

**UNITED STATES INTERNATIONAL TRADE COMMISSION
WASHINGTON, DC**

**Before the Honorable
Administrative Law Judge Theodore R. Essex**

In the Matter of
**CERTAIN PORTABLE
ELECTRONIC COMMUNICATION
DEVICES, INCLUDING MOBILE
PHONES AND COMPONENTS
THEREOF**

Inv. No. 337-TA-885

**COMPLAINANTS NOKIA CORPORATION AND NOKIA INC.'S RESPONSIVE
CLAIM CONSTRUCTION BRIEF**

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I. INTRODUCTION

As set forth in its September 16, 2013 Opening Claim Construction Brief (EDIS No. 518341), and explained further below, Nokia proposes constructions of the Disputed Terms that are faithful to the language of the claims in which those terms appear, follow the inventors' express definitions of those terms, and adhere to the usage of those terms in the specification and file history. In contrast, HTC proposes constructions that: (1) improperly import limitations into the claims, (2) introduce ambiguities into, rather than clarifying the scope of, the claims, and/or both. Accordingly, Nokia requests that the ALJ adopt Nokia's proposed constructions and reject HTC's constructions.¹

II. U.S. PATENT NO. 6,035,189

A. "means for loading sets of executable instructions concerning new services"

Nokia Proposal	HTC Proposal
Function: loading sets of executable instructions concerning new services Structure: Processing unit, memory, and card reader; or processing unit, memory, and telephone part, and equivalents thereof. See Col. 2:37-40	Function: loading sets of executable instructions concerning new services offered by the telecommunication system Structure: intelligent network card 6 and intelligent card reader 11.

¹ Because HTC and Google present common positions, Nokia's responsive brief refers to HTC and Google collectively as "HTC." In addition, in referring to the parties' prior opening claim construction briefs, Nokia uses the following abbreviations:

- "Nokia Br." refers to Complainants' Nokia Corporation and Nokia Inc.'s Opening Claim Construction Brief.
- "HTC Br." refers to HTC Corporation, HTC America, Inc. and Google Inc.'s Initial Claim Construction Brief For U.S. Patent No. 6,305,189; U.S. Patent No. 6,711,211; And U.S. Patent No. 8,140,650.
- "Resp. Br." refers to Respondents' Initial *Markman* Brief Regarding Disputed Claim Terms In U.S. Patent Nos. 6,373,345, 7,187,945, 8,363,824, and 7,366,529.

Col. 2:60-65 Col. 3:7-29 Col. 3:43-53 Col. 4:1-21 Col. 4:33-39 Col. 4:64-5:11 Col. 5:30-47 Col. 6:5-18 Col. 6:19-36 Col. 6:37-58 Fig. 3.	
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As explained in Nokia’s opening brief, Nokia’s construction should be adopted because it correctly reflects the function explicitly recited in claim 8 and correctly identifies the two alternative sets of structure disclosed in the specification. By contrast, HTC’s proposed function adds extraneous words to the function chosen by the patentee, and HTC’s proposed structure ignores disclosed embodiments. HTC’s opening brief provides no basis for its attempt to rewrite the claimed function and disregard disclosed structures. Accordingly, Nokia’s identifications of function and structures should be adopted.

1. HTC Mischaracterizes The ’189 Patent

As an initial matter, HTC’s technology background section mischaracterizes the ’189 patent by portraying it as limited to one particular embodiment and ignoring the many other embodiments disclosed. Contrary to HTC’s allegation, the novelty of the ’189 patent is ***not*** limited to the use of a physical card and card reader for accessing new services. (HTC Br. at 2.) Although that is ***one*** of the disclosed embodiments, the ’189 patent explicitly discloses ***other*** embodiments, including those in which new services are conveyed ***over the telecommunication network*** itself:

- “The extension program [for new services] can be delivered to the user on a separate storage medium, such as an intelligent card, ***or it can be***

transferred as a data message over the telecommunication network.”
(’189 patent, 3:26-29 (emphasis added).)

- “Instructions and programming data concerning the use of a new service need not necessarily be delivered from the service provider to the user in such a way that the intelligent card 6 is separately brought in to be programmed. *The information can also be conveyed via the same telecommunication network in which the other data are transferred.*” (*Id.* at 6:19-24 (emphasis added).)
- Fig. 3 discloses a mobile phone including a telephone part for communicating over the telecommunication network. (*Id.* at Fig. 3.)

HTC’s attempt to portray the ’189 patent as limited to the particular system disclosed in Figure 1 similarly lacks merit. (HTC Br. at 2 (alleging that “*Fig. 1* of the ’189 patent illustrates the telecommunication system in which the claimed device operates”); at 4 (“*All of these asserted claims* relate to a specifically configured telecommunication terminal that operates within the telecommunication system of *Fig. 1* of the ’189 patent.”) (emphasis added).) Contrary to HTC’s allegation, the ’189 patent explains that Figure 1 is an example of an embodiment to which the invention could apply — *not* the only embodiment. (’189 patent, 3:59-60 (“*Fig. 1* shows *a simple telecommunication network* in which the method according to the invention *can be* applied.”) (emphasis added).) Indeed, the ’189 patent teaches many other embodiments apart from the example disclosed in Figure 1. (See, e.g., *Id.* at Fig. 3, 3:26-29, 3:43-47, 4:37-39, 6:19-24, 8:12-14.)

HTC’s mischaracterization of the ’189 patent in the technology background section is a flaw that HTC carries over into its claim-construction positions.

2. **HTC's Attempt To Rewrite The Explicitly-Recited Function Does Not Comport With Means-Plus-Function Law, Is Not Supported By The Intrinsic Record, And Injects Ambiguity Into The Claimed Function**

In seeking to rewrite the function explicitly recited in the claim to include the extraneous words “offered by the telecommunications system,” HTC misapplies the rules for construing means-plus-function terms, mischaracterizes the intrinsic record, and injects unnecessary ambiguity into the claimed function.

First, HTC misapplies the rules of claim construction governing means-plus-function terms, because it identifies a function different from that explicitly recited in the claim. Means-plus-function law requires that: “a court *may not* construe a means-plus-function limitation by adopting a function different from that explicitly recited in the claim.” *JVW Enters., Inc. v. Interact Accessories, Inc.*, 424 F.3d 1324, 1331 (Fed. Cir. 2005) (emphasis added) (internal quotation marks omitted); *accord Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999). Here, the function explicitly recited in the claims is straightforward: “loading sets of executable instructions concerning new services.” (’189 patent, 8:4-45.) HTC’s attempt to rewrite the function to include words not explicitly recited ignores the rules of claim construction. Accordingly, the rules of claim construction require the rejection of HTC’s proposed identification of function.

Although the rules of claim construction are dispositive here, HTC’s citations to the patent do not even purport to support its attempted rewrite of the explicitly-recited function. (See HTC Br. at 7-9.) For instance, HTC cites various excerpts in the specification that contain the words “telecommunications systems,” however, the cited excerpts do not help HTC because they are generic in nature and not specifically tied to

the claimed function. The mere fact that the specification discusses “telecommunications systems” does not provide a basis for importing the extraneous words “offered by a telecommunication system” into the explicitly-recited function of this means-plus-function element.

As an example, HTC cites the following excerpt as allegedly supporting its rewrite of the function: “The invention *also* relates to a telecommunication system wherein changing services are offered to users, and a terminal for such a system.” (HTC Br. at 7 (emphasis added).) But this statement is open-ended, is generic, and does not purport to describe or limit the claimed function, let alone require rewriting it. The remainder of HTC’s cited excerpts are similarly generic and disconnected from the claimed function as to provide no basis for HTC’s attempted rewrite.

Ironically, even as HTC disregards the express claim language in the “means for loading” element, HTC also tries to support its rewrite by citing *other* claim language that is even further removed from the claimed function. For example, HTC cites an excerpt of the claim preamble that recites “terminal for a telecommunication system.” (HTC Br. at 7, n.18.) HTC also cites another excerpt of the claim preamble that concerns a *different* claim element: “output means for displaying.” (HTC Br. at 8, n.26.) But this preamble language does not help HTC because (1) it does not purport to modify the explicitly-recited “means for loading” function, (2) does not recite the “new services” that are the subject of the “means for loading” element, and (3) otherwise is too attenuated to warrant rewriting the function. Here, the claim language tells us that the

function is “loading sets of executable instructions concerning new services,” and HTC has no basis to rewrite it²

Finally, HTC’s attempted rewrite would inject unnecessary ambiguity. Indeed, in view of the disconnected nature of HTC’s citations, it is unclear how HTC even interprets the extraneous words “offered by the telecommunications system.” On the one hand, HTC may be interpreting those words simply to mean that new services can be offered over or through a telecommunications network. On the other hand, HTC may be interpreting those words to require that the company maintaining the telecommunications network be *the same* as the service provider — which is contrary the teachings of the ’189 patent. (’189 patent, 1:41-43 (“The service provider is *not* necessarily the same as the company maintaining the network”) (emphasis added).) But it is not necessary for the ALJ and the parties to interpret this extraneous language, as it does not appear in the explicitly-recited function. For this additional reason, the ALJ should decline HTC’s invitation to rewrite the explicitly-recited function.³

² HTC also cites the title of the patent, even though it too does not specifically relate to the claimed function, and the law of claim construction accords little weight to patent titles. See, e.g., *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1312 (Fed. Cir. 1999) (recognizing that the purpose of the patent title is “not to demarcate the precise boundaries of the claimed invention but rather to provide a useful reference tool for future classification purposes”).

³ HTC also mischaracterizes Nokia’s ITC Complaint in alleging that it supports HTC’s claim construction positions. HTC’s purported quotation of Nokia’s ITC Complaint — “the ’189 patent discloses ‘a device that has the ability to add new services made available by a telecommunication system’” — is incomplete. (HTC Br. at 9.) The full quotation is as follows: “The ’189 Patent discloses, *for example*, a device that has the ability to add new services made available by a telecommunications system.” (Nokia ITC Complaint, EDIS No. 509-796 at ¶ 35 (emphasis added).) Given the exemplary nature of that description, it does not provide a basis for HTC’s attempt to limit the claimed function. Moreover, HTC’s characterization disregards the express disclaimer in Nokia’s ITC Complaint:

3. **HTC's Identification Of Structure Disregards One Of The Disclosed Embodiments And Mischaracterizes The Other**

As explained in Nokia's opening brief, the '189 patent expressly discloses *two* alternative structures as the "means for loading" — (1) a processing unit, memory, and card reader and (2) a processing unit, memory, and telephone part, that transmits and receives, information over the telecommunications network. (Nokia Br. at 9-15.) Here, the parties do not dispute that *one* of the embodiments disclosed by the '189 patent involves a card reader. The primary dispute between the parties is whether the "card reader embodiment" is the *only* disclosed embodiment (HTC's position) or whether the '189 patent *also* discloses an embodiment that does *not* require use of a card reader, namely a "telecommunications network embodiment" (Nokia's position). A subsidiary dispute between the parties concerns what structures in the "card reader embodiment" actually perform the loading function.

a. **HTC Fails To Show That The "Card Reader Embodiment" Is The Only Disclosed Embodiment; The '189 Patent Expressly Discloses A "Telecommunication Network Embodiment"**

HTC's opening brief devotes many pages to the card reader embodiment, but disregards the rest of the disclosure in the '189 patent regarding a *second* embodiment that does *not* require use of a card reader but instead allows for delivery of information over the telecommunication network itself — i.e., the telecommunication network

All non-technical descriptions of the inventions herein are presented to give a general background of those inventions. Such statements are not intended to be used, nor should be used, for purposes of patent claim interpretation. Complainants present these statements subject to, and without waiver of, their right to argue that claim terms should be construed in a particular way, as contemplated by claim interpretation jurisprudence and the relevant evidence.

(*Id.* at 9, n. 2.)

embodiment. Although the '189 patent teaches an embodiment involving use of a physical card that can be plugged into the phone (e.g., an intelligent card), the '189 patent *also* teaches that “the invention as such does *not* require an intelligent card of the phone or other terminal equipment, if the equipment otherwise has the storage capacity needed.” ('189 patent, 4:37-39 (emphasis added).) The '189 patent teaches *two different approaches* for delivering new services — (1) through use of a physical card or (2) *by transferring information over the telecommunication network itself*:

- “The extension program [for new services] can be delivered to the user on a separate storage medium, such as an intelligent card, *or it can be transferred as a data message over the telecommunication network.*” ('189 patent, 3:26-29 (emphasis added).)
- “Instructions and programming data concerning the use of a new service need not necessarily be delivered from the service provider to the user in such a way that the intelligent card 6 is separately brought in to be programmed. *The information can also be conveyed via the same telecommunication network in which the other data are transferred.*” (*Id.* at 6:19-24 (emphasis added).)
- Dependent claims 2 and 3 provide that the set of instructions [for new services] are delivered to the user on “a separate storage means” such as an “intelligent card,” whereas dependent claim 4 provides that the “set of instructions is *delivered to the user by means of data transmission via said telecommunication network.*” (Compare *id.* at 8:6-11 with *id.* at 8:12-14 (emphasis added).)⁴
- Fig. 3 depicts a mobile phone that includes a telephone part for transmitting, receiving, and processing data communicated over the telecommunication network. (*Id.* at Fig. 3.)

⁴ Although these dependent claims are not currently asserted in this Investigation, their claim language is relevant to what embodiments are disclosed in the '189 patent. See, e.g., *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc) (“Other claims of the patent in question, both asserted and unasserted, can . . . be valuable sources of enlightenment as to the meaning of a claim term.”) (citing *Vitronics Corp. v. Conception, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)).

Accordingly, HTC has no basis for requiring use of a card and excluding the other disclosed embodiment allowing for delivery of instructions over the telecommunication network.

Nor does HTC's opening brief show any inaccuracy in Nokia's identification of the "means for loading" in the telecommunication network embodiment. As set forth in Nokia's opening brief, those structures are (1) the telephone part, which transmits, receives, and processes data communicated over the telecommunication network ('189 patent, Fig. 3 item 12, 5:6-11); (2) the processing unit, which processes the information received and in turn loads it into memory (*id.* at Fig. 13 item 9, 3:43-47, 4:66-5:2, 6:13-18); and (3) the memory (i.e., storage means), which is where the information is loaded and then stored (*id.* at Fig. 13 item 10, 3:43-47, 4:66-5:2, 6:13-18); (*see generally* Nokia Br. at 12-13.)

Moreover, HTC ignores the prosecution history of the '189 patent, in which the patentee ***expressly identifies*** the processing unit, the memory, and the telephone part as the "means for loading." In the original application, the patentee expressly identified the "means for loading" in original claim 8 as items 9, 10, 11, and 12:

8. A terminal (3) for a telecommunication system which comprises output means (7) for displaying to a user information about services offered by said telecommunication system and input means (8, 8a) for making selections concerning said services, characterized in that it comprises means (9, 10, 11, 12) for loading

('189 Prosecution History, June 2, 1997 Application at 12 (Ex. 30, NKHTC0000025) (emphasis added).) And after amending claim 8, the patentee again provided this identification:

8. (Amended) A terminal [(3)] for a telecommunication system [which comprises], the terminal comprising output means [(7)] for displaying to a user information about services offered by said telecommunication system and input means [(8, 8a)] for making selections concerning said services, [characterized in that it] wherein

said terminal further comprises means [(9, 10, 11, 12)] for loading sets of executable instructions concerning new services, means [(7, 9, 10)] for displaying information

(Nokia Br. Ex. 2, NOK885ITC00000450) (underlining in original to show amendments; emphasis by boldface/italics added).) In the '189 patent, item 9 is the processing unit, item 10 is the memory, and item 12 is the telephone part for transmitting and receiving information over the telecommunication network (item 11 is the card reader which is not relevant to the telephone network embodiment). ('189 patent, Fig. 3.)⁵

Despite these disclosures in the intrinsic record, HTC does not even attempt to identify *any* “means for loading” structures for the telecommunication network embodiment. Instead of providing its own identification of corresponding structures, HTC takes a scattershot approach in making a series of allegations about the structures disclosed by the '189 patent and identified by Nokia. HTC's allegations lack merit and do not warrant the exclusion of these expressly disclosed structures. *See generally Oatey*

⁵ Nokia's identification of the “means for loading” also comports with the patent examiner's identifications during prosecution of the '189 patent. The patent examiner originally found that disclosures in the prior art corresponding to the “means for loading” element could be found in U.S. Patent No. 5,579,535 to Orton (the '535 patent”) in items 654, 660, 652 and 650 of figure 8. (Ex. 30, '189 Prosecution History, Feb. 26, 1999 Office Action at 6-7, NOK885ITC00000340-341); Ex. 31, '535 patent at Fig. 8.) Consistent with Nokia's own identifications, item 654 is labeled “micro-processor controller,” item 660 is labeled “memory,” and items 652 and 650 are a transceiver and antenna — i.e., a telephone part for transmitting and receiving information communicated over the telephone network. (Ex. 31, '535 patent at Fig. 8.)

