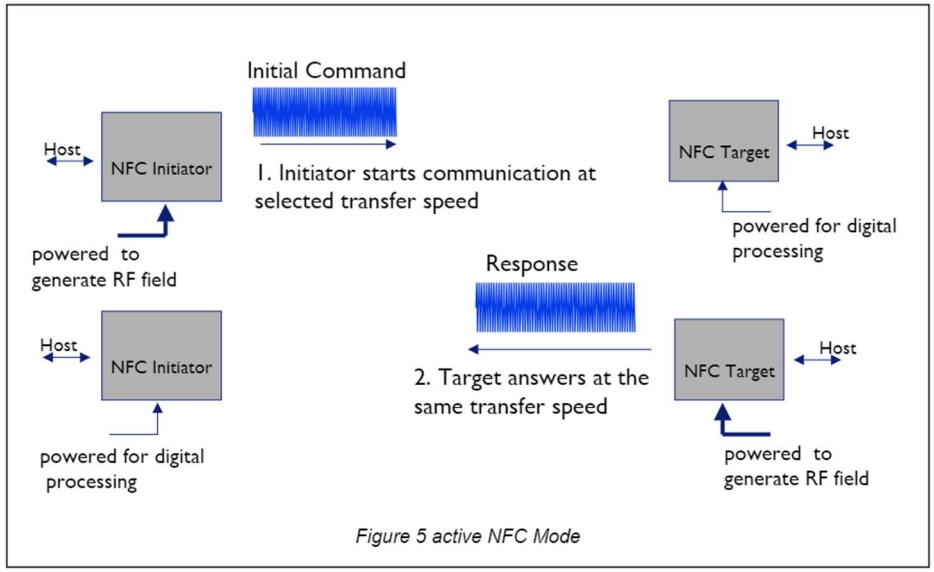
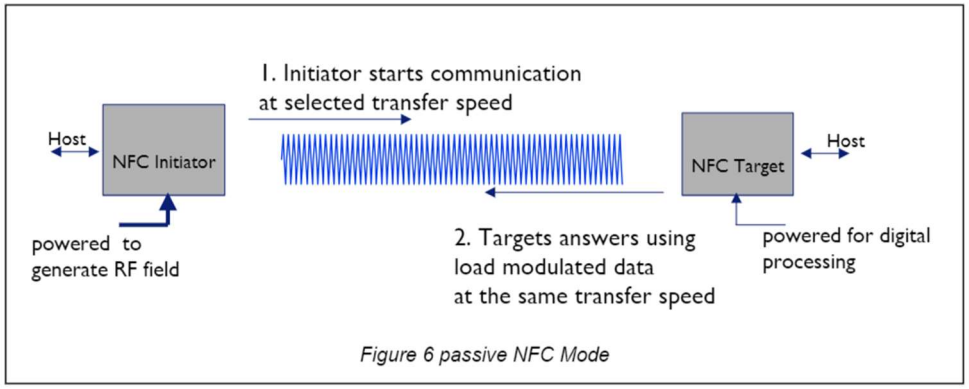
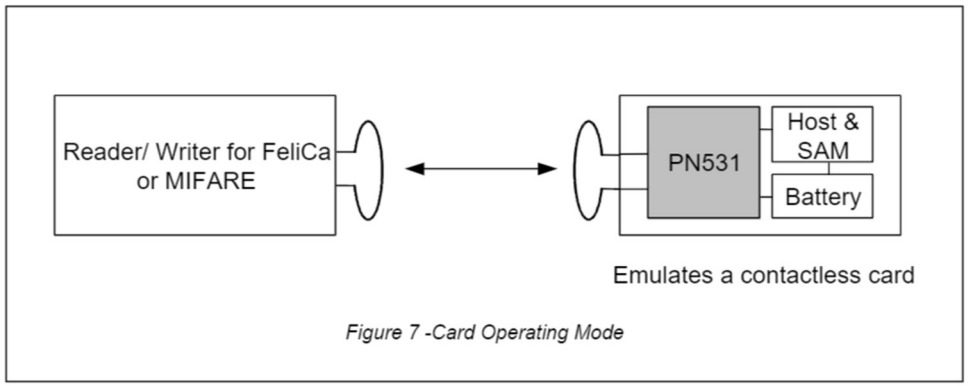
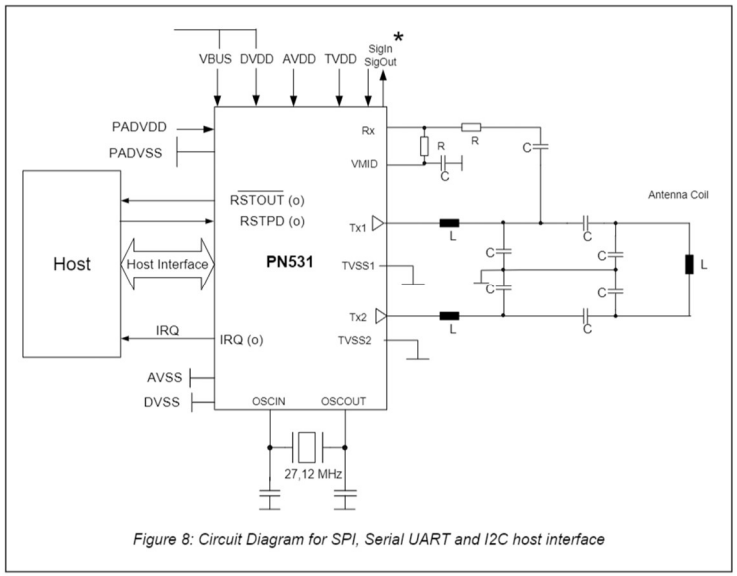