Co. v. IPS Corp., 514 F.3d 1271, 1276-77 (Fed. Cir. 2008) (“We normally do not interpret claim terms in a way that excludes embodiments disclosed in the specification.”).

For example, HTC’s allegation that the processing unit “is not sufficiently specific to the purported function” (HTC Br. at 14) lacks merit. The ’189 patent expressly teaches use of the processor in loading. (’189 patent, 3:43-47.) And consistent with the teachings of the ’189 patent, the patentee identified the processing unit as part of the “means for loading.” (’189 Prosecution History, June 2, 1997 Application at 12 (Ex. 30, NKHTC0000025); Nokia Br. Ex. 2, NOK885ITC00000450).) Accordingly, Nokia’s identification of the processing unit as part of the “means for loading” is correct.⁶

⁶ HTC’s reliance on *WMS Gaming Inc. v. Int’l Game Tech.*, 184 F.3d 1339 (Fed. Cir. 1999) to criticize Nokia’s identification of the processing unit is misplaced, as it ignores recent Federal Circuit precedent in *In re Katz Interactive Call Processing Patent Litigation*, 639 F.3d 1303 (Fed. Cir. 2011). In *Katz*, the Federal Circuit confirmed that disclosure of a processor is sufficient for basic functions such as “processing,” “receiving,” and “storing”:

By contrast, in the seven claims identified above, Katz has not claimed a specific function performed by a special purpose computer, but has simply recited the claimed functions of “processing,” “receiving,” and “storing.” ***Absent a possible narrower construction of the terms “processing,” “receiving,” and “storing,” discussed below, those functions can be achieved by any general purpose computer without special programming. As such, it was not necessary to disclose more structure than the general purpose processor that performs those functions.*** Those seven claims do not run afoul of the rule against purely functional claiming, because ***the functions of “processing,” “receiving,” and “storing” are coextensive with the structure disclosed, i.e., a general purpose processor.***

Katz, 639 F.3d at 1316 (emphasis added). In addition, contrary to HTC’s allegation, the disclosure of an algorithm is not necessary for the performance of basic functions by a general purpose computer. See, e.g., *e-LYNXX Corp. v. Innerworkings, Inc.*, No. 1:10-cv-2535, 2012 WL 4484921, at *19 (M.D. Pa. Sept. 27, 2012) (“To the extent that any of the means-plus-function elements describe functions that can be performed by a general purpose computer, there is no requirement that the specification disclose an algorithm as

In addition, HTC's allegation that the memory "is unclear as to what structure is identified" similarly lacks merit. (HTC Br. at 14.) Contrary to HTC's suggestion, Figure 3 of the '189 patent expressly discloses memory (i.e., "storage means") used by the processor in connection with the loading function. ('189 patent, Fig. 3; *see also* 3:43-59 ("Extension and update information, which is programmed into the phone for a new service, has to be expressed in the form of a computer program or corresponding instructions which ***can be loaded in the storage media used by the processor*** controlling the operation of the phone.") (emphasis added); 4:66-5:2 ("Operation of the telephone 3 is controlled by ***a central processing unit 9 which comprises a microprocessor and has storage means 10*** at its disposal.") (emphasis added).) And consistent with the disclosure, the patentee specifically identified the storage means as part of the "means for loading." ('189 Prosecution History, June 2, 1997 Application at 12 (Ex. 30, NKHTC0000025; Nokia Br. Ex. 2, NOK885ITC00000450).) HTC has no basis for seeking to exclude the memory from the "means for loading."

Finally, HTC's allegation that the telephone part is "indefinite as to the identified structure" also lacks merit. (HTC Br. at 14.) To the contrary, the intrinsic record discloses a telephone part that transmits and receives data as part of the "means for loading." For example, the specification teaches that "the mobile phone includes ***a telephone part 12 for data transmission and for processing transmitted speech and data***, used by the mobile phone to communicate between the nearest base station (not shown)." ('189 patent, 5:6-10 (emphasis added); *see also* 5:40-47, 5:61-67.) Consistent with that disclosure, Figure 3 shows such a telephone part. ('189 patent, Fig. 3.)

the corresponding structure."'). Even so, the '189 patent does disclose exemplary programming language for adding new features to the terminal. (*See, e.g.*, '189 patent, 7:9-43.)

Moreover, during prosecution of the '189 patent, the patentee specifically identified the telephone part as part of the “means for loading.” ('189 Prosecution History, June 2, 1997 Application at 12 (Ex. 30, NKHTC0000025); Nokia Br. Ex. 2, NOK885ITC00000450).) And consistent with the transmitting/receiving functionality of the telephone part, the patent examiner cited a prior-art transceiver as relevant to the “means for loading” limitation. ('189 Prosecution History, Feb. 26, 1999 Office Action at 7 (Ex. 30, NOK885ITC00000341); Ex. 31, '535 patent at Fig. 8.) In short, the intrinsic record amply discloses the telephone part for transmitting and receiving data, and HTC has no basis seeking to exclude it from the “means for loading.”⁷

In sum, HTC's argument is flawed because it focuses solely on the card reader embodiment and ignores the other embodiment that allows for delivery of information over the telecommunication network. In connection with that telephone network embodiment, Nokia correctly identifies the processing unit, the memory, and the

⁷ HTC's attempted claim differentiation argument (HTC Br. at 15-16) makes no sense. As HTC notes, independent claim 8 is directed to “[a] terminal for a telecommunication system” whereas dependent claim 10 (which depends on claim 8) specifies that the “terminal is a telephone apparatus.” Under claim differentiation, claim 8 is presumed to be **broader** than claim 10 — i.e., the terminal could, but need not, be a telephone apparatus. See, e.g., *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed. Cir. 2004) (“[T]he presence of a dependent claim that adds a particular limitation raises a presumption that the limitation in question is not found in the independent claim . . . where the limitation that is sought to be ‘read into’ an independent claim already appears in a dependent claim, the doctrine of claim differentiation is at its strongest.”) (citations omitted). Indeed, the specification itself teaches that this is the logical reading: “It is obvious to one skilled in the art that the **application of the invention is not limited to mobile phones** but the method according to the invention can be applied to all kinds of terminal equipment in a telecommunication network that are used for conveying intelligent network services.” ('189 patent, 4:41-46 (emphasis added).) HTC's allegation that Nokia's identification of structures in the telecommunications network embodiment “violates the doctrine of claim differentiation since there would be no difference between claims 8 and 10 under Nokia's construction” (HTC Br. at 16) is not based on a sound application of the doctrine of claim differentiation.

telephone part as the “means for loading”, and HTC provides no basis for excluding those structures. Accordingly, Nokia’s identification of structures should be adopted.

b. HTC Mischaracterizes The “Card Reader Embodiment”

A subsidiary dispute between the parties concerns what structures in the card reader embodiment actually perform the loading function. For this embodiment, the parties agree that one of the disclosed structures is the card reader. (See Joint Claim Construction Chart, EDIS No. 518-258; *see also* ’189 patent, Fig. 3 item 7, 5:2-4; 5:32-37.) The parties disagree regarding the other structures that constitute the “means for loading.” Nokia submits that the additional structures performing the loading function are the processing unit and the memory. (Nokia Br. at 11-12.) HTC, however, contends that the additional structure is the physical card itself. (HTC Br. at 10-11.)

HTC does not show any inaccuracy in Nokia’s identification of the “means for loading” in that embodiment. Like in the telecommunications network embodiment, the ’189 patent teaches that the processing unit and memory perform the loading function in the card reader embodiment. (’189 patent, 4:66-5:4 (“Operation of the telephone 3 is controlled by a *central processing unit 9* which comprises a microprocessor and has *storage means 10* at its disposal. The central processing unit 9 is connected to an *intelligent card reader 11* which can communicate bidirectionally with an intelligent card 6 connected to it.”) (emphasis added).) Indeed, the main difference between the telecommunications network embodiment and the card reader embodiment stems from the *source* of the executable instructions. In the telecommunications network embodiment, the mobile phone obtains the executable instructions from the telecommunications network itself (by virtue of the telephone part), whereas, in the card

reader embodiment, the mobile phone obtains the executable instructions from a physical card (by virtue of the card reader). Otherwise, in both embodiments, the role of the processing unit and memory in the loading functions are largely the same.

HTC again ignores the prosecution history of the '189 patent, in which the patentee *expressly identifies* the processing unit, the memory, and the card reader as the “means for loading” in this embodiment. ('189 Prosecution History, June 2, 1997 Application at 12 (Ex. 30, NKHTC0000025); Nokia Br. Ex. 2, NOK885ITC00000450).) Notably, the patentee did not identify the physical card itself as part of the “means for loading.”

Further, an analogy to the telephone network embodiment illustrates why it is the card reader — and not the physical card itself — that is part of the “means for loading.” In the telephone network embodiment, the telephone network itself is not the “means for loading.” Rather, the telephone network is the source of the executable instructions which in turn are loaded into the terminal by the “means for loading” (i.e., the processing unit, the memory, and the telephone part for transmitting and receiving information over the telephone network). In the card reader embodiment, the physical card plays an analogous role as the telephone network in the telephone network embodiment. Specifically, the physical card is the source of the executable instructions which in turn are loaded into the terminal by the “means for loading” (i.e., the processing unit, the memory, and the card reader) — not the “means for loading” itself.

Indeed, following that logic, HTC at one point appears to concede that it is the card reader — and not the physical card itself — that performs the actual loading: “Thus, once the IN card 6 is inserted into the mobile phone 3, *the IN card reader 11 loads the*

sets of executable instructions concerning new services onto the terminal 3.” (HTC Br. at 11 (emphasis added).)

As a result, in the card reader embodiment, Nokia correctly identifies the processing unit, the memory, and the card reader as the “means for loading.” HTC provides no basis for substituting the physical card itself in place of the processing unit and the memory. Accordingly, Nokia’s identification of structures should be adopted for this embodiment as well.⁸

III. U.S. PATENT NOS. 6,373, 345

A. HTC Mischaracterizes The ’345 Patent And Impermissibly Seeks To Limit The Claims To Just One Of Many Exemplary Embodiments

HTC’s technology background and claim construction sections mischaracterize the disclosure of the ’345 patent and violate a cardinal rule of claim construction — that claim scope may not be limited by importing an exemplary embodiment from the specification into the claims. *See, e.g., Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc) (“[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments”). In particular, HTC tries to limit the claims of the ’345 patent to a particular illustrative embodiment disclosed in the ’345 patent, namely the circuit diagram shown in Figures 5B and 6.⁹ (Resp. Br. at 5.) But contrary to HTC’s

⁸ HTC’s brief contends that “Claim 8 requires that the terminal comprises the means for loading, imposing a requirement for the *structure must be contained within the terminal*.” (HTC Br. at 11 (emphasis added).) HTC’s contention, however, does not support HTC’s claim construction positions, as all Nokia’s identifications of structure — (1) a processing unit, memory, and card reader and (2) a processing unit, memory, and telephone part for transmitting and receiving data over a telecommunication network — are contained within the terminal.

⁹ Figure 6 is an excerpt from a portion of Figure 5B.

allegations, the claims of the '345 patent are not limited to any illustrative figure or exemplary embodiment taught in the specification.

First, the claim language itself claims the inventive subject matters using the broad, open-ended term “comprising.” See *Cias, Inc. v. Alliance Gaming Corp.*, 504 F.3d 1356, 1360 (Fed. Cir. 2007) (“In the patent claim context the term ‘comprising’ is well understood to mean ‘including but not limited to.’”). The claims contain no language limiting their scope to any illustrative figure or exemplary embodiment taught in the specification. HTC’s attempt to limit the claims to a particular, exemplary embodiment illustrated in Figures 5B and 6 simply ignores the claim language itself.

Second, contrary to HTC’s characterizations, the specification discloses *many* embodiments and explicitly describes them as exemplary and not limiting. For example, the “Summary of the Invention” section mentions the phrase “in one embodiment” five times:

- “***In one embodiment*** the modulator is of the direct conversion type.” (’345 patent, 4:43-44 (emphasis added).)
- “***In one embodiment*** the low-pass filter is located in the current mirror of the multiplier circuit of the modulator.” (’345 patent, 4:46-47 (emphasis added).)
- “***In one embodiment*** the low-pass filter is located between the transistors of the transistor pair which mirrors the current in the current mirror, whereby the low-pass filter filters the signal path between the transistor supplying the control and the transistor generating the mirrored current.” (’345 patent, 4:48-52 (emphasis added).)
- “***In one embodiment*** the low-pass filter is formed by an RC low-pass arrangement where the resistor is connected in series with the signal path and the capacitor is connected in parallel regarding the signal’s propagation direction behind the resistor, to the common potential of the transistor pair.” (’345 patent, 4:53-57 (emphasis added).)

- “***In one embodiment*** the common potential of the transistor pair is connected to the negative potential of the operating voltage.” (’345 patent, 4:58-60 (emphasis added).)

Indeed, for the avoidance of doubt, the ’345 patent explains that “***[t]he invention is not limited to concern only the presented embodiment examples***, but many modifications are possible within the inventive idea defined by the claims.” (’345 patent, 6:49-53 (emphasis added); *see also* 4:6-15 & 4:39-43 (broadly describing the inventive subject matters).) HTC’s attempt to limit the ’345 patent to a particular illustrative embodiment does not comport with the ’345 patent’s disclosure of numerous, exemplary embodiments.

More specifically, with respect to “current mirrors” and their arrangements of transistors, the specification similarly describes its disclosures as merely exemplary and not limiting. For instance, the specification describes Figure 5B’s illustration of transistors in a current mirror as “an example”:

The transistors in the current mirrors 7 in FIG. 5B ***present an example of*** driver components in a driver arrangement 420 in FIG. 4.

(’345 patent, 6:10-12 (emphasis added).)¹⁰ Likewise, the specification expressly describes the disclosure in Figure 6 as “an example”:

In FIG. 6 the resistor R5 and the condensator C1 (and how they are connected to the current mirror) ***present an example of*** the filter arrangement 430 in FIG. 4.

(’345 patent, 6:38-41 (emphasis added); *see also* 6:33-34 (“FIG. 6 shows a more unconstrained arrangement of one current mirror located in the current mirrors 7 of FIG. [5B].”).) Contrary to HTC’s allegations that the specification requires limiting the claims

¹⁰ Given this clear statements from the specification, the arrangement of transistors for the current mirrors in both Figure 5B and 6 are likewise merely examples.

to Figures 5B and 6, the specification itself demonstrates that Figures 5B and 6 are exemplary and not a valid basis for limiting the express claim language.

In addition, HTC's attempt to limit the claims to Figures 5B and 6 ignores the disclosure surrounding Figure 4, to which the descriptions of Figures 5B and 6 refer. ('345 patent, 6:10-12, 6:38-41.) Figure 4 — “a schematic drawing of a modulator according to the invention” — provides a high-level representation that is *broad*er than the exemplary configurations illustrated in Figures 5B and 6 and is *not* tied to any particular circuit diagram.