Figure 3 Reader/Writer Mode

Philips Specification at Figure 4

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 4 NFC Mode* Philips Specification at 11 NFC communication differentiates between an active and a passive communication. • Active NFC Mode means both the initiator and the target are using their own RF field for the communication. • Passive NFC Mode means that the target answers to an initiator command in a load modulation scheme. The initiator is active i.e. generating the RF field. Philips Specification at 11 • Initiator: generates RF field @ 13.56 MHz and starts the NFC communication • Target: responds to initiator commands either using load modulation scheme (RF field continuously generated by Initiator) or using modulation of self generated RF field (no RF field generated by initiator) Philips Specification at Figure 5

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 5 active NFC Mode* Philips Specification at Figure 6  *Figure 6 passive NFC Mode* Philips Specification at Figure 7

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 7 -Card Operating Mode* Philips Specification at Figure 8  *Figure 8: Circuit Diagram for SPI, Serial UART and I2C host interface* Philips Specification at Figure 9

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

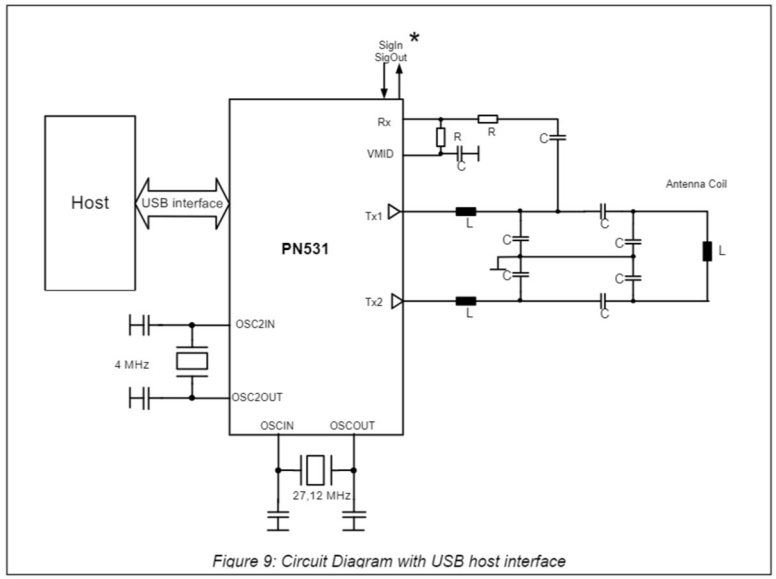


Figure 9: Circuit Diagram with USB host interface

Philips Specification at Table 6–1

6.1 Absolute Maximum Continuous Ratings

SYMBOL	PARAMETER	MIN	MAX	UNIT
AVDD DVDD PVDD SVDD TVDD	Supply Voltages	-0.5	4.0	V
VBUS	USB Supply Voltage	-0.5	5.5	V

Table 6-1: Absolute Maximum Continuous Ratings

To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

See also claim 5 above.

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
10. The mobile device of claim 5 wherein the mobile device comprises a mobile phone.	Philips Specification discloses or renders obvious "[t]he mobile device of claim 5 wherein the mobile device comprises a mobile phone." *See* claim 4 above. *See also* claim 5 above.
11[pre]. A mobile device comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is a claim limitation. Philips Specification discloses or renders obvious "[a] mobile device." *See* 1[pre] above.
[11a] a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field;	Philips Specification discloses or renders obvious "a smartcard controller that includes load modulation circuitry for half duplex communication by creating at least one frequency sideband about a carrier frequency of an interrogating radio frequency (RF) field." Philips Specification at 3 > In card mode the PN531 is able to answer a reader/writer command either in FeliCa™ or ISO14443A/MIFARE® card mode. The PN531 generates the proper digital load modulated signals and with an external circuit, can respond to commands sent by the reader/writer. Philips Specification at 6 > The Analog circuitry handles the modulation and demodulation of the analog signals according to the card mode, reader /writer mode and NFC mode communication scheme. Philips Specification at Figure 3.2

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

3.2 Pin Description

Pin	Symbol	Type	Pad Ref Voltage	Description
1	DVSS	PWR		Digital Ground
2	LOADMOD	O	DVDD	Load Modulation output provides digital signal for FeliCa and MIFARE® card operating mode
3	TVSS1	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
4	TX1	O	TVDD	Transmitter 1: delivers the modulated 13.56 MHz energy carrier
5	TVDD	PWR		Transmitter power supply: supplies the output stage of TX1 and TX2
6	TX2	O	TVDD	Transmitter 2: delivers the modulated 13.56 MHz energy carrier
7	TVSS2	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
8	AVDD	PWR		Analog Power Supply
9	VMID	PWR	AVDD	Internal Reference Voltage: This pin delivers the internal reference voltage.
10	RX	I	AVDD	Receiver Input: Input pin for the reception signal, which is the load modulated 13.56 MHz energy carrier from the antenna circuit.
11	AVSS	PWR		Analog Ground
12	AUX1	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
13	AUX2	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
14	OSCIN	I	AVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator. This pin is also the input for an externally generated clock (fosc = 27.12 MHz).
15	OSCOUT	O	AVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator.
16	I0	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
17	I1	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
18	TESTEN	I	DVDD	Test enable pin: When set to 1 enable the test mode. When set to 0 reset the TCB and disable the access to the test mode.
19	OSC2OUT	O	DVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator for the USB clock.
20	OSC2IN	I	DVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator for the USB clock generation. This pin is also the input for an externally generated clock (f_{osc} =4 MHz). In test mode this signal is used as test clock input
21	P35	IO	DVDD	General purpose IO signal
22	P34	IO	SVDD	General purpose IO signal or clk signal for the SAM
23	SIGOUT	O	SVDD	Contactless communication interface output: delivers a serial data stream according to NFCIP-1 and output signal for the SAM. In test mode this signal is used as test signal output.
24	SIGIN	I	SVDD	Contactless communication interface input: accepts a digital, serial data stream according to NFCIP-1 and input signal from the SAM. In test mode