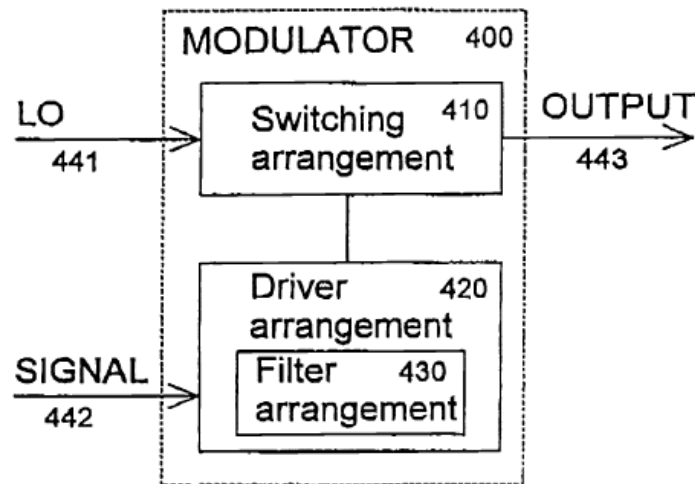
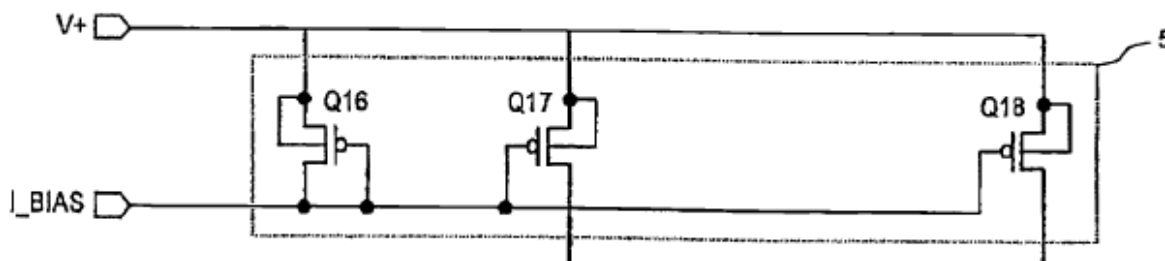


FIGURE 4

('345 patent, 5:19-20 & Fig. 4; see also 5:32-59 (describing Figure 4 using permissive language and not limiting it to any particular circuit diagram); 5:50-60 (“*Preferably* the filter arrangement is such that is it possible to construct it as a part of the integrated circuit.”) (emphasis added).)

Furthermore, contrary to HTC's allegations that current mirror and the arrangement of transistors therein should be limited to the particular, exemplary embodiment illustrated in Figures 5B and 6, the '345 patent discloses an example of a

current mirror and an arrangement of transistors that is *different* from the exemplary circuit diagram illustrated in Figures 5B and 6:



(’345 patent at Fig. 5A; see also at 6:1-4 (“The current I_{BIAS} controls the currents with the aid of the current mirror 5 comprising the arrangement of the transistors Q16, Q17 and Q18.”).) Indeed, this exemplary current mirror contains *multiple* pairs of transistors (e.g., Q16/Q17 and Q16/Q18). These disclosures undermine HTC’s effort to limit current mirrors and its arrangement of transistors to exactly that shown in Figures 5B and 6.

B. “current mirror”

Nokia Proposal	HTC Proposal
No construction necessary. Alternative: An arrangement of transistors such that a defined current passing into one is mirrored in another.	A circuit designed to receive an input current and generate an output current that is a constant multiple of the input current.

1. HTC’s Attempt To Limit “Current Mirror” To The Embodiment In Figures 5B And 6 Contravenes The Rules Of Claim Construction And Does Not Comport With The Intrinsic Record

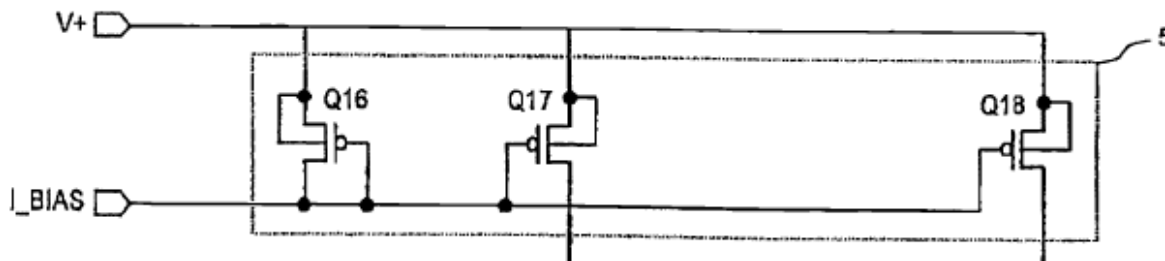
HTC does not and cannot show that its construction of “current mirror” — “[a] circuit designed to receive an input current and generate an output current that is a constant multiple of the input current” — comports with the intrinsic record. In seeking to add the language “generate an output current that is a constant multiple of the input

current,” HTC seeks to add an extraneous limitation that simply is not present. HTC purports to support its proposed construction on pages 10 to 12 of its brief, but HTC does not cite to *any* intrinsic evidence that allegedly supports it. HTC identifies no claim language that leads to HTC’s construction. HTC similarly cites nothing in the specification that requires its construction. Nor does HTC identify any support for its construction in the prosecution history.

To the extent HTC alleges that the claims should be limited to Figures 5B and 6 of the specification, (see Resp. Br. at 5), HTC’s approach contravenes a cardinal rule of claim construction. It is well established that claims are not to be limited to preferred embodiments. See, e.g., *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc). Here, as discussed on pages 16-19 above, the ’345 patent teaches that the illustrations in Figures 5B and 6 are merely exemplary. (See, e.g., ’345 patent, 6:10-12 (“The transistors in the current mirrors 7 in FIG. 5B **present an example of** driver components in a driver arrangement 420 in FIG. 4”), 6:38-41 (“In FIG. 6 the resistor R5 and the condensator C1 (and how they are connected to the current mirror) **present an example of** the filter arrangement 430 in FIG. 4”), Fig. 4 (disclosing high-level representation that is *not* tied to any particular circuit diagram) (emphasis added).) HTC’s attempt to limit the claims to the particular embodiment taught in Figures 5B and 6 does not comport with claim construction law or the intrinsic record.¹¹

Indeed, as discussed above, the ’345 patent discloses an example of a current mirror that is *different* from the particular embodiment illustrated in Figures 5B and 6:

¹¹ Although the ’345 patent demonstrates that it is not limited to the exemplary embodiments illustrated in Figures 5B and 6, HTC does not even attempt to explain how those exemplary embodiments purport to support its construction.



(’345 patent at Fig. 5A; see also at 6:1-4 (“The current I_{BIAS} controls the currents with the aid of the *current mirror 5 comprising the arrangement of the transistors Q16, Q17 and Q18.*”) (emphasis added).) In this example, the specification teaches that transistors Q16, Q17, and Q18 form a type of “current mirror.” HTC presents no basis in the intrinsic record for seeking to limit “current mirrors” to just the exemplary embodiment illustrated in Figures 5B and 6, let alone for reading into the claims the extraneous limitation “generate an output current that is a constant multiple of the input current.”¹²

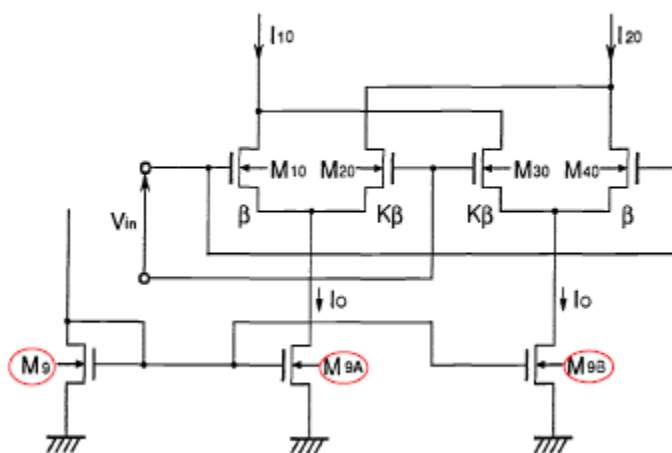
¹² Another example in the intrinsic record of a current mirror that is different from the example illustrated in Figures 5B and 6 of the ’345 patent is shown in prior-art reference GB 2 261 130 (Ex. 32), which is intrinsic evidence, because it was cited during the prosecution of the ’345 patent and is disclosed on its face. See, e.g., *Kumar v. Ovonic Battery*, 351 F.3d 1364, 1368 (Fed. Cir. 2003) (“[P]rior art cited in a patent or cited in the prosecution history of the patent constitutes intrinsic evidence.”); *V-Formation, Inc. v. Benetton Group SpA*, 401 F.3d 1307, 1311 (Fed. Cir. 2005) (holding that the district court properly considered as intrinsic evidence a prior art patent listed on the face of the patent to be construed). Similar to Figure 5A of the ’345 patent, the ’130 patent discloses a three-transistor current mirror containing two pairs of transistors.

2. HTC's Extrinsic Evidence Does Not Support Its Construction

In reality, HTC seeks to impose the extraneous limitation “generate an output current that is a constant multiple of the input current” based entirely on extrinsic evidence. (Resp. Br. at 10-11.) But it is well established that extrinsic evidence is “less significant” than the intrinsic record in determining the meaning of claim language. *See, e.g., Philips v. AWH Corp.*, 415 F.3d 1303, 1317-18 (Fed. Cir. 2005) (en banc). Indeed, “[a] court may look to extrinsic evidence so long as the extrinsic evidence does not contradict the meaning otherwise apparent from the intrinsic record.” *Helmsderfer v. Bobrick Washroom Equip., Inc.*, 527 F.3d 1379, 1382 (Fed. Cir. 2008).

HTC’s citations to extrinsic evidence to impose the extraneous limitation “generate an output current that is a constant multiple of the input current” are unavailing for numerous reasons. First, many of HTC’s citations simply suggest that current mirrors *may be* employed to generate a constant multiple of the reference current — *not* that they *must be*. (Resp. Br. Ex. 8 at [0027] (“As is well known in the art, the current mirror 62 is employed to generate a DC current that is a constant multiple of a reference current.”));

FIGURE 2



(Ex. 32, '130 patent, Fig. 2 (disclosing pairs of transistors M9/M9A and M9/M9B).)

Resp. Br. Ex. 6 at 3:21-23 (“As is known in the art, current mirrors are employed to generate a DC current that is a constant multiple of the reference current.”); Resp. Br. Ex. 9 at 7:25-28 (describing an embodiment that “*may* be any circuit designed . . . as a constant multiple”) (emphasis added).) In addition, HTC’s extrinsic evidence acknowledges that the examples it cites are the “simplest,” most “basic current-mirror circuit,” used as “building blocks” rather than describing more complex current mirrors capable of controllable, non-constant gain. (See, e.g., Resp. Br. Ex. 7 at 373 (describing Fig. 5.58(a) as “the basic current-mirror circuit” that “is shown in its simplest form” and is a “circuit building block”); Resp. Br. Ex. 11 at 270-71 (This section, including all of its equations and diagrams, applies to “[t]he simplest form of current source.”); Resp. Br. Ex. 13 at 89 (describing a diagram as the “simplest form”).) HTC’s extrinsic evidence also acknowledges the possibility of “more elaborate current-mirror circuits” than those disclosed by simple teaching examples. (Resp. Br. Ex. 7 at 374; see also Resp. Br. Ex. 10 at 251 (cited by HTC for the proposition that the output gain must be a constant multiple, but actually only stating generally that “output current is equal to the input current multiplied by a desired current gain” without any requirement for “constant” gain).)

In short, HTC’s extrinsic evidence falls far short of proving that current mirrors are required to generate constant gain. HTC’s attempt to read this extraneous limitation into the claims should be rejected.¹³

¹³ HTC’s cited equations from the extrinsic textbook Sedra and Smith (Resp. Br. at 11-12; Resp. Br. Ex. 7 at 374, 429) do not show that current mirrors are limited to constant gain. In the case of field effect transistors, the cited equation merely states that gain “is determined by device geometry” – the ratio of width to length of the transceiver. (Resp. Br. Ex. 7 at 374.) But the fact that gain “is determined by device geometry” does not require the geometry to be uncontrollable or constant. In fact, this very same extrinsic evidence textbook teaches students how to create transistors that would result in controllable gain in a current mirror. (Ex. 33, Sedra Additional Excerpt at 746 (Fig.

3. HTC Fails To Undermine Nokia's Position

As set forth in Nokia's opening brief, a current mirror is a well-known electronics component that requires no construction. (Nokia Br. at 19.) Here, HTC identifies no basis for why "current mirror" need be construed apart from the fact that HTC has provided a construction. But the mere fact that one party provides a construction does not establish that a term that otherwise is well understood in the art needs to be construed. *See, e.g., Finjan, Inc. v. Secure Computing Corp.*, 626 F.3d 1197, 1207 (Fed. Cir. 2010) (affirming district court's instruction to jury that disputed term should be given its ordinary meaning; finding no "actual dispute" where district court rejected defendants' construction) (citing *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351 (Fed. Cir. 2008)).

Indeed, courts routinely find that well-known electronics components require no construction. *See, e.g., Synopsys, Inc. v. Nassda Corp.*, No. C 03-02664 SI, 2004 WL 5643689, at *16-17 (N.D. Cal. July 8, 2004) (construing term "power network transistors" to have its plain and ordinary meaning and rejecting construction that would limit term to only one kind of transistor).

In addition, the only issue that HTC raises with respect to Nokia's alternative construction — an arrangement of transistors such that a defined current passing into one is mirrored in another — is that it uses the term "mirror." But HTC does not demonstrate why use of the term "mirror" is problematic. The specification of the '345 patent uses the term "mirror" numerous times. ('345 patent, 2:14-16, 4:47-51, 6:38-41; *see also* Nokia Br. at 21 (citing examples).) Indeed, HTC acknowledges that, in Figure 6,

10.33 shows that switches (S1, S2, S3, ... SN) may be used to connect multiple transistors in parallel with each other for a controllable transistor.).)

there is “a second transistor Q24 that generates a *‘mirrored’* output current” (Resp. Br. at 10 (emphasis added)) — confirming that the term “mirrored” is well understood. Subjecting “mirror” to further construction would create, rather than remove, ambiguity regarding the well-known structure it purports to construe in the first place. For this additional reason, Nokia’s position should be adopted and HTC’s construction should be rejected.¹⁴

C. **“pair of transistors”**

Nokia Proposal	HTC Proposal
No construction necessary.	Two transistors in a fixed arrangement.

1. **HTC’s Attempt To Limit “Pair Of Transistors” To “A Fixed Arrangement” Does Not Comport With The Intrinsic Evidence**

HTC does not and cannot show that its construction of “pair of mirrors” — “[t]wo transistors in a fixed arrangement” — is required by the intrinsic record. In seeking to add the extraneous language “in a fixed arrangement,” HTC once again seeks to read in a limitation that simply is not there.¹⁵

¹⁴ Contrary to HTC’s allegation (Resp. Br. at 9), there is no inconsistency in stating that a term requires no construction and, in the alternative, providing a construction that sets forth the plain and ordinary meaning of that term. *See, e.g., In re Certain Computers and Computer Peripheral Device and Components Thereof and Products Containing the Same*, Inv. No. 337-TA-841, 2012 WL 4829461 (Oct. 4, 2012) (Claimant arguing that multiple terms should be given their plain and ordinary meaning, as well as arguing for alternative constructions). Indeed, in this case, HTC has alleged that terms are indefinite and then proceeded to provide a construction. (*Compare* HTC Br. Ex. 6 (Richardson Decl.), ¶ 26 (arguing for indefiniteness of term), *with* HTC Br. Ex. 6 (Richardson Decl.), ¶ 27 (construing term).)