Philips Specification at 11

NFC communication differentiates between an active and a passive communication.

• Active NFC Mode means both the initiator and the target are using their own RF field for the communication.

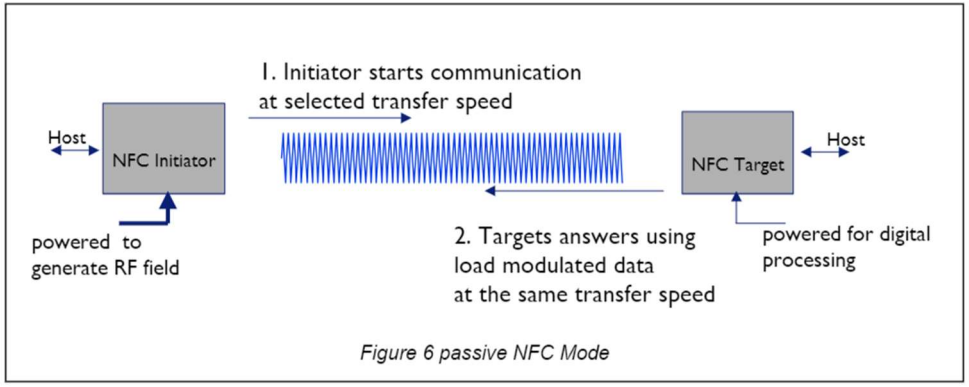
• Passive NFC Mode means that the target answers to an initiator command in a load modulation scheme. The initiator is active i.e. generating the RF field.

Philips Specification at 11

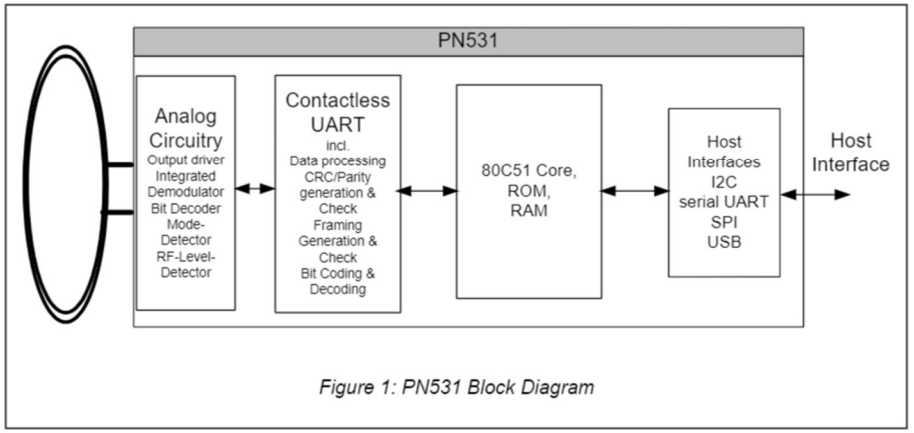
• Initiator: generates RF field @ 13.56 MHz and starts the NFC communication

• Target: responds to initiator commands either using load modulation scheme (RF field continuously generated by Initiator) or using modulation of self generated RF field (no RF field generated by initiator)

Philips Specification at Figure 6

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 6 passive NFC Mode* *See* [1a] above. To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[11b] an antenna tuned to operate at 13.56 MHz;	Philips Specification discloses or renders obvious "an antenna tuned to operate at 13.56 MHz." *See* [1b] above.
[11c] an amplifier coupled to be powered by the mobile device, wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller; and	Philips Specification discloses or renders obvious "an amplifier coupled to be powered by the mobile device, wherein the amplifier is coupled to amplify a signal received from the antenna and to provide an amplified signal to the smartcard controller." *See* [5c] above.
[11d] an active transmit driver circuit coupled between the smartcard controller and the antenna, wherein the active	Philips Specification discloses or renders obvious "an active transmit driver circuit coupled between the smartcard controller and the antenna, wherein the active transmit driver circuit is coupled to be powered by the mobile device." For example: *See* [5d] and claim 9 above.