¹⁵ Indeed, it is unclear what HTC even means by the unspecified phrase “a fixed arrangement,” and HTC’s brief provides no clarification of it. HTC variously describes this unspecified limitation as a prohibition on “point[ing] to any two transistors in a circuit,” a prohibition on “point[ing] . . . to two different sets of transistors used at different times,” and requiring “[s]ome known association . . . between the two

HTC purports to support its proposed construction on pages 6 through 8 of its brief, but the intrinsic evidence cited by HTC does not support HTC's construction. First, the claim language cited by HTC (Resp. Br. at 7) does not require "a fixed arrangement." The claims do not contain the words "a fixed arrangement." Instead, the cited claim language merely recites that the pair of transistors be part of the current mirror and contain a low-pass filter arrangement and signal path between them. ('345 patent, Claims 1 and 7.) This language does not require, let alone suggest, that the transistors must be in "a fixed arrangement." In short, the claim language provides no basis for HTC's attempt to read the limitation "a fixed arrangement" into the claims.

Similarly, HTC's citations to the specification (Resp. Br. at 7) do not require or even suggest that the "pair of transistors" must be in "a fixed arrangement." Contrary to the rules of claim construction, HTC once again attempts to limit the claim language to Figure 6 (Resp. Br. at 7) by reading into the claims a particular embodiment from the specification. *See, e.g., Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012) ("We do not read limitations from the specification into claims; we do not redefine words.") As discussed above, the '345 patent teaches that the illustrations in Figures 5B and 6 are merely exemplary. (*See, e.g., '345 patent*, 6:10-12 ("The transistors in the current mirrors 7 in Fig. 5B present ***an example*** of driver arrangement 420 in Fig. 4.") (Emphasis added); 6:38-41, Fig. 4.) Here, the specification contains no language that could be read as requiring that the transistors must be "in a fixed arrangement." Indeed, the '345 patent does not mention the word "fixed" at all. In addition, contrary to HTC's allegation, the mere fact that the specification uses the word "arrangement" in

transistors." (Resp. Br. at 6-7.) As such, reading in this unspecified limitation would create, rather than resolve, ambiguity.

various places (Resp. Br. at 7) provides no logical support for HTC's attempt to read into the claims the extraneous limitation "in a *fixed* arrangement."

Further, as discussed above, the specification of the '345 patent discloses examples of current mirrors that are *different* than the particular embodiment illustrated in Figures 5B and 6. ('345 patent at Fig. 5A; *see also* at 6:1-4 ("The current I_{BIAS} controls the currents with the aid of the *current mirror 5 comprising the arrangement of the transistors Q16, Q17 and Q18.*") (emphasis added).) Once again, HTC presents no basis for seeking to limit the claims to just one exemplary embodiment.

Moreover, HTC's citation to the prosecution history (Resp. Br. at 8) does not require, let alone suggest, that the transistors must be in "a fixed arrangement." The portion of the prosecution history cited by HTC does not contain any disclaimer or other narrowing language — it merely references the specification itself. And as discussed above, the specification does not contain any language requiring that the transistors must be "in a fixed arrangement."¹⁶

Accordingly, HTC's attempt to include the limitation "a fixed arrangement" should be rejected.

¹⁶ Moreover, the extrinsic evidence confirms that one of ordinary skill in the art would have understood that pairs of transistors in a current mirror were not necessarily in a "fixed arrangement." For example, the Savant reference shows a current mirror in Figure 9.12 with transistor Q1 mirrored to transistors Q2, Q3, and Q4. (Nokia Br. Ex. 6, NOK885ITC00009021 at 9024.) Thus, Q1 may be "paired" with any of Q2, Q3, or Q4. Nothing in the intrinsic record would prohibit the '345 patent from including transistors that could be paired in multiple configurations. Furthermore, as explained above, one of ordinary skill in the art understood that a transistor may be built from other transistors. (Ex. 34 Paul R. Gray et al., *Analysis and Design of Analog Integrated Circuits*, 165-66 (5th ed. 2009) (Problem 2.17 teaches "that two MOS transistors connected in parallel with channel widths of W_1 and W_2 ... can be modeled as one equivalent MOS transistor whose width is $W_1 + W_2$ ").)

2. **HTC's Attempt To Read The "Comprising" Claim Language As Precluding Additional Structures Contravenes The Rules Of Claim Construction**

As discussed in Nokia's opening brief (Nokia Br. at 25), the broader claim limitation at issue here recites "current mirrors **comprising** a pair of transistors..." ('345 patent at 6:58, 7:20.) The issue is not whether "pair" means two, but the meaning of the broader limitation "current mirrors **comprising** a pair of transistors," namely whether that language **precludes** the presence of additional transistors or structures.

Nothing in the claim language affirmatively precludes the presence of additional transistors or other structures. The claim limitation uses the well-known transition word "comprising." "In the patent claim context the term 'comprising' is well understood to mean 'including but not limited to.'" See *Cias, Inc. v. Alliance Gaming Corp.*, 504 F.3d 1356, 1360 (Fed. Cir. 2007). "Comprising" is a term of art carefully chosen by patent practitioners for its open-ended meaning, as opposed to "consisting of" which signifies restriction and exclusion. See, e.g., *Vehicular Techs. Corp. v. Titan Wheel Int'l, Inc.*, 212 F.3d 1377, 1382-83 (Fed. Cir. 2000). Here, the "comprising" language demonstrates that the current mirrors must include **at least** a pair of transistors, but provides no basis for suggesting that additional transistors or other structures are excluded.¹⁷ Indeed, cases routinely find that "comprising" does not preclude the claims from covering subject matters that have structures in addition to that which is required. E.g., *Versa Corp. v. Ag-Bag Int'l Ltd.*, 392 F.3d 1325, 1329 (Fed. Cir. 2004) ("'[C]omprising' language is not

¹⁷ Moreover, the patentee understood how to use the word "only" in relation to the number of transistors. ('345 patent, 6:13-17 ("an arrangement having only two transistors" — referring to the switching arrangement, and not the current mirror).) If the patentee had desired to limit the current mirror to only a pair of transistors and nothing more, the patentee could have limited the claim language to "**only** a pair of transistors."

limiting and may include features not recited in the claim”); *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 811 (Fed. Cir. 1999).

Accordingly, HTC’s attempt to limit the current mirrors to only two transistors similarly lacks merit.

c. HTC Fails To Undermine Nokia’s Position

Finally, HTC’s criticism of Nokia for not proposing a construction of this term makes no sense. The reason Nokia proposed no construction is that no construction is necessary. *E.g.*, *Morpho Detection, Inc. v. Smiths Detection, Inc.*, No. 2:11cv498, 2012 U.S. Dist. LEXIS 150996, at *53 (E.D. Va. Oct. 19, 2012) (citing *U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997)) (citations omitted) (internal quotation marks omitted) (“[T]he task of comprehending claim words is not always a difficult one, and in some cases claim construction involves little more than the application of the widely accepted meaning of commonly understood words.”). Here, a “pair of transistors” is a straightforward, plain English term. As HTC’s proposed construction demonstrates, subjecting this straightforward term to construction risks creating, rather than resolving, ambiguity. Accordingly, HTC’s proposed construction of “pair of transistors” should be rejected and “pair of transistors” should be accorded its plain and ordinary meaning.

IV. U.S. PATENT NO. 6,711,211

A. “macroblock segmentation”

Nokia Proposal	HTC & Google Proposal
“A segmentation of a macroblock into blocks.”	A “macroblock segmentation” specifies possible ways in which a macroblock can be segmented into blocks for the purpose of motion coefficient prediction.

As explained in Nokia’s opening brief, Nokia’s construction should be adopted because the ’211 patent explicitly defines “macroblock segmentation”: “[t]he segmentation of a macroblock into blocks is in this description called macroblock segmentation.” (’211 patent, 6:66-7:1.) HTC’s proposed construction ignores this express definition, attempts to import limitations from the specification, renders language in the claim superfluous, and mischaracterizes the prosecution history.

HTC first contends that “macroblock segmentation” is defined in the claims. (HTC Br. at 27.) But that is demonstrably incorrect. Claim 26 recites:
a method for decoding encoded video information . . . the method comprising:

defining a certain number of available macroblock segmentations *that*
specify possible ways in which a macroblock can be segmented into
blocks

(’211 patent, 20:40, 20:45-48.) As the claim itself demonstrates, the “certain number of available macroblock segmentations” are *what* in turn “specify possible ways in which the macroblock can be segmented into blocks,” and not the definition of “macroblock segmentations.” Rather than defining what macroblock segmentations *are* (like Nokia’s proposed construction), HTC imports later-recited claim language (the “specify” phrase) regarding what the macroblock segmentations *do*. And by simply incorporating language

that already is part of the claim, HTC's proposed construction renders superfluous the claim requirement that certain number of available macroblock segmentations "specify possible ways in which a macroblock can be segmented into blocks." *See, e.g., Merck & Co., Inc. v. Teva Pharm. USA, Inc.*, 395 F.3d 1364, 1372 (Fed. Cir. 2005) ("A claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so.") (internal citations omitted); *Gen. Am. Transp. Corp. v. Cryo-Trans, Inc.*, 93 F.3d 766, 770 (Fed. Cir. 1996) (rejecting the district court's claim construction because it rendered superfluous the claim requirement for openings adjacent to the end walls). HTC's construction does not actually construe "macroblock segmentations," but instead merely regurgitates later-recited language that already is part of the claims. Thus, HTC's proposed construction violates a fundamental purpose of claim construction: to determine the meaning and scope of the asserted claims. *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1360 (Fed. Cir. 2008).

HTC next asserts that an alleged prosecution history disclaimer requires imposing the additional limitation "for the purpose of motion coefficient prediction." But HTC cannot meet its "heavy burden" to demonstrate a prosecution history disclaimer. *Cadence Pharm., Inc. v. Paddock Labs, Inc.*, 886 F. Supp. 2d 445, 464-65 (D. Del. 2012) (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1325-6 (Fed. Cir. 2003)). It is well established that a prosecution history disclaimer will be found "only if the allegedly disclaiming statements constitute a clear and unmistakable surrender of subject matter." *Ecolab, Inc. v. FMC Corp.*, 569 F.3d 1335, 1342 (Fed. Cir. 2009) (internal quotation marks omitted). No such disclaimer occurred here. Contrary to HTC's allegation, the applicant did *not* distinguish "macroblock segmentations" over the

Zhang¹⁸ reference. Rather, the applicant distinguished the claimed “macroblock-segmentation—prediction-method pairs” over the block segmentations and their association with motion compensation modes of Zhang.¹⁹ (HTC Br. Ex. 5, at NKHTC0001648.) Specifically, in the rejection, the examiner did not focus on the term “macroblock segmentations” but on the separate term “macroblock-segmentation – prediction-method *pairs*”:

Zhang et al discloses . . . defining for each available macroblock segmentation at least one available prediction method, each of which prediction methods produces prediction motion coefficients for block within the macro block, ***resulting in a certain finite number of available macroblock-segmentation - prediction-method pairs*** (since the examiner interprets that each pairs of macroblock- segmentation—prediction-method can have a different segmentation and the same prediction method and furthermore, ***since Zhang et al does not mention each macroblock-segmentation has a corresponding prediction-method which is different for each different macroblock-segmentation and therefore Zhang et al, page 1706, right column, lines 18-21 meets the limitation as claimed***);

(’211 Prosecution History, Mar. 27, 2003 Office Action (Ex. 35, NKHTC0001522-23.) (emphasis added.) In response, the applicant directed his remarks at the examiner’s “*pairs*” rejection, stating “[t]he Office Action draws a specific analogy between the different block segmentations . . . and the ***macroblock-segmentation—prediction-method pairs*** recited in in the independent claims of the present invention.” (HTC Br. Ex. 5, at NKHTC0001648.) (emphasis added.) Thus, the applicants’ statements on which

¹⁸ (HTC Br. Ex. 8, NKHTC0001531- NKHTC0001541.)

¹⁹ “For a given block, it may be motion compensated by one (single-motion mode), two (dual motion mode with inner block segmentation), four (split), or more than four (further decomposition) motion vectors.” (HTC Br. Ex. 8 at NKHTC0001534.)

HTC relies were in the context of the rejection regarding “pairs” — not “macroblock segmentations.”²⁰ (HTC Br. Ex. 5, at NKHTC0001648.)

Nothing in the prosecution history supports, let alone imposes, a prosecution history disclaimer in the construction of “macroblock segmentations.” And HTC does not meet its heavy burden of showing a prosecution history disclaimer that requires adding the extraneous limitation “for the purpose of motion coefficient prediction.”²¹

B. “certain finite number”

Nokia Proposal	HTC & Google Proposal
No construction necessary	Indefinite.

As described in Nokia’s opening brief, the term “certain finite number” is simply a number that can be ascertained and is not unbounded. Therefore, it needs no further construction. HTC’s allegation that this term cannot be construed is baseless.

²⁰ The applicant’s complete statement provides context: “The Applicant acknowledges the Examiner’s comment that each macroblock-segmentation—prediction-method pair could have the same prediction method, but respectfully points out that the different segmentations proposed by Zhang relate specifically to ***the definition of different block sizes to be used in the direct motion compensated prediction*** of a current frame of video data i.e. the block size with which a motion vector is associated. In the method of the present invention, the different macroblock segmentations relate to different possibilities for predicting motion coefficients for a block from motion coefficients previously determined for other blocks i.e. ***a block segmentation to be used in motion coefficient prediction.***” (HTC Br. Ex. 5, at NKHTC0001648-49 (emphasis in original).)

²¹ The applicant’s statement that “motion compensated prediction with respect to a reference frame and motion coefficient prediction using previously determined motion coefficients are substantially different techniques” (’211 Prosecution History, Mar. 26, 2003 Office Action (Ex. 35 at NKHTC0001522-23)) highlights that the distinction is based on motion compensated prediction / motion coefficient prediction. Thus, this statement undermines HTC’s assertion that the applicant was distinguishing the prior art on the basis of macroblock segmentation.

As an initial matter, HTC’s claim that “certain finite number” would not be understood by one of ordinary skill in the art is belied by HTC’s own brief. Specifically, HTC devotes several pages of its brief to the intrinsic record’s voluminous discussion of “certain finite number.” (HTC Br. at 20-22.) For example, HTC acknowledges that:

- the invention provides “‘a *finite number* of prediction methods,’ for each ‘macroblock segmentation,’ thereby forming ‘*[c]ertain* predetermined allowable pairs of the macroblock segmentations and prediction methods’” (HTC Br. at 21-22); and
- the specification provides two examples (6 and 13 pairs) and hints that the upper bound is a limited number that is, to some degree, restricted relative to an undefined large number. (HTC Br. at 23.)

In short, as HTC itself acknowledges, “‘certain finite number’ limits the number of pairs.” (HTC Br. at 21.) In other words, this term means exactly what it says.

In addition, HTC ignores the intrinsic record evidence. The ’211 patent describes “certain finite number” in detail. The claim language demonstrates the certain finite number relates back to the number of macroblock-segmentation—prediction method pairs referenced in the claims. (See, e.g., ’211 patent, 20:49-56.) This number of pairs is a result of defining at least one prediction method for each available macroblock-segmentation. And the specification describes how macroblock-segmentations are defined. (Nokia Br. at 41-42; see also, section C, *infra*). The specification further explains how prediction-methods are defined. (Nokia Br. at 44-46. (explaining what prediction methods are, how they are selected, and how to specify prediction methods for available macroblock segmentations.); see also, section D, *infra*). The number of available macroblock segmentations, prediction methods, and prediction methods per segmentation can be ascertained for a particular implementation of encoder/decoder. (See, Nokia Br. Ex. 19, Schonfeld Decl. ¶ 39.) Consequently, one of ordinary skill in the

art would be able to determine the certain finite number of available macroblock-segmentation—prediction method pairs for a particular implementation of an encoder/decoder because the number of available macroblock segmentations and the number of prediction methods per macroblock segmentation may vary by implementation. (See, Nokia Br. Ex. 19, Schonfeld Decl. ¶ 39.) The certain finite number is the sum of the macroblock-segmentation-prediction method pairs.

HTC’s allegation of indefiniteness relies almost exclusively on the declaration of its retained consultant Iain Richardson. (HTC Br. at 21.) According to his declaration,

Because a person of ordinary skill in the art would be unable to objectively ascertain either the upper bound of possible macroblock segmentations or the upper bound of possible prediction methods, it is my opinion that a person of ordinary skill in the art would be unable to determine the upper bound of a “certain finite number” based on any notional maximum number of possible pairs.

(HTC Br. Ex. 6, Corrected Decl. Iain Richardson, ¶ 39). But neither the claims nor the specification require the determination of the upper bounds of possible macroblock segmentations or prediction methods. Rather, what is required is that there be a set of allowable macroblock-segmentation—prediction-method pairs that is created according to the claims, thus determining the “certain finite number.” (See, e.g., ’211 patent, 20:49-56; 7:59-65; 7:35-36.) Moreover, Dr. Richardson himself offered two constructions of “certain finite number,” undermining the contention that this term is not amenable to construction.

Further, the prosecution history of the European counterpart to the ’211 patent does not support HTC’s indefiniteness allegation or undermine Nokia’s position that no construction is required. In the communication relied on by HTC, the applicant describes a result of implementing the claimed invention, stating:

[the claimed subject matter] provides a rather clear technical contribution, with the effect of limiting the number of possible macroblock-segmentation—prediction method pairs in order to reduce the computational complexity compared to case where a free pairing of macroblock segmentations and prediction methods would be possible

(HTC Br. at 23-24, HTC Br. Ex. 7, GOOG_ITC885_2000398.) The applicant’s statement is *consistent* with the description of a result of the invention in the ’211 patent. (’211 patent, 7:59-64.) It does not imply that certain finite number requires a construction or that it is indefinite.

For the foregoing reasons, and the reasons set forth in Nokia’s opening brief, the ALJ should adopt Nokia’s proposal that no construction is necessary because one of ordinary skill in the art would understand the meaning of certain finite number in the context of the claims and the specification.

C. “means [program means] for defining a certain number of available macroblock segmentations that specify possible ways in which a macroblock can be segmented into blocks; (by agreement this includes “defining a certain number of available macroblock segmentations”)”

Nokia Proposal	HTC & Google Proposal
<p>Agreed Function: Defining a certain number of available macroblock segmentations.</p> <p>Structure: Processor and other supporting circuitry programmed as described in the patent (Step 501 of Fig. 5 and accompanying portions of the specification) to define the available macroblock segmentations, and equivalents thereof. See Col. 10:8-15 Col. 10:32-39</p>	<p>Agreed Function (claims 50 and 56): Defining a certain number of available macroblock segmentations.</p> <p>Structure: (claims 50/56): No corresponding structure</p>

Col. 11:32-44 Col. 16:21-36 Col. 16:37-51 Figs. 3, 4, 5, 7, 8, 9, 10, 11 and accompanying portions of the specification.	
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The parties agree that the identified function for this term is: “defining a certain number of available macroblock segmentations.” (HTC Br. at 24.) But HTC’s assertion that the specification does not disclose structure corresponding to that function mischaracterizes and ignores the disclosures in the specification.

First, HTC’s allegation that Nokia’s proposed structure is not clearly linked or associated with the identified function, or that it merely restates the function without providing sufficient disclosure of algorithm is incorrect. (HTC Br. at 25.) HTC ignores the vast majority of disclosure that demonstrates that the processor and other supporting circuitry disclosed in the patent perform the recited function. For example, Nokia identified the following disclosure in the ’211 patent as corresponding structure:

- The specification explains that “[a]n encoder or a decoder according to the invention can be realized using hardware or software, or using a suitable combination of both.” (’211 patent, 16:37-39.)
- Suitable hardware and software include the mobile station depicted in Figure 11, which includes “[a] central processing unit, microprocessor μ P controls the blocks responsible for different functions of the mobile station: a random access memory RAM, a radio frequency block RF, a read only memory ROM, a user interface UI having a display DPL and a keyboard KBD, and a digital camera block CAM.” (’211 patent, 16:52-58.)
- Computer PCs are also examples of video encoding and decoding stations identified in the specification. (’211 patent, 17:38-41.)

(*See also*, Nokia Br. at 38-42.) In addition, Nokia identified the disclosure in the ’211

patent that teaches how a processor can be programmed to perform the identified function. (Nokia Br. at 41-42.)

Second, HTC's specific criticisms of Nokia's identification of structure fare no better. For example, HTC appears to take issue with Nokia's identification of Fig. 4 (10:8-15; 10:32-39), alleging that it "consists of an encoding method." (HTC Br. at 25.) But, as HTC itself recognizes, "Step 401 of Fig. 4 is textually associated in the specification with the recited function of 'defining a certain number of macroblock segmentations.'" (HTC Br. at 25.) And the corresponding description at (10:8-15; 10:32-39) is relevant to both encoders and decoders because it describes macroblock segmentations, in general. Accordingly, Fig. 4 and (10:8-15; 10:32-39) are clearly linked to the function of defining macroblock segmentations.²²

HTC also complains that the specification "does not explain how a designer would define, or program a computer to define a certain number of available macroblock segmentations from the many possible segmentations." (HTC Br. at 26.) Again, HTC ignores the majority of the disclosure Nokia relies on. As explained in Nokia's opening brief, the specification does indeed provide this disclosure. (Nokia Br. at 41-42.) For example, the specification explains with reference to Figure 3, that macroblock segmentation can be carried out by dividing a video frame into macroblocks and further dividing the macroblocks into rectangular blocks. ('211 patent, 5:12-14.) The specification provides examples of macroblock-segmentations (in Figure 3) and explains

²² HTC recognizes that the disclosure in the specification that is related to the encoder is also relevant to the decoder, and relies on this relationship to support its arguments in other portions of its brief. (See, e.g., HTC Br. at 36-37) (asserting that the patentee linked encoder and decoder claims during prosecution.). HTC cannot have it both ways, i.e., it cannot assert that the patentee linked the encoder and decoder claims while also asserting that sections of the specification that discuss the encoder are not clearly linked structure for functions of the decoder claims.

that “[d]epending on the encoding method, there may be many possible macroblock segmentations.” (’211 patent 5:19-21.) Accordingly, the specification discloses sufficient algorithmic structure to perform the identified function.

Again, HTC focuses exclusively on Figure 4 and asserts that the “‘defining’ structure of Fig. 4, however, is a design process that occurs ‘offline’ or before the encoder is designed and implemented.” (HTC Br. at 25.) (citing ’211 patent, 10:27-30). Once again, HTC ignores the many other structures identified by Nokia. In any event, contrary to HTC’s allegation, the specification does **not** support such a narrow interpretation. Although the specification describes an exemplary embodiment where the function of defining the available macroblock segmentations may take place off line, nothing in the specification suggests, let alone requires, that the defining function always take place offline, and certainly not before the encoder is designed and implemented. Rather, the specification explains that the defining process **may** take place offline, but does not exclude other possibilities. The exemplary embodiment is shown in the flowcharts of Figures 4 and 5. There, element 501 reads “specify information about available macroblock segmentations.” According to the specification:

Typically steps 401 and 402 are carried out off-line, ***before encoding video streams***. Usually they are carried out already when, for example, an encoder is designed and implemented.

(’211 patent, 10:27-30). A similar statement is made with reference to the decoder:

Steps 501 and 502 are ***typically*** carried out off-line, ***before receiving an encoded video stream***. They ***may*** be carried out, ***for example, during*** the design of implementation of a decoder.

(’211 patent, 11:41-44.) As can be seen, HTC’s assertion is demonstrably incorrect. Importantly, the specification only describes when these steps may ***typically*** take place. This language alone, underscores that the defining process is not restricted to the *typical*

or *usual* embodiments described. Further, and contrary to HTC's asserted interpretation, the specification elaborates on what is meant by "off-line," *i.e.*, before encoding video streams or before receiving an encoded video stream. ('211 patent, 10:27-28, 11:39-42.) Thus, "off-line" in the specification refers to the point in time before encoding video or before the decoder receives video. (*Id.*) The specification concludes by saying that this step *may be* carried out *during* the design and implementation of the decoder. ('211 patent, 11:42-44.) HTC conflates the statements in the specification to support its requirement that this step be performed "before design and implementation of an encoder." The ALJ should reject HTC's attempt to require the defining process to take place outside of the encoder and decoder.

Third, HTC claims that the specification fails to provide any algorithmic structure for the defining process. (HTC Br. at 25-26.) But the '211 patent does disclose an algorithm. HTC fails to consider Nokia's complete disclosure of corresponding structure, choosing instead to attack portions of it in piecemeal fashion. Nokia described this corresponding structure in its opening brief. (Nokia Br. at 40-42.) For example, and as more fully set forth in Nokia's opening brief, the specification describes: (i) how macroblocks can be segmented (*see, e.g.*, '211 patent, 5-14); (ii) that such segmentations can comprise those depicted in figures 3 (*see, e.g.*, '211 patent, 5:19-21; 10:8-11); (iii) that additional examples of segmentations are provided in figures 7 and 8; (iv) factors that may be considered in selecting a particular segmentation ('211 patent, 5:37-40; Fig. 4 step 411); and (v) examples of hardware that can be used to implement the inventive encoders and decoders, including the mobile station of Fig. 11 (which includes a central processing unit, microprocessor, a random access memory, a read only memory ROM), computer PCs (*see, e.g.*, '211 patent, 16:37-39; 16:52-58; and 17:38-41), and the motion

field estimation and motion compensated prediction blocks of Figures 9 and 10. Such disclosure is sufficient disclosure of algorithmic and physical structure for one of ordinary skill in the art to understand the process of defining a certain number of available macroblock segmentations. *See, e.g., Function Media, L.L.C. v. Google Inc.*, 708 F.3d 1310, 1318 (Fed. Cir. 2013) (“The specification can express the algorithm in any understandable terms including as a mathematical formula, in prose, or as a flow chart, or in any other manner that provides sufficient structure.”) (citing *Noah Sys., Inc. v. Intuit, Inc.*, 675 F.3d 1302, 1312 (Fed. Cir. 2012)).

Accordingly, the ALJ should adopt Nokia’s proposed construction.

D. “means [program means] for specifying at least one available prediction method for each available macroblock segmentation.”

Nokia Proposal	HTC & Google Proposal
<p>Agreed Function: Specifying at least one available prediction method for each available macroblock segmentation.</p> <p>Structure: Processor and other supporting circuitry programmed as described in the patent (Step 502 of Fig. 5 and accompanying portions of the specification) to specify at least one available prediction method for each available macroblock segmentation, and equivalents thereof. See Col. 10:10-27 Col. 11:33-12:2 Col. 16:21-36 Col. 16:37-51 Figs. 3, 4, 5, 7, 8, 9, 10, 11 and accompanying portions of the specification</p>	<p>Agreed Function: specifying at least one available prediction method for each available macroblock segmentation</p> <p>Structure: Step 502 of FIG. 5; 11:33-12:2, 16:21-36, 16:37-51, FIGS. 10 and 11</p>

The parties agree on the proposed function for this term. Nokia identifies several sections of the specification as corresponding structure, and Nokia's identification of structure is linked to the identified function, as described in Nokia's opening brief. (Nokia Br. at 42-46.) HTC admits that the parties largely agree on the corresponding structure. Indeed, HTC only disputes the inclusion of Col. 10:10-27 and Fig. 4, and not the remaining structure identified by Nokia. (HTC Br. at 29-30.)

Even still, HTC provides no basis for alleging that the "defining" structure of block 402 of Fig. 4 and the corresponding description at col. 10:10-27 is not properly linked to the "specifying" function recited in the claims. (HTC Br. at 29.) Independent claims 50 and 56 read in conjunction with the prosecution history clearly link these "specifying" and "defining" functions. For example, Claim 50 recites a decoder for performing motion compensated decoding of encoded video information comprising "means for specifying at least one available prediction method for each available macroblock segmentation." ('211 patent, 23:46-47.) Claim 26 uses similar language but introduces the step with the word "defining" instead of "specifying." ('211 patent, 20:49-50; 23: 46-47.) And the prosecution history explains that claim 26's "defining" element and claim 50's "means for specifying" elements correspond to each other, explaining that claim 50 "is a decoder implemented to perform the decoding method of claim 26."²³ (HTC Br. Ex. 5, at NKHTC0001649-NKHTC0001650.) Notably, HTC relies on a similar link between the encoder and decoder claims based on the applicant's statements in this very office action response, recognizing that the applicant linked the encoder

²³ The prosecution history refers to original claim 33 which issued as claim 50. (Ex. 35, '211 Pros. History, Index of Claims, at NKHTC0001762.)

claims to the decoder claims during prosecution.²⁴ (HTC Br. at 36-37.) Thus, the “defining” step of method claim 26 is implemented as a “specifying” element in the corresponding decoder of claim 50. Accordingly, specifying and defining are clearly linked, and one of ordinary skill in the art would understand that the disclosure made with respect to “defining” at (Col. 10:10-27) is also relevant to the corresponding “specifying” function.

HTC alleges that the other disputed structure — the structure of col. 10:10-27 related to macroblock segmentations and prediction methods — is not clearly linked to the “specifying” function in the claim because it allegedly takes place before the encoder is designed and developed. (HTC Br. at 29.) As explained above, nothing in the intrinsic record requires that the defining process take place before the encoder is designed and developed. Rather, the specification explains that this step is *typically* “carried out off-line, before encoding video streams.” (’211 patent, 10:27-28.) The specification continues, that this step is *usually* “carried out already when, for example, an encoder is designed and implemented.” (’211 patent, 10:28-30.) Accordingly, the claims and specification do not preclude the defining step from taking place, for example, during the initialization of a decoder. For the foregoing reasons and those stated in Nokia’s opening brief, the ALJ should adopt Nokia’s identification of corresponding structure.

²⁴ See HTC arguments made in support of its arguments relating to the term “with reference to the defined macroblock-segmentation—prediction-method pairs.” (HTC Br. at 36-37.)

E. “means [program means] for determining the prediction method relating to the segmentation of the macroblock with reference to the defined macroblock-segmentationprediction method pairs.”

Nokia Proposal	HTC & Google Proposal
<p>Function: Determining the prediction method relating to the segmentation of the macroblock with reference to the defined macroblock-segmentation—prediction method pairs.</p> <p>Structure: Processor and other supporting circuitry programmed, as described in the patent (Step 505 of Fig. 5 and accompanying portions of the specification), to determine the prediction method relating to the segmentation of the macroblock with reference to the macroblock-segmentation—prediction-method pairs, and equivalents thereof. See Col. 11:50-65 Col. 16:15-20 Col. 16:21-36 Col. 16:37-51 Figs. 3, 4, 5, 6, 7, 8, 9, 10, 11 and accompanying portions of the specification.</p>	<p>Function: Determining a single prediction method relating to the segmentation of the macroblock with reference to the defined macroblock-segmentation—prediction-method pairs</p> <p>Structure: No corresponding structure</p>

HTC disagrees with Nokia’s proposed function and asserts that there is no corresponding structure in the specification. But Nokia’s identification of function is consistent with prevailing law, and its identification of structure is clearly linked with that function in the specification.

1. HTC's identification of function departs from the express language and is contrary to prevailing law.

Nokia's identification of function is the explicitly-recited function of in this means-plus-function claim limitation, consistent with prevailing law. See, e.g., *JVW Enters, Inc. v. Interact Accessories, Inc.*, 424 F.3d 1324, 1331 (Fed. Cir. 2005) (“[A] court may not construe a means-plus-function limitation by adopting a function different from that explicitly recited in the claim.”) (citation omitted) (internal quotation marks omitted). There is no dispute that HTC identifies “a function different from that explicitly recited in the claim.” *Id.* Contrary to the claim language itself, HTC seeks to limit this element to a “single” prediction method. HTC alleges that Nokia's proposed function —i.e., the claim language — is ambiguous because the limitation “the prediction method” allegedly lacks antecedent basis. (HTC Br. at 30.) (citing ’211 patent, 20:57-59.²⁵) Contrary to HTC's allegation, the claims recite explicit antecedent basis for this term. For example, claim 50 recites:

means for specifying ***at least one available prediction method*** for each available macroblock segmentation, thereby providing a certain finite number of available macroblock-segmentation—prediction-method pairs, each prediction method defining a method for deriving prediction motion coefficients for blocks within a macroblock using motion coefficients of at least one prediction block . . .

means for determining ***the prediction method*** relating to the segmentation of the macroblock with reference to the defined macroblock-segmentation—prediction-method pairs; and

²⁵ HTC cites independent method claim 26 in support of its position that independent claims 50 and 56 lack antecedent basis for “the prediction method.” (See HTC Br. at 30 n. 107.) As there are no means-plus-function elements in claim 26, Nokia assumes the citation was in error and treats the citation as though it was made to independent claim 56.