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
transmit driver circuit is coupled to be powered by the mobile device.	Philips Specification at 3 In reader/ writer mode the PN531's internal transmitter part is able to drive a reader/writer antenna designed to communicate with ISO14443A /MIFARE® or FeliCa™ cards and transponders without additional active circuitry. The receiver part provides a robust and efficient implementation of a demodulation and decoding circuitry for signals from ISO14443A compatible cards and transponders. The digital part handles the complete ISO14443A framing and error detection (Parity & CRC). Philips Specification at 3 In card mode the PN531 is able to answer a reader/writer command either in FeliCa™ or ISO14443A/MIFARE® card mode. The PN531 generates the proper digital load modulated signals and with an external circuit, can respond to commands sent by the reader/writer. Philips Specification at 4 • 80C51 microcontroller core with 32 kbyte ROM and 1 kbyte RAM • Highly integrated analog circuitry for transmission and reception • Output drivers to connect an antenna with minimum number of external components • Integrated RF Level detector • Integrated mode detector • Hardware and embedded Firmware support for • ISO 14443A reader/writer mode • MIFARE®Classic encryption and MIFARE® higher baudrate communication up to 424 kbit/s • Contactless communication according to the FeliCa™ scheme at 212 kbit/s and 424 kbit/s • NFC standard ECMA 340 and ISO 18092: NFC IP-1 interface and protocol • Host protocol on following interfaces • USB 2.0 full speed compliant device • SPI • I2C • High speed serial UART • Optional interrupt line to the host • Hard reset with low power function • Flexible Power down mode or power reduction mode per software • Internal oscillator to connect a 27.12 MHz quartz

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	• Internal oscillator to connect a 4 MHz quartz for the USB interface • 2.5 - 3.6 V power supply • USB bus powered (In USB mode) • Specific IO ports and interrupt sources for external devices control Philips Specification at Figure 1 **2 BLOCK DIAGRAM** **2.1 Simplified PN531 Block Diagram**  *Figure 1: PN531 Block Diagram* Philips Specification at 6 The Analog circuitry handles the modulation and demodulation of the analog signals according to the card mode, reader /writer mode and NFC mode communication scheme. Philips Specification at 7 The device operates with six individual power supplies for best performance in terms of EMC behaviour and signal de-coupling. This gives outstanding RF performance and maximum flexibility to adapt to different operating voltages of digital and analog parts. Philips Specification at Figure 3.2

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

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Pin	Symbol	Type	Pad Ref Voltage	Description
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5	TVDD	PWR		Transmitter power supply: supplies the output stage of TX1 and TX2
6	TX2	O	TVDD	Transmitter 2: delivers the modulated 13.56 MHz energy carrier
7	TVSS2	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
8	AVDD	PWR		Analog Power Supply
9	VMID	PWR	AVDD	Internal Reference Voltage: This pin delivers the internal reference voltage.
10	RX	I	AVDD	Receiver Input: Input pin for the reception signal, which is the load modulated 13.56 MHz energy carrier from the antenna circuit.
11	AVSS	PWR		Analog Ground
12	AUX1	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
13	AUX2	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
14	OSCIN	I	AVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator. This pin is also the input for an externally generated clock (fosc = 27.12 MHz).
15	OSCOUT	O	AVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator.
16	I0	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
17	I1	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
18	TESTEN	I	DVDD	Test enable pin: When set to 1 enable the test mode. When set to 0 reset the TCB and disable the access to the test mode.
19	OSC2OUT	O	DVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator for the USB clock.
20	OSC2IN	I	DVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator for the USB clock generation. This pin is also the input for an externally generated clock (f_{osc} =4 MHz). In test mode this signal is used as test clock input
21	P35	IO	DVDD	General purpose IO signal
22	P34	IO	SVDD	General purpose IO signal or clk signal for the SAM
23	SIGOUT	O	SVDD	Contactless communication interface output: delivers a serial data stream according to NFCIP-1 and output signal for the SAM. In test mode this signal is used as test signal output.
24	SIGIN	I	SVDD	Contactless communication interface input: accepts a digital, serial data stream according to NFCIP-1 and input signal from the SAM. In test mode

Philips Specification at Figure 3

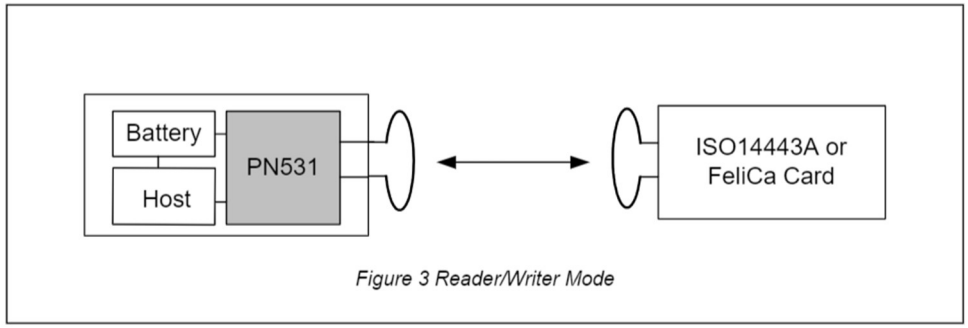
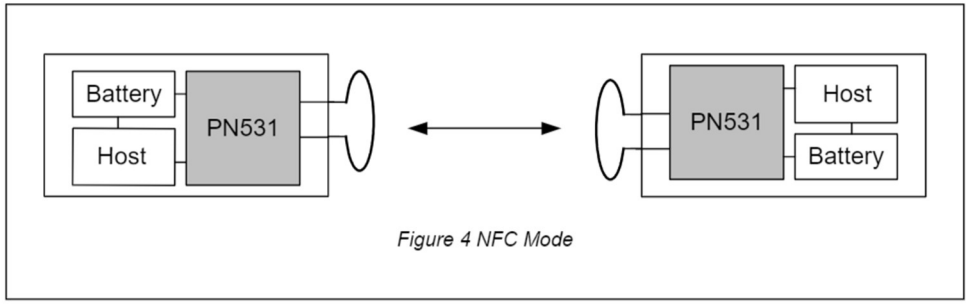