('211 patent, 23:46-53; 23:57-59). The term “at least one available prediction method” in the former element provides antecedent basis for the term “the prediction method” in the latter element. Thus, HTC’s allegation lacks support.²⁶

HTC injects “single” into the function to clarify an alleged ambiguity in the claim language. (HTC Br. at 30.) But there is no ambiguity because “the prediction method” has antecedent basis as described above. In reality, HTC attempts to change the function explicitly recited by importing a limitation from the specification into the claims. By changing the phrase “the prediction method” to “a single prediction method” HTC improperly limits the scope of the claims. But the claims provide no basis for this limitation. *Kara Tech. Inc. v. Stamps.com Inc.*, 582 F.3d 1341, 1348 (Fed. Cir. 2009) (“The patentee is entitled to the full scope of his claims, and we will not limit him to his preferred embodiment or import a limitation from the specification into the claims.”).²⁷

²⁶ In the alternative, should the ALJ find that there is no explicit antecedent basis, a person of ordinary skill in the art would understand that the “the prediction method” refers to “at least one available prediction method” recited earlier in the claim and would reasonably understand the scope of the claim because the antecedent basis is clear from the context of the claim. In that case, the claim provides implicit antecedent basis for the phrase “the prediction method.” *Energizer Holdings v. ITC*, 435 F.3d 1366, 1370-1371 (Fed. Cir. 2006) (“If the scope of a claim would be reasonably ascertainable by those skilled in the art, then the claim is not indefinite. Moreover, we noted . . . that an antecedent basis can be present by implication.”) (internal quotations omitted).

²⁷ HTC also claims that its identified function is consistent with the specification because — allegedly — the prior art generates prediction method coefficients for each block of the macroblock, citing *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244 (Fed. Cir. 2008), for the proposition that one of ordinary skill in the art would likely conclude that the definition does not encompass that which is expressly distinguished as prior art.). (See HTC Br. 30-31.) In *Halliburton*, the Court considered a specific claim term in a specific patent where the patentee admitted that its proposed construction would read on the prior art. *Id.* at 1252. The case expressly stated that does not stand for a general proposition that a claim cannot be definite if it reads on prior art. *Id.* Nor does *Halliburton* deviate from well-established law that precludes “adopting a function different from that explicitly recited in the [means plus function] claim.” *JVW Enters.*, 424 F.3d at 1331.

HTC also contends that the encoder claims’ (claims 1, 32 and 54) recitation of “selecting for a macroblock one of the available macroblock-segmentation—prediction method pair” supports its proposed construction, which injects the limitation “a single prediction method” into the claims. (HTC Br. at 31; ’211 patent, 18:13-15.) To the contrary, that the claims use different language in the recitation of these elements indicates that when the patentee wanted to require “one” he did so explicitly in claims 1, 32, and 54. *Kara Tech. Inc. v. Stamps.com Inc.*, 582 F.3d 1341, 1347 (Fed. Cir. 2009) (“Here, when the inventor wanted to restrict the claims to require the use of a key, he did so explicitly.”).

HTC further contends that every embodiment in the specification discloses only one method and one pair to encode or decode each macroblock. (HTC Br. at 31.) HTC asserts that the use of one pair to encode or decode each macroblock is therefore central to the invention. (HTC Br. at 31-32.) But HTC has not cited — and the specification does not contain — any words or expressions of manifest exclusion or restriction supporting the imposition of such a limitation on the claims. *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004) (“Even when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction.”). Therefore, the ALJ should adopt Nokia’s proposed function, which is taken directly from the claim language.

2. HTC ignores the express structure in the specification for this claim element.

HTC ignores all of the corresponding structure identified by Nokia, and makes the unsupported assertion that Nokia has not identified any algorithmic structure for

“determining prediction methods . . . with reference to the macroblock-segmentation—prediction-method pairs.” (HTC Br. at 32.) To the contrary, in its opening brief, Nokia identified more than sufficient corresponding physical and algorithmic structure to perform the identified function of “determining the prediction method relating to the segmentation of the macroblock with reference to the defined macroblock-segmentation—prediction method pairs.” HTC does not dispute that Nokia has properly identified corresponding physical structure. But it contends — and fails to meet the heavy burden of proving by clear and convincing evidence — that the ’211 patent does not disclose a corresponding algorithmic structure. *Intellectual Prop. Dev., Inc. v. UA-Columbia Cablevision of Westchester, Inc.*, 336 F.3d 1308, 1319 (Fed. Cir. 2003) (“[A] challenge to a claim containing a means-plus-function limitation as lacking structural support requires a finding, by clear and convincing evidence, that the specification lacks disclosure of structure sufficient to be understood by one skilled in the art as being adequate to perform the recited function.”).

First, HTC concedes that the decoder stores information about “allowed pairs of macroblock segmentations and prediction methods,” yet claims that no algorithm is provided regarding how the decoder performs the function of determining the prediction method with reference to pairs. (HTC Br. at 32.) That position lacks merit. For example, the motion compensated prediction block of figure 10 (part of the decoder) contains a segmentation—prediction-method mapping block 122/132, which is used to store information about the allowed pairs of segmentation and prediction methods. (’211 patent, 16:29-32.) Indeed, the specification explains that Segmentation—Prediction Method Mapping block is “responsible for indicating . . . the correct prediction method related to each macroblock segmentation.” (’211 patent, 15:64-67.) Further, the block’s

name, “Segmentation—Prediction Method Mapping,” indicates that it contains a mapping that associates segmentations with prediction methods. (’211 patent, 15:64-67; 16:28-31.) Moreover, as discussed in Nokia’s opening brief, the specification explains what the data available to the decoder represents, *i.e.*, “a macroblock-segmentation—prediction-method pair indicates unambiguously both the segmentation of a macroblock and how the prediction motion coefficients for the blocks within the macroblock are produced.” (’211 patent, 7:43-46.) The specification further describes situations where the decoder can determine the prediction method when only the macroblock segmentation is known. (’211 patent, 8:5-15; 11:18-21) (explaining that where there is only one available prediction method for a macroblock segmentation, the decoder can determine the prediction method for a macroblock using an indication of the macroblock segmentation alone.) The specification also describes that additional data may be needed in other circumstances. (*Id.*) (’211 patent, 16:15-18.) (“If there are various available prediction methods per macroblock segmentation, there may be a need to transmit some information that also indicates the selected prediction method.”) Based on this explanation, one of ordinary skill in the art would understand how to access the data stored in the decoder to determine the prediction method for the macroblock-segmentation.

Accordingly the ALJ should adopt Nokia’s proposed construction.

F. “means [program means] for producing prediction motion coefficients for blocks within said macroblock using the determined prediction method.”

Nokia Proposal	HTC & Google Proposal
<p>Agreed Function: Producing prediction motion coefficients for blocks within said macroblock using the determined prediction method</p> <p>Structure: Processor and other supporting circuitry programmed, as described in the patent (Step 506 of Fig. 5 and accompanying portions of the specification), to produce prediction motion coefficients for blocks within said macroblock, and equivalents thereof.</p> <p>See Col. 3:65-5:7 Col. 11:65-12:2 Col. 12:3-56 Col. 14:14-16:36 Col. 16:21-36 Col. 16:37-51 Figs. 3, 4, 5, 6, 7, 8, 9, 10, 11 and accompanying portions of the specification.</p>	<p>Agreed Function: Producing prediction motion coefficients for blocks within said macroblock using the determined prediction method</p> <p>Structure: 7:36-58; Step 506, FIG. 5; 11:65-67; 12:3-56; 14:14-16:36; 16:37-51; FIGS. 8, 9, 10, 11</p>

The parties agree on the identified function for this term. Nokia additionally identified several portions of the specification that disclose corresponding structure for the agreed function. HTC only disputes the inclusion of the structure of (col. 5:51-6:21) in Nokia’s proposed structure. HTC does not take issue with the other structure Nokia identifies.²⁸ HTC, on the other hand, does not include all of the structure identified in the specification necessary to perform the agreed function. Nokia’s opening brief identifies

²⁸ In an effort to reduce the number of disputed issues to be considered by the ALJ, Nokia withdraws its identification of the structure at (col. 5:51-6:21).

this structure and explains how it performs the agreed function. (Nokia Br. at 51-54.) For the foregoing reasons and those identified in Nokia’s opening brief, the ALJ should adopt Nokia’s proposed construction.

G. “with reference to the defined macroblock-segmentation—prediction-method pairs”

Nokia Proposal	HTC & Google Proposal
“Using information from the macroblock-segmentation –prediction-method pairs.”	“using a prediction method specified by the available macroblock-segmentation—prediction-method pairs.”

The intrinsic record of the ’211 patent, including the plain language of the claims, supports construing the term “with reference to the defined macroblock-segmentation—prediction-method pairs” according to Nokia’s proposed construction. HTC’s allegations regarding alleged lack of antecedent basis and lack of support in the specification (HTC Br. at 35-36) are nothing more than an attempt to import limitations from the specification into the claim.

First, HTC argues that the limitation “‘defined macroblock-segmentation—prediction-method pairs’ lacks antecedent basis because there are no ‘defined’ pairs previously recited in the claim. (HTC Br. 35.). But that phrase is adequately supported by the specification and the claims. The term “macroblock-segmentation—prediction-method pairs” appears twice in the asserted claims. Thus the first appearance of the term provides the proper explicit antecedent basis for the second occurrence. In addition, the context of the claims suggests further antecedent basis for this term, demonstrating that

this term is not ambiguous and there is no need to rewrite it. For example, claim 26 recites:

- “defining a certain number of available macroblock segmentations. . .”; and
- “defining for each available macroblock segmentation at least one available prediction method, thereby providing a certain finite number of macroblock-segmentation—prediction-method pairs. . .”²⁹ (’211 patent, 20:46-47; 20:49-52.)

Thus, macroblock-segmentation—prediction-method pairs are a result of “defining ... macroblock segmentations” and “defining for each macroblock-segmentation at least one prediction method.”³⁰ A person of ordinary skill in the art would understand that the “defined macroblock-segmentation—prediction-method pairs” refer to this result and would reasonably understand the scope of the claim. Therefore, the claim provides proper antecedent basis for the phrase “defined macroblock-segmentation—prediction-method pairs.” *Energizer Holdings v. ITC*, 435 F.3d 1366, 1370-1371 (Fed. Cir. 2006) (“If the scope of a claim would be reasonably ascertainable by those skilled in the art, then the claim is not indefinite. Moreover, we noted . . . that an antecedent basis can be present by implication.”) (internal quotations omitted). Accordingly, the ALJ should

²⁹ Independent claims 50 and 56 recited similar limitations, *i.e.*: claim 50: “means for defining a certain number of available macroblock segmentations. . .” and “means for specifying at least one available prediction method for each available macroblock segmentation. . .”; claim 56: “program means for defining a certain number of available macroblock segmentations...” and “program means for specifying at least one available prediction method for each available macroblock segmentation. . .”

³⁰ Similarly, in claims 50 and 56, the macroblock-segmentation—prediction-method pairs are a result of the “[program] means for defining a certain number of available macroblock segmentations. . .” and “[program] means for specifying at least one available prediction method for each available macroblock segmentation...”

reject HTC's attempt to rewrite the claim by adding the word "available" into the construction of this term.³¹

Second, HTC alleges that "with reference to" should mean "using a prediction method specified by." That proposal is not consistent with the plain meaning of the term or the intrinsic record. Instead, HTC seeks to import limitations from the specification into the claims, ignores disclosure of other embodiments in the specification, and contravenes established claim construction precedent that the words in the claim should be given their plain and ordinary meaning unless some other meaning is ascribed to them in the specification. *3M Innovative Props. Co. v. Tredegar Corp.*, No. 2012-1241, 2013 U.S. App. LEXIS 16203 at *45 (Fed. Cir. Aug. 6, 2013) ("It is axiomatic that we will not narrow a claim term beyond its plain and ordinary meaning unless there is support for the limitation in the words of the claim, the specification, or the prosecution history.") (refusing to narrow the term "ribbon" because "[i]n this patent, as in everyday parlance, the term 'ribbon' has a customary meaning that is not subject to specific size requirements.") (internal citations omitted). That the specification does not ascribe different meaning to this term is further proof that "with reference to" is used in the claim in accordance with its common, ordinary meaning.

Further, HTC's construction is overly narrow and contrary to the doctrine of claim differentiation. In support of its construction, HTC relies on language from corresponding elements of the encoder claims 32 and 54. (HTC Br. at 37.) For example, claim 32 recites, "means for deriving macroblock-segmentation-specific prediction motion coefficients for blocks within said macroblock *using the prediction method*

³¹ HTC complains that Nokia's proposed construction does not contain the word "defined." (HTC Br. at 35-36.) Of course, HTC's construction does not contain the word "defined" either.

specified by the selected macroblock-segmentation—prediction method pair.” (’211 patent, 21:56-60.) (emphasis added). But under the doctrine of claim differentiation, that certain claims recite “with reference to” while others recite “specified by,” indicates that these terms have different scope and meaning. See, e.g., *Rembrandt Techs, LP v. Cablevision Sys. Corp. (In re Rembrandt Techs, LP, Patent Litig.)*, 496 F. App’x 36, 45 (Fed. Cir. 2012). Further, when the patentee wanted to restrict the claims to use the prediction method “specified by” the macroblock-segmentation—prediction-method pair, he did so explicitly as in claims 32 and 54. *Kara Tech. Inc. v. Stamps.com Inc.*, 582 F.3d 1341, 1347 (Fed. Cir. 2009) (“Here, when the inventor wanted to restrict the claims to require the use of a key, he did so explicitly.”).

Third, HTC’s allegation that Nokia’s construction refers to “unspecified” information (HTC Br. at 37) lacks merit. The specification provides several examples that explain how the prediction method can be determined with reference to the defined macroblock-segmentation—prediction-method pairs. For example, the specification explains where there is only one prediction method per macroblock segmentation, the prediction method can be determined from the selected macroblock segmentation, alone, which implies that the macroblock-segmentation—prediction-method pairs can be treated as a mapping table. (’211 patent, 8:8-12.) The specification further lends support for this interpretation when it describes that the Segmentation—Prediction Method Mapping block 122/132 of Figures 9 and 10, which stores information about the allowed pairs of macroblock segmentations and prediction methods, is responsible for indicating the correct prediction method related to each macroblock segmentation. (15:64-67; 16:29-32, Fig. 9, 10). But where there are multiple prediction methods per macroblock segmentation, the specification explains that “there may be a need to transmit some

information that also indicates the selected prediction method” to the decoder. (’211 patent, 16:15-18.) This additional information can include identification of the entire macroblock-segmentation—prediction-method pair. (See, e.g., ’211 patent, 21:22-27, claim 31.) In cases where the encoder receives an indication of the entire macroblock-segmentation—prediction-method pair, determining the prediction method “with reference to the defined macroblock-segmentation prediction method pairs” may simply entail checking that the pair is allowed, rather than “using the prediction method specified by . . .” as HTC asserts.