Figure 3 Reader/Writer Mode

Philips Specification at Figure 4

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 4 NFC Mode* Philips Specification at 11 NFC communication differentiates between an active and a passive communication. • Active NFC Mode means both the initiator and the target are using their own RF field for the communication. • Passive NFC Mode means that the target answers to an initiator command in a load modulation scheme. The initiator is active i.e. generating the RF field. Philips Specification at 11 • Initiator: generates RF field @ 13.56 MHz and starts the NFC communication • Target: responds to initiator commands either using load modulation scheme (RF field continuously generated by Initiator) or using modulation of self generated RF field (no RF field generated by initiator) Philips Specification at Figure 5

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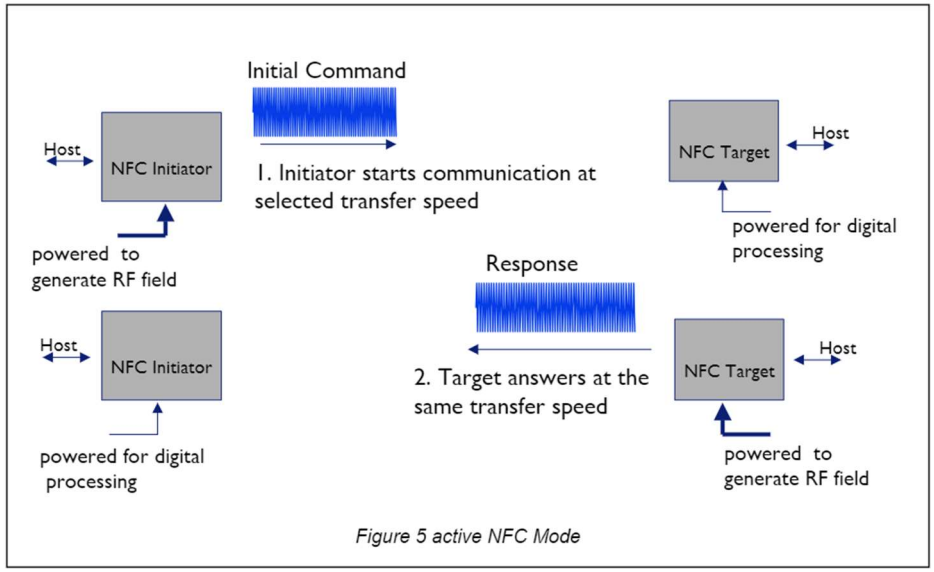
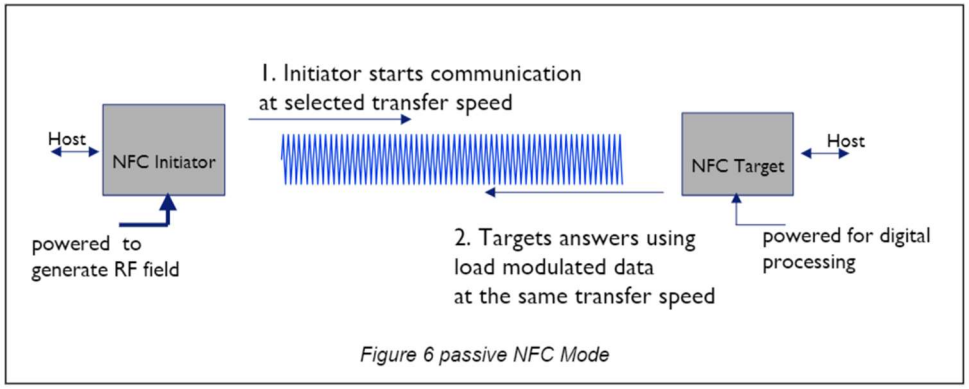
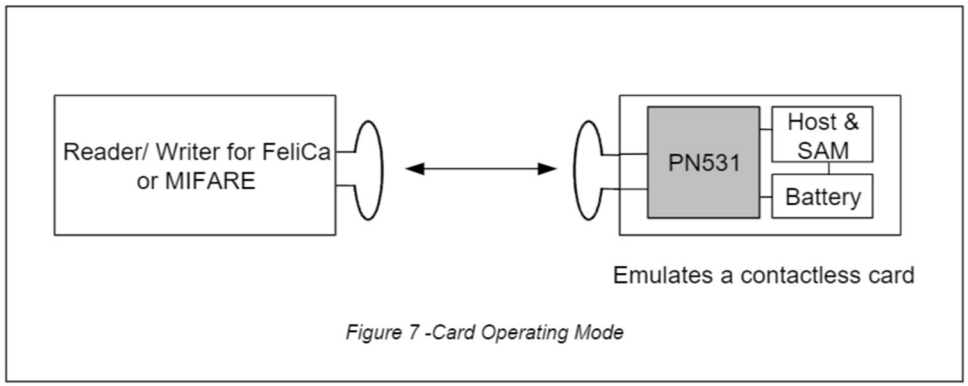
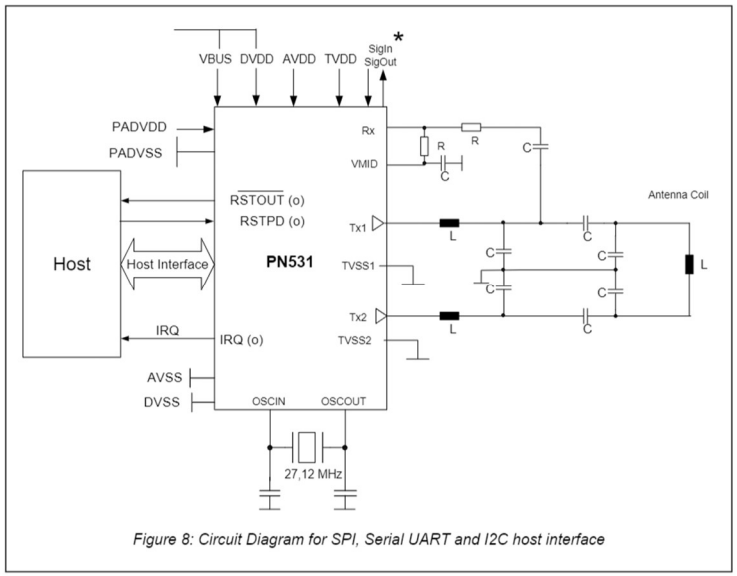
	 *Figure 5 active NFC Mode* Philips Specification at Figure 6  *Figure 6 passive NFC Mode* Philips Specification at Figure 7

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 7 -Card Operating Mode* Philips Specification at Figure 8  *Figure 8: Circuit Diagram for SPI, Serial UART and I2C host interface* Philips Specification at Figure 9

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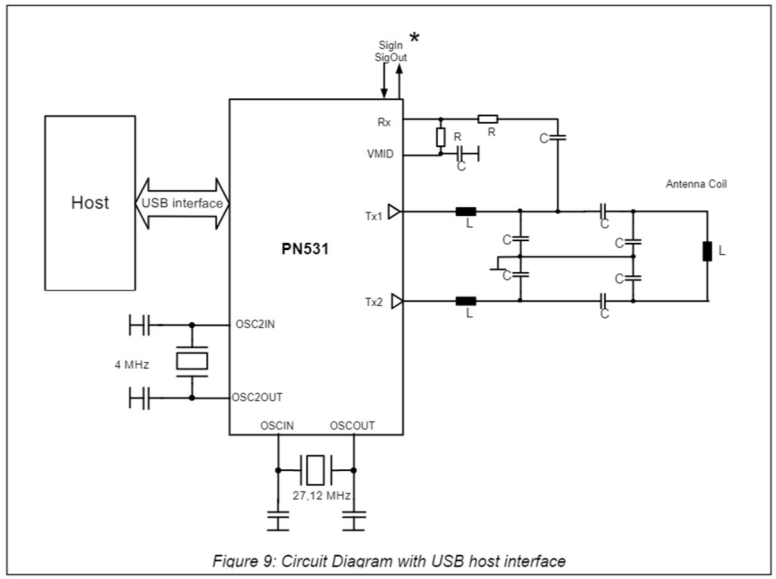


Figure 9: Circuit Diagram with USB host interface

Philips Specification at Table 6–1

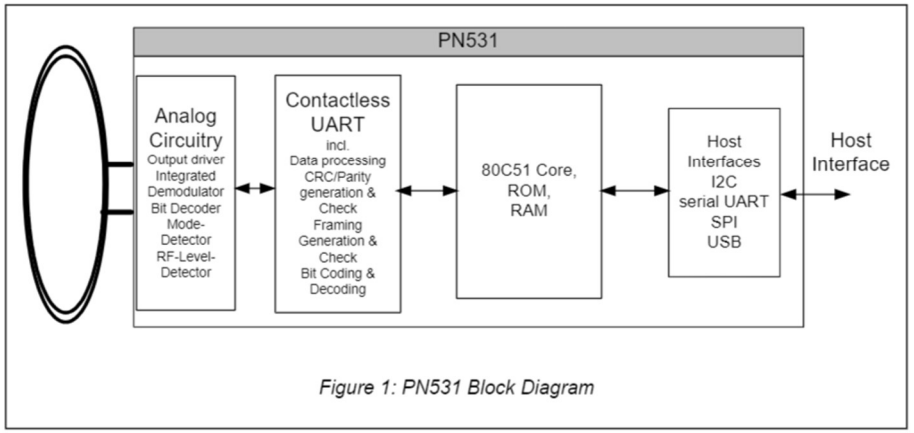
6.1 Absolute Maximum Continuous Ratings

SYMBOL	PARAMETER	MIN	MAX	UNIT
AVDD DVDD PVDD SVDD TVDD	Supply Voltages	-0.5	4.0	V
VBUS	USB Supply Voltage	-0.5	5.5	V

Table 6-1: Absolute Maximum Continuous Ratings

To the extent this limitation is not disclosed by Philips Specification, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Philips Specification, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
12. The mobile device of claim 11 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field.	Philips Specification discloses or renders obvious "[t]he mobile device of claim 11 wherein the antenna comprises an inductive element too small to draw enough power sufficient to operate the smartcard controller from the interrogating radio frequency (RF) field." Philips Specification at 3 In reader/ writer mode the PN531's internal transmitter part is able to drive a reader/writer antenna designed to communicate with ISO14443A /MIFARE® or FeliCa™ cards and transponders without additional active circuitry. The receiver part provides a robust and efficient implementation of a demodulation and decoding circuitry for signals from ISO14443A compatible cards and transponders. The digital part handles the complete ISO14443A framing and error detection (Parity & CRC). Philips Specification at 4 • 80C51 microcontroller core with 32 kbyte ROM and 1 kbyte RAM • Highly integrated analog circuitry for transmission and reception • Output drivers to connect an antenna with minimum number of external components • Integrated RF Level detector • Integrated mode detector • Hardware and embedded Firmware support for • ISO 14443A reader/writer mode • MIFARE®Classic encryption and MIFARE® higher baudrate communication up to 424 kbit/s • Contactless communication according to the FeliCa™ scheme at 212 kbit/s and 424 kbit/s • NFC standard ECMA 340 and ISO 18092: NFC IP-1 interface and protocol • Host protocol on following interfaces • USB 2.0 full speed compliant device • SPI • I2C • High speed serial UART • Optional interrupt line to the host • Hard reset with low power function • Flexible Power down mode or power reduction mode per software • Internal oscillator to connect a 27.12 MHz quartz • Internal oscillator to connect a 4 MHz quartz for the USB interface