Finally, HTC’s claim that a narrower construction should be adopted is contrary to law. HTC’s reliance on *Athletic Alternatives* is misplaced and that case is distinguishable. See *Athletic Alternatives v. Prince Mfg.*, 73 F.3d 1573 (Fed. Cir. 1996). In *Athletic Alternatives*, the parties presented evidence from which the court found that the ordinary meaning of the term “varies between” was equivocal and could mean, either “in the space that separates” or “from one to another.” *Athletic Alternatives*, 73 F.3d at 1579. Because of this ambiguity, the court could not resort to construction based on the ordinary meaning of the term. *Id.* Here, HTC has not cited any evidence that supports “with reference to” having the ordinary meaning “using the prediction method specified by.” Rather, HTC points to specific embodiments in the specification, attempting to limit the claims to these embodiments. Thus, Nokia is entitled to the full scope of this claim term in accordance with its plain and ordinary meaning. *Kara Tech. Inc.*, 582 F.3d at 1348 (“The patentee is entitled to the full scope of his claims, and we will not limit him to his preferred embodiment or import a limitation from the specification into the claims.”); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (“In some cases, the ordinary meaning of claim language as understood by a person of skill in the art may

be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words.”) (internal citations omitted).

Accordingly, the ALJ should adopt Nokia’s proposed construction for this term.

V. U.S. PATENT NO. 7,187,945

There is no dispute that claim terms generally are given their ordinary and customary meaning. Similarly, under well-established law, an inventor’s use of the word “comprising” in a claim means that the claim does “not exclude the presence in the accused apparatus or method of factors in addition to those explicitly recited.” *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 811 (Fed. Cir. 1999); *see, e.g., Nazomi Commnc’ns, Inc. v. Arm Holdings, PLC*, 403 F.3d 1364, 1370 (Fed. Cir. 2005) (“‘Comprising’ is often synonymous with ‘including.’”). Indeed, claims using the transition term “comprising” “create[] a presumption that the body of the claim is open [which] [i]n the parlance of patent law...creates a presumption that the recited elements are only a part of the device [and] does not exclude additional elements.” *Crystal Semiconductor Corp. v. TriTech Microelecs. Int’l, Inc.*, 246 F.3d 1336, 1348 (Fed. Cir. 2001). HTC ignores prevailing law and proposes introducing unsupported negative limitations into open claim language in attempting to limit the claims to embodiments described in the specification. The ALJ should reject HTC’s proposed constructions for the ’945 patent disputed terms, and decline to construe the plain-English phrases that describe the invention.

A. **“second signal path selecting [sub-]part for selectively conveying receive signals ... in the second frequency range”**

Nokia Proposal	HTC Proposal
No construction necessary.	the second signal path selecting [sub-]part selectively conveys receive signals in the second frequency range (1600 MHz – 2500 MHz) and not the first frequency range (800 MHz – 990 MHz)

HTC offers two arguments for appending the negative limitation “and not the first frequency range (800 MHz – 990 MHz)” to the claim language. First, HTC cobbles together examples from embodiments in the specification to support its construction. But as explained below, those examples do not and cannot limit the scope of the claims. Second, HTC’s construction is not supported by prevailing law. Time and again the Federal Circuit has refused to import specific embodiments into the claims. *See, e.g., Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc); *Warsaw Orthopedic, Inc. v. Globus Med., Inc.*, 416 F. App’x 67, 69-70 (Fed. Cir. 2011) (refusing to limit claim to a preferred embodiment where “the specification does not clearly indicate that the patentee intended to deviate from the ordinary, broad meaning” and “indeed, the specification clearly indicates that the claims are not so limited.”) Accordingly, the ALJ should adopt Nokia’s common-sense approach to easily understandable, plain-English claim language, reject HTC’s proposed construction, and refuse to limit the scope of the claims. *See, e.g., Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc) (explaining that where the ordinary meaning of claim language is readily apparent, “[claim construction] involves little more than the application of the widely accepted meaning of commonly understood words”).

1. **HTC's proposed construction improperly reads limitations from the embodiments into the claims.**³²

It is axiomatic in claim construction that courts are not to read embodiments from the specification into the claims. *See, e.g., Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (“[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments.”); *Kara Tech. Inc. v. Stamps.com Inc.*, 582 F.3d 1341, 1348 (Fed. Cir. 2009) (“The patentee is entitled to the full scope of his claims, and we will not limit him to his preferred embodiment or import a limitation from the specification into the claims.”) HTC’s quotation of specific embodiments described in the specification does not compel a different result. The open claim language presumptively forecloses adding the negative limitation HTC seeks. There is no evidence that the specification prohibits or disavows a second signal path selecting part that operates in a frequency band other than the claimed frequency range. To the contrary, the specification contains an express example leaving open the possibility of the second signal path selecting [sub-]part making use of additional frequency bands. Accordingly, the ALJ should reject HTC’s contention.

a. **The claim language presumptively does not exclude additional elements.**

Courts consider “the context of the surrounding words of the claim . . . in determining the ordinary and customary meaning of those claims.” *ACTV, Inc. v. Walt Disney Co.*, 346 F.3d 1082, 1088 (Fed. Cir. 2003); *see also On Demand Machine Corp. v. Ingram Industries, Inc.*, 442 F.3d 1331, 1344 (Fed. Cir. 2006) (“Care must be taken

³² HTC’s brief refers to “extrinsic evidence” supporting its claim construction, but does not cite any extrinsic evidence with regard to the construction of the “second signal path selecting part” term. (Resp. Br. at 18-23.)

lest word-by-word definition, removed from the context of the invention, leads to an overall result that departs significantly from the patented invention.”). In particular, the “second signal path selecting [sub-]part ...” claim term appears in a larger claim phrase:

1. A method for routing a plurality of RF communications signal paths in a communications device ... said method comprising:

* * *

operatively connecting the plurality of receive paths to the frequency range substantially between 1600 MHz and 2500 *second signal path selecting part for selectively conveying receive signals in one of said plurality of receive paths in the second frequency range* via the second antenna;

* * *

19. A communications device operable in a plurality of operating modes in a first frequency range substantially between 800 MHz and 990 MHz and a second frequency range substantially between 1600 MHz and 2500 MHz, said communications device comprising:

* * *

the *second signal path selecting sub-part* comprises a plurality of selectable positions for operatively connecting a plurality of receive paths *for selectively conveying receive signals* in one of said plurality of receive paths *in the second frequency range via the second antenna*,

* * *

(’945 patent, claims 1, 19.) The italicized sections are the claim language extracts to which HTC seeks to append a negative limitation. But the underlined claim language presumptively means that the claims are open, i.e. include, but are not limited to. See, e.g., *ArcelorMittal France v. AK Steel Corp.*, 700 F.3d 1314, 1320 (Fed. Cir. 2012) (“The transition ‘comprising’ creates a presumption . . . that the claim does not exclude additional, unrecited elements.”) (quoting *Crystal Semiconductor Corp. v. TriTech Microelectronics Int’l, Inc.*, 246 F.3d 1336, 1348 (Fed. Cir. 2001)); *Nazomi Commnc’ns*, 403 F.3d at 1370 (“‘Comprising’ is often synonymous with ‘including.’”). Viewing the phrase in the context of the entire claim, demonstrates that the claim language does not justify adding the negative limitation HTC seeks.

b. The specification does not exclude the second signal path from receiving a specific frequency range.

HTC contends that the specification “consistently and exclusively” describes the invention as having a second signal path limited to a 2GHz signal path. (Resp. Br. at 18.) But — as HTC concedes — each of HTC’s cites to the specification describe a specific disclosed embodiment and not a clear disavowal of claim scope nor do they describe the invention as a whole.³³ (See Resp. Br. at 21; ’945 patent, 2:31-6:11 (listing twenty-seven different embodiments of the invention where each description of an embodiment begins with the words “[A]ccording to the present invention . . .”), *see also* 11:20-25.) Indeed, HTC cites only one embodiment where the inventors described an exemplary antenna layout that limits the second signal path to 1-2 GHz frequency bands. (’945 patent, 7:23-27.) But no embodiment excludes the second selecting path from handling signals in other frequency bands, HTC has not identified any such embodiment, and the specification’s silence cannot be interpreted as a limitation on the scope of the claims. *See, e.g., Sony Elecs., Inc. v. Guardian Media Techs., Ltd.*, 658 F. Supp. 2d 1208, 1218 (S.D. Cal. 2009) (“The silence of the claims on the issue of physical separation weighs against reading a ‘physically separate’ limitation into the claim.”); *cf. Renishaw PLC v.*

³³ HTC relies on *C.R. Bard v. U.S. Surgical Corp.*, 388 F.3d 858 (Fed. Cir. 2004), for the proposition that the twenty-seven occasions that the inventors state “according to the present invention” when they introduce each embodiment compels limiting the scope of the claim language. That is incorrect. *C.R. Bard* concerned statements in a specific patent whose specification “describe[d] in general terms what it deem[ed] to be the invention.” *Id.* at 864. And even in those cases the court simply concluded that statements describing the whole invention to be “**more likely** to contain statements that support a limiting definition of a claim term than other sections, although what import to give language from the specification **must, of course, be determined on a case-by-case basis.**” *Id.* That principle “has no application where . . . the other statements and illustrations make it clear that the limitations do **not** describe the invention as a whole.” *Creative Integrated Sys., Inc. v. Nintendo of Am., Inc.*, Nos. 2012–1579, 2012–1626, 2013 WL 2378555, at *4-5 (Fed. Cir. June 3, 2013) (emphasis in original).

Marposs Societa' per Azioni, 158 F.3d 1243, 1248-49 (Fed. Cir. 1998) (“[A] party wishing to use statements in the written description to confine or otherwise affect a patent's scope must, at the very least, ***point to a term or terms in the claim with which to draw in those statements.***”). Instead, HTC selectively quotes and highlights specification passages that omit statements that the invention is not limited to those embodiments. ('945 patent, 6:53-56 (referencing Figs 3-7, each of which are embodiments of the invention); 7:49-57 (explaining that the invention “can be ported to at least ***five different regional designs*** as shown in FIGS. 3 to 7, with only slight modifications to the selected set of filters and/or duplexers); *see also* 11:20-25.)

Further, the specification teaches the second antenna (and thus second selecting [sub]part) supporting low power and low frequency signals. Specifically, the patent specification teaches an embodiment where the second receive path “handles only low RX [receive] power levels” but “must still have good linearity properties for WCDMA RX due to the WCDMA TX [transmit] signal leakage through the antenna.” ('945 patent, 7:17-22.) Thus, according to the specification, in this embodiment the second receive path must be able to transmit and receive WCDMA signals. WCDMA transmits and receives in both high and low frequency bands:

TABLE I

Continent	Name	TX freq	RX freq
US	GSM 850	824–849	869–894
EU	GSM 900	880–915	925–960
EU	GSM 1800	1710–1785	1805–1880
US	GSM 1900	1850–1910	1930–1990
US	WCDMA or CDMA 850	824–849	869–894
US	WCDMA or CDMA 1900	1850–1910	1930–1990
US	WCDMA 1700/2100	1710–1755	2110–2155
EU	WCDMA 1800	1710–1785	1805–1880
EU	WCDMA 2100	1920–1980	2110–2170

(‘945 patent, 2:11-25.) Accordingly, in at least this example, the inventors taught that the second signal path must be able to handle receive signals outside of 1600-2500 MHz. HTC’s proposed construction would exclude that embodiment, which is contrary to well-established law. *See, e.g., Oatey Co. v. IPS Corp.*, 514 F.3d 1271, 1276-77 (Fed. Cir. 2008) (“We normally do not interpret claim terms in a way that excludes embodiments disclosed in the specification.”); *MEMS Tech. Berhad v. Int’l Trade Comm’n*, No. 2010-1018, 447 F. App’x 142, 150 (Fed. Cir. 2011) (affirming construction where the specification disclosed embodiments that would have been excluded under the construction rejected by the Commission). Because the teachings of the specification contradict the limitations in HTC’s proposed construction, the ALJ should reject that construction.

B. “first/second signal path selecting [sub-]part operatively connected to the first/second antenna”

Nokia Proposal	HTC Proposal
No construction necessary.	the first/second signal path selecting [sub-]part operates to connect the first/second antenna to one of a plurality of signal paths

HTC does not propose a construction for this phrase; rather, HTC proposes appending language to the end of a phrase that appears in the claims:

Actual Claim 1 Language	HTC’s proposed addition to Claim 1
1. A method for routing a plurality of RF communications signal paths ... said method comprising... providing a first signal path selecting part operatively connected to the first antenna, providing a second signal path selecting	1. A method for routing a plurality of RF communications signal paths ... said method comprising... providing a first signal path selecting part <u>operates to connect</u> the first antenna <u>to one of a plurality of signal paths</u> ,

part operatively connected to the second antenna...	providing a second signal path selecting part <u>operates to connect</u> the second antenna <u>to one of a plurality of signal paths</u> ...
---	--

HTC’s proposal does not construe the claim language at all. Instead, HTC simply (1) substitutes (unnecessarily) “operates to connect” for “operatively connected” and (2) appends the phrase “to one of a plurality of signal paths” to the end of the claim element. Neither proposal resolves disputed meanings of technical scope or clarifies or explains what the patentee covered by the claims. *U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997). Rather, HTC attempts to limit the scope of the claim by rewriting the claim element. *See, e.g., K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1364-65 (Fed. Cir. 1999) (“Courts do not rewrite claims; instead, we give effect to the terms chosen by the patentee.”); *Resonate Inc. v. Alteon Websystems, Inc.*, 338 F.3d 1360, 1365 (Fed. Cir. 2003) (reversing district court’s construction which added a limitation to a claim; finding that “[c]ourts may not rewrite claim language based on what has been omitted from a claim”). The ALJ should reject HTC’s attempt to append language to this phrase and decline to construe the claim element.

Analysis of a claim starts with the words of the claim. *Phillips*, 415 F.3d at 1312. But HTC departs from that fundamental principle and asserts that the words of the claim cannot mean what they say. Relying on *Innova/Pure Water v. Safari Water Filtration Systems*, 381 F.3d 1111 (Fed. Cir. 2004), HTC contends the phrase “‘operatively connected’ reflects a functional relationship.” (Resp. Br. at 24.) Based on that premise, HTC invents a “designated function” for the “first/second signal path ...” claim element to justify adding language to the claim. But the premise is faulty. First, *Innova* does not override the “ bedrock principle of patent law that the claims of a patent define the

invention to which the patentee is entitled the right to exclude.” *Innova*, 381 F.3d at 1116. Second, *Innova* does not stand for the proposition that the words “operatively connecting” have a universal construction across all patents; the dicta HTC cites simply reflects a generalization, not a universal rule of construction. See *id.* at 1118 (“**Generally speaking, and as used in the '759 patent**, it means the claimed components must be connected in a way to perform a designated function.”); *World Kitchen (GHC), LLC v. Zyliss Haushaltwaren AG*, No. 05-1138, 151 F. App’x 970, 973 n.3 (Fed. Cir. 2005) (“We reject OXO’s argument that our construction of the term “operatively connected” in *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.* controls this case. *Innova/Pure Water* involved a different patent, with different claims, written description, and prosecution history.”).

But even to the extent that *Innova* does apply to “operatively connecting” as used in the ’945 patent, it does not license an accused infringer to add language to the claims in order to narrow its scope. Indeed the *Innova* court rejected and overruled a district court construction that used the “operatively connected” language in the claim to import a limitation from the specification:

In the absence of modifiers, general descriptive terms are typically construed as having their full meaning. Thus, the district court was correct to look to the ordinary meaning of the terms “operatively” and “connected” and we discern no error in the district court’s initial understanding that “the ordinary and customary meaning of ‘operatively connected’ requires the ... linking together of the tube and the cap to produce the intended or proper effect.” ***But the district court erred when it proceeded beyond this plain meaning based on the “[e]xamples of means for connecting the tube to the cap disclosed in the '759 patent,”*** all of which reflect a “physical engagement [between the tube and the cap] that results in a unitary structure.”