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	• 2.5 - 3.6 V power supply • USB bus powered (In USB mode) • Specific IO ports and interrupt sources for external devices control Philips Specification at Figure 1 **2 BLOCK DIAGRAM** **2.1 Simplified PN531 Block Diagram**  *Figure 1: PN531 Block Diagram* Philips Specification at Figure 3.2

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")

3.2 Pin Description

Pin	Symbol	Type	Pad Ref Voltage	Description
1	DVSS	PWR		Digital Ground
2	LOADMOD	O	DVDD	Load Modulation output provides digital signal for FeliCa and MIFARE® card operating mode
3	TVSS1	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
4	TX1	O	TVDD	Transmitter 1: delivers the modulated 13.56 MHz energy carrier
5	TVDD	PWR		Transmitter power supply: supplies the output stage of TX1 and TX2
6	TX2	O	TVDD	Transmitter 2: delivers the modulated 13.56 MHz energy carrier
7	TVSS2	PWR		Transmitter Ground: supplies the output stage of TX1 and TX2
8	AVDD	PWR		Analog Power Supply
9	VMID	PWR	AVDD	Internal Reference Voltage: This pin delivers the internal reference voltage.
10	RX	I	AVDD	Receiver Input: Input pin for the reception signal, which is the load modulated 13.56 MHz energy carrier from the antenna circuit.
11	AVSS	PWR		Analog Ground
12	AUX1	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
13	AUX2	O	DVDD	Auxiliary Output: This pin delivers analog and digital test signals.
14	OSCIN	I	AVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator. This pin is also the input for an externally generated clock (fosc = 27.12 MHz).
15	OSCOUT	O	AVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator.
16	I0	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
17	I1	I	DVDD	Interface mode lines: selects the used host interface. In test mode I0 is used as test signals.
18	TESTEN	I	DVDD	Test enable pin: When set to 1 enable the test mode. When set to 0 reset the TCB and disable the access to the test mode.
19	OSC2OUT	O	DVDD	Crystal Oscillator output: Output of the inverting amplifier of the oscillator for the USB clock.
20	OSC2IN	I	DVDD	Crystal Oscillator Input: input to the inverting amplifier of the oscillator for the USB clock generation. This pin is also the input for an externally generated clock (f_{osc} =4 MHz). In test mode this signal is used as test clock input
21	P35	IO	DVDD	General purpose IO signal
22	P34	IO	SVDD	General purpose IO signal or clk signal for the SAM
23	SIGOUT	O	SVDD	Contactless communication interface output: delivers a serial data stream according to NFCIP-1 and output signal for the SAM. In test mode this signal is used as test signal output.
24	SIGIN	I	SVDD	Contactless communication interface input: accepts a digital, serial data stream according to NFCIP-1 and input signal from the SAM. In test mode

Philips Specification at Figure 3

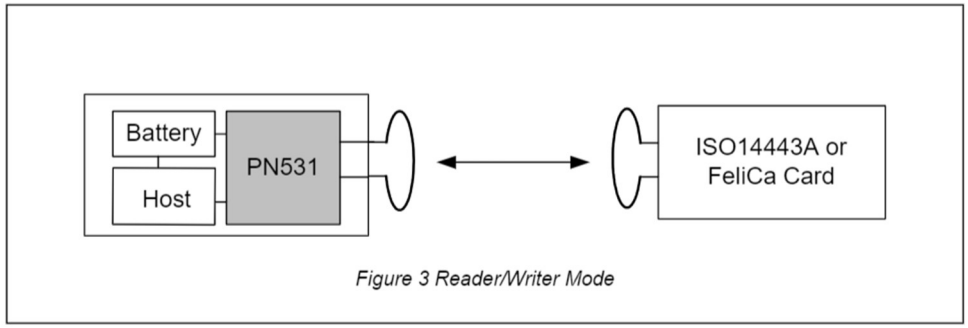
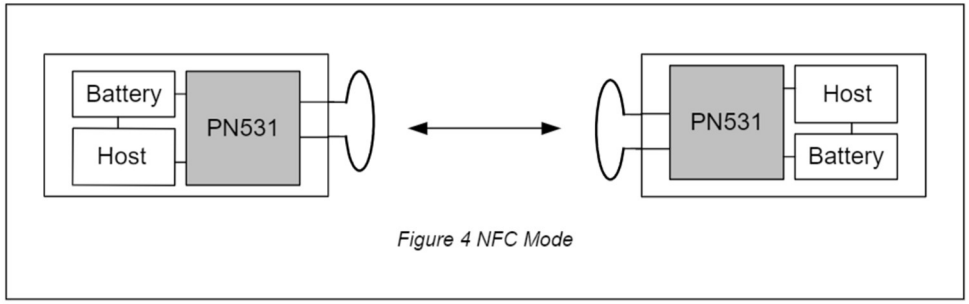
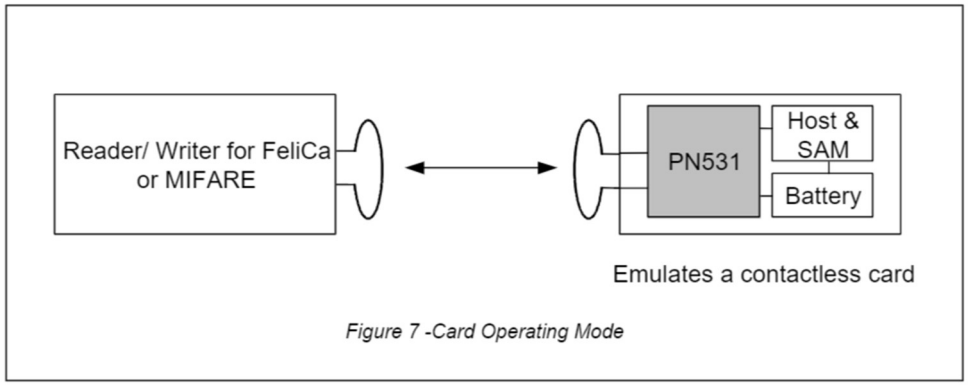
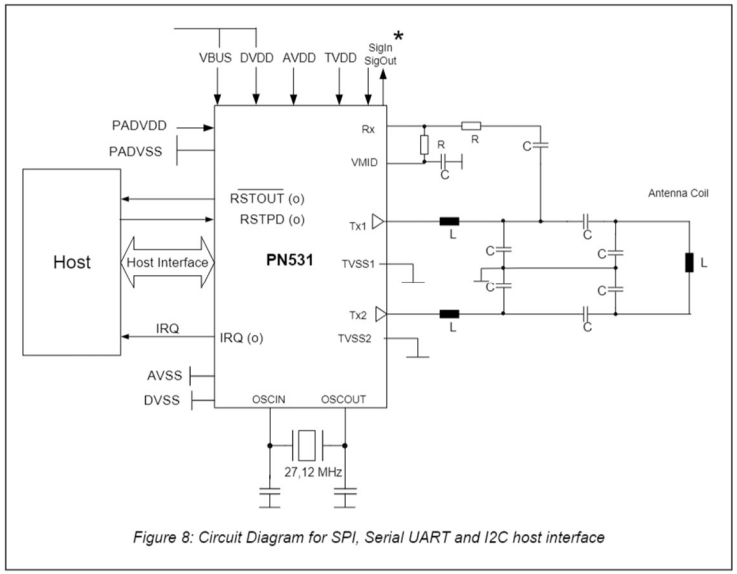
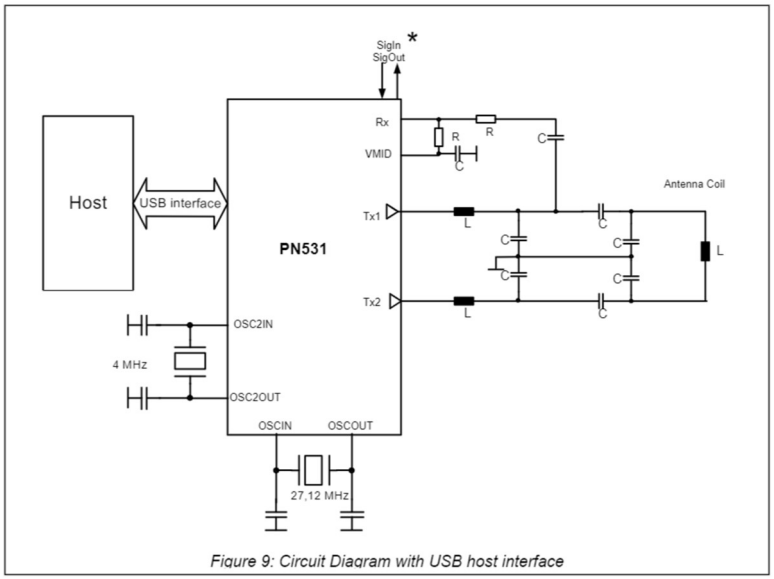


Figure 3 Reader/Writer Mode

Philips Specification at Figure 4

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 4 NFC Mode* Philips Specification at Figure 7  *Figure 7 -Card Operating Mode* Philips Specification at Figure 8

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 8: Circuit Diagram for SPI, Serial UART and I2C host interface* Philips Specification at 14 The figure below shows a typical application, where the antenna is directly connected to the PN531. The used host interface is SPI, Serial UART or I2C. Philips Specification at Figure 9

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	 *Figure 9: Circuit Diagram with USB host interface* Philips Specification at 15 The figure below shows a typical application where the antenna is directly connected to the PN531. The host interface is USB. *See* claim 2 above. *See also* claim 11 above.
13. The mobile device of claim 11 wherein the smartcard controller is coupled to be powered by the mobile device.	Philips Specification discloses or renders obvious "[t]he mobile device of claim 11 wherein the smartcard controller is coupled to be powered by the mobile device." *See* claim 3 above. *See also* claim 11 above.
14. The mobile device of claim 11 wherein the mobile device comprises a mobile phone.	Philips Specification discloses or renders obvious "[t]he mobile device of claim 11 wherein the mobile device comprises a mobile phone." *See* claim 4 above.

Claim Element	Exemplary Citations to Philips Semiconductors, "Short Form Specification: Near Field Communication PN531–µC based Transmission module" (2004) ("Philips Specification")
	See also claim 11 above.