Innova, 381 F.3d at 1118 (internal citations omitted). Thus, it is error to construe “operatively connected” beyond “linking together” two structures “to produce the

intended or proper effect.” *Id.* The plain meaning of the claim element is to connect the first/second selecting part to the first/second antenna. The functionality of that connection is fully explained in the claim language itself, which HTC does not credit:

1. A method for routing a plurality of RF communications signal paths ... said method comprising...

providing a first signal path selecting part operatively connected to the first antenna,

* * *

operatively connecting the plurality of transmit and receive paths to the first signal selecting part ***for selectively conveying signals in one of said plurality of transmit and receive paths in the first frequency range via the first antenna.***

(’945 patent, claim 1.) Consequently, the functional relationship that HTC seeks is already in the claim language, and thus the ALJ need not engage in unnecessary, redundant construction. *U.S. Surgical*, 103 F.3d at 1568 (“[Claim construction] is not an obligatory exercise in redundancy.”). Instead, the claims should be read in context, giving credit to the entire claim. *Phillips*, 432 F.3d at 1314 (“[T]he context in which a term is used in the asserted claim can be highly instructive.”); *ACTV, Inc. v. Walt Disney Co.*, 346 F.3d 1082, 1088 (Fed. Cir. 2003) (“While certain terms may be at the center of the claim construction debate, the context of the surrounding words of the claim also must be considered in determining the ordinary and customary meaning of those claims.”). HTC’s convoluted attempt to add language into the claim terms violates that principle and should be rejected.

C. “first/second signal path selecting sub-part”

Nokia Proposal	HTC Proposal
No construction necessary.	first and second signal path selecting sub-parts located within the same signal-path selecting module

Like the prior term, HTC does not propose a construction for “first/second signal path selecting sub-part” at all. Instead, HTC seeks to add a spatial limitation — “located within the same signal-path selecting module” — that is unsupported by the intrinsic evidence.

HTC argues that the doctrine of claim differentiation requires adding the spatial limitation to distinguish the use of “signal path selecting part” in claim 1 and “signal path selecting sub-part” in claims 12, 19, and 31. (Resp. Br. at 30.) But, once again, HTC ignores the context of the claim language in seeking to limit the scope of the claims. Claims 1-7 are method claims that claim “a method for routing a plurality of RF communications signal paths in a communications device.” (*E.g.*, ’945 patent, claim 1.) That method comprises steps for “providing” certain “parts” and then connecting those parts to antennae and signal paths to route the RF communications signal paths. (*Id.*) In contrast, independent claims 12, 19, 31 claim apparatuses. For example, claim 19 claims “[a] communications device ...comprising, a first antenna, a second antenna, and a **front-end part**.” (’945 patent, claim 19.) The claim goes onto specify the sub-structure that comprises the front-end part:

a front-end **part** comprising:
a first signal path selecting **sub-part** operatively connected to the first antenna, and

a second signal path selecting ***sub-part*** operatively connected to the second antenna

(’945 patent, claim 19.) Thus the plain reading of the claim is that the first and second sub-parts are components within the front-end part.

The inventors defined “front end” in the patent as the “RF electronics (filtering, switching, etc.) between the antennas and the power amplifiers (PAs) or RFIC.” (’945 patent, 10:7-9.) In other words, the front end is a collection of components between the RFIC and the antenna. Consistent with that definition, each disclosed embodiment teaches a device with an RF front-end. (See ’945 patent 6:19-34 (describing Figs. 3-8 as having a WCDMA RF front-end module).) Figure 8 shows one possible architecture of a communications device with an RF front-end, where two switches (SW1, SW2) “*can be*” contained in sub-modules within antenna switch module 20, and a plurality of filters 30. (’945 patent, 10:9-18.) HTC improperly seeks to limit the scope of the apparatus claims to figure 8. (Resp. Br. at 31-32.) But exemplary embodiments cannot limit the scope of the claims unless there is a clear disavowal of claim scope or an express definition provided by the patentee. *E.g., Home Diagnostics, Inc. v. LifeScan, Inc.*, 381 F.3d 1352, 1358 (Fed. Cir. 2004) (“Absent a clear disavowal or contrary definition in the specification or the prosecution history, the patentee is entitled to the full scope of its claim language.”); *see also Thorner v. Sony Computer Entm’t Am. LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012). Even if the inventors had only described a single embodiment in the patent, the claims cannot be limited to the preferred embodiment absent a clear intent to give a unique meaning different from its ordinary and customary meaning to one of skill in the art. *Laryngeal Mask Co. v. Ambu A/S*, 618 F.3d 1367, 1372 (Fed. Cir. 2010); *Phillips*, 415 F.3d at 1323 (“[W]e have expressly rejected the contention that if a patent

describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment.”). So HTC’s proposed construction would violate the well-established principles of claim construction.

Moreover, HTC both misreads the specification and ignores the other embodiments taught in the specification. First, the inventors expressly defined the “front-end” as a collection of components, specifically filters and switches; thus, each individual filter and switch is a sub-part of the front-end. (’945 patent, 10:7-9.) Though components “can be” grouped into modules, the patent cannot be read to require that exemplary architecture. Further, HTC ignores the rest of the specification where the patentee expressly noted “that there are different implementation options for the architecture shown in this disclosure.” (’945 patent, 10:50-51.) Indeed, the inventors described different embodiments covered by the independent apparatus claims. (*E.g.*, ’945 patent, Figs 10-11, 10:50-11:25.) In particular, the inventors described an embodiment wherein “the switches and filters for one antenna may be placed in one module” or, alternatively, “both antenna switch modules SW1, SW2 can be implemented on a single chip or even integrated with the RFIC (RF integrated circuit),” or, alternatively, “the whole front-end could be implemented in a single module.” (’945 patent, 10:50-57.) In other words, “parts” and “modules” are not coextensive according to the patent. Thus HTC’s artificial “module” limitation does not comport with the separate and distinctly claimed parts and sub-parts claimed in the apparatus claims. HTC’s attempt to limit the claims in this way is contrary to prevailing law, inconsistent with the claims and the specification, and should be rejected.

VI. U.S. PATENT NO. 8,140,650

There is no dispute that claim terms generally are given their ordinary and customary meaning. But when an inventor supplies his or her own definition for a term, that definition controls. While Nokia adheres to those tenets, HTC offers various reasons for altering the language the inventors specifically chose. HTC’s proposed constructions diverge from the express intent of the inventors and attempt to insert limitations of specific embodiments into the claims. Consequently, the ALJ should reject HTC’s proposed constructions for the ’650 patent and adopt the express language of the inventors.

A. “configuration data set”

Nokia Proposal	HTC & Google Proposal
“a set of data comprising configuration information having direct or indirect effect on one or more functions of the device or an application in the device”	“device settings stored in a service context having direct or indirect effect on one or more functions of the device or an application in the device”

As stated in its opening brief, Nokia’s construction of “configuration data set” should be adopted because it reflects the inventor’s express definition for that term. (See ’650 patent, 2:37-40.) A patentee may act as his or her own lexicographer, and that definition controls. *See, e.g., Phillips v. AWH Corp.*, 415 F.3d 1303, 1321 (Fed. Cir. 2005). HTC adopts part of the inventors’ definition — “having direct or indirect effect on one or more functions of the device or an application in the device” — but rejects the remainder.

HTC’s sole argument for disregarding the express intent of the inventors is that in certain embodiments of the invention a configuration data set includes “device settings.” (HTC Br. at 42-43.) But “claim terms take on their ordinary and accustomed meanings

unless the patentee demonstrated an intent to deviate from the ordinary and accustomed meaning of a claim term by redefining the term or by characterizing the invention in the intrinsic record using words or expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.” *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1327 (Fed. Cir. 2002). Here the inventors defined the term without limiting it as HTC proposes.

HTC dedicates the remainder of its brief to criticizing the inventor’s definition of “configuration data set” because it is allegedly circular and because of a purported conflict between independent claim 1 and dependent claim 5. Neither objection is meritorious and neither overcomes the presumption that an inventor’s express definition controls. *See, e.g., Phillips v. AWH Corp.*, 415 F.3d 1303, 1316 (Fed. Cir. 2005) (en banc).

1. **HTC’s specification citations do not limit the express definition of configuration data set.**

HTC claims that the specification equates configuration data set with “device settings,” pointing to three excerpts of the specification. (HTC Br. at 42-43 n.138-140.) But those isolated cites do not define “configuration data sets.” Column 1, lines 46-49 describe the drawbacks of the *prior art* Open Mobile Alliance (“OMA”) Device Management (“DM”) procedures — not the invention. (See ’650 patent, 1:44-52 (“By OMA DM procedures, these operator specific sets of settings, which may also be referred to as configurations, in a user terminal device can be maintained by an operator controlled management server.”) (underlined portion of the quotation omitted from HTC opening brief).)

Similarly, column 1, lines 21 through 27 introduce the concept of device management by an external entity, but do not define “configuration data set.” At most, the quoted sentence states that a generic device configuration may include (but does not consist solely of) settings and protocols used by the device. (’650 patent, 1:21-25.) And the remainder of the paragraph explains other user-specific configuration settings that device managers can change, but does not define a “configuration data set.” (’650 patent, 1:25-30 (“In addition to device-specific settings, it is also possible to *transmit user-specific data*, such as user profiles, logos, ringing tones, and menus with which the user can personally modify the settings of the device, or the modification takes place automatically in connection with device management.”).) Neither quote describes the invention itself, but the background art. Whereas, the inventors defined “configuration data set” in describing the invention and how that invention solved a problem not addressed by the prior art.

Finally, HTC argues that the patent specification describes a dichotomy between user related data and device settings, which preclude the use of the inventor’s definition. (HTC Br. at 43.) First, that tautology presumes that a configuration data set is a “device setting” and nothing more, which is contrary to the specification. Second, HTC’s citations do not describe configuration data sets, but service contexts. Again, HTC presumes, without support, that there is a one-to-one relationship between configuration data set and device settings. Finally, HTC emphasizes the purported differences between user data and device settings. But even if such a clear dichotomy exists, HTC’s proposal does not clarify the distinction with any more precision than the inventor definition.

2. **The doctrine of claim differentiation does not compel deviation from the inventors' definition.**

HTC argues that the difference between the language in independent claim 1 and dependent claim 5 distinguishes between “configuration data sets” and “user-related data” because (otherwise) the limitation of dependent claim 5 would be read into independent claim 1. (HTC Br. at 44.) That argument is without merit. First, HTC refers to a portion of claim 1 describing the “service context” limitation, not a limitation on what configuration data set may contain:

1. A method comprising,

storing multiple configuration data sets and a plurality of applications in a device,

checking access control information for defining a right of an application in the device to access a configuration data set in response to an indication from an application in the device requiring access to a configuration data set,

and in response to the application being entitled to access the configuration data set, on the basis of the access control information, arranging access to the configuration data set for the application,

wherein at least one service context is stored in the device, ***the service context comprising at least the configuration data set***, and

access to the service context is allowed for the application on the basis of the access control information if the application is authorized on the basis of access control information associated with the service context,

wherein access control information comprises at least one of information specified by an external entity and information controlled by an external entity

(’650 patent, claim 1.) Nothing in claim 1 describes the permissible (or impermissible) contents of a configuration data set. Similarly claim 5 further limits claim 1 by requiring a ***service context*** to include user related data:

5. A method as claimed in claim 1, wherein *the service context comprises* user related data stored by an application of the device.

(’650 patent, claim 5) Thus, claim 5 *requires* a service context to contain a configuration data set and user-related data. Claim 1 only requires the service context to contain at least a configuration data set. But neither claim limits the permissible content of a configuration data set, beyond the inventors’ express definition of that term, which Nokia has consistently proposed.

Because Nokia has proposed a construction that recognizes and gives credit to the express definition in the specification, the ALJ should adopt that construction.

B. “service context”

Nokia Proposal	HTC & Google Proposal
“An area in a terminal to which access is controlled”	“a specific storage area in the device that stores configuration data set(s) to which the application seeks access”

Nokia’s proposed construction credits the inventors’ express definition of this term. HTC seeks to import embodiments and limitations from the specification to limit the scope of the claims. Besides being contrary to prevailing law, *e.g.*, *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc), HTC mischaracterizes the parties’ dispute over this term, relies on a single embodiment in the specification to support its proposed construction, and introduces ambiguity as to this term (and “configuration data set”) by ignoring the inventors’ lexicography.

First, HTC mischaracterizes the parties sole dispute as: whether the service context is a specific storage area or can be any area in the device. (HTC Br. at 50.) That is incorrect. Nokia’s (and the inventors’) construction of “service context” requires that it

be an access-controlled area in the device, not any area in the device. The ALJ should reject any HTC argument predicated on that strawman. Moreover, Nokia does not concede that the service context should be construed as storing configuration data sets. (See HTC Br. at 50 n.152.) Though the claim language itself places limitations on what a service context may or must contain, Nokia does not support construing “service context” to either conflict with the express definition of the inventors or import claim language limitations into the term itself. That approach divorces the proposed term from the context of the claim language and thus fails to credit the claim language as a whole. See, e.g., *Burns v. Chrysler Group LLC*, No. 1:11 CV 448, 2012 WL 1095958, at *1 (N.D. Ohio Mar. 30, 2012) (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1318-19, 1322-24 (Fed. Cir. 2005)) (“Although courts can put . . . extrinsic sources to appropriate use in helping to ascertain the commonly understood meaning of words, they must give this evidence only the relatively limited weight it is due and not divorce claim terms from the context of the intrinsic evidence.”).

Second, HTC contends that the specification “repeatedly emphasizes” that the service context be a “specific storage area,” but only cites two (incomplete) portions of a single paragraph. (HTC Br. at 51, n.154.) Even if HTC’s interpretation of those lines was correct, that single embodiment cannot limit the scope of the claim term. E.g., *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (“[W]e have expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment.”). Further, HTC’s reproduction of a quote from the specification omits a crucial passage that demonstrates that description is “one embodiment” in the specification:

A service context 203 may be regarded as an area in the terminal TE to which access is controlled. Hence, information stored in a service context specific storage area in the terminal TE may specify or form the service context 203. *In one embodiment service contexts 203 represent different configurations in the terminal TE used for accessing services, for instance an Internet access service.*

(’650 patent, 4:49-55; cf. HTC Br. at 51 (omitting italicized sentence).) The underlined portion is the inventors’ definition of “service context.” The italicized portion is the portion of the passage HTC chose not to include, and the ALJ need not credit HTC’s selective quotation and highlighting.³⁴

Third, HTC alleges that Nokia relies on an “isolated sentence” for its construction. (HTC Br. at 51.) While it is correct that the inventors’ definition of “service context” appears in a single sentence, that definition is by no means “isolated.” Rather, the inventors’ consistently applied that definition throughout the specification. (See, e.g., Fig. 2 (depicting service contexts as access controlled areas that may contain information from other areas in the device); 4:49-53 (“Hence, information stored in a service context specific storage area in the terminal TE may specify or form the service context 203.”); 6:42-56 (embodiment of invention where a service context is an access-controlled area); 6:57-7:6 (same); 7:56-62 (same); 7:63-8:5 (same); see also Nokia Br., Ex. 23, (NKHTC0002626).) As opposed to the “snippets” referred to in *Sinorgchem Co.*

³⁴ As a further example, HTC quotes a passage from column 4, lines 62 to 66, emphasizing language that purportedly limits a service context to a specific storage area. (HTC Br. at 51.) As an initial matter, the emphasized language modifies “central repository 204” not the “service context 203.” But more importantly, changing the emphasis in that passage demonstrates that this is simply a description of one embodiment and not a clear disavowal of claim scope:

For instance, a service context 203 may comprise or be associated with sensitive user data 208 stored in a file system 207, settings 205 and certificates 206 stored in a central repository 204, which may be a specific storage for service context information.

v. *Int'l Trade Comm'n*, 511 F.3d 1132, 1145 (Fed. Cir. 2007), Nokia is crediting the drafters' "clear[], deliberat[e], and precis[e]" definition of the term. *Id.* at 1136.

Finally, HTC alleges that Nokia's construction is overbroad such that a service context could include a "configuration data set." (HTC Br. at 52.) But such an illogical result only occurs by discrediting the inventors' intent as to both terms. The specification and claims demonstrate that a service context is an access-controlled *area* in the device, whereas the configuration data set is *data* comprising configuration information. ('650 patent, 2:37-38, 4:49-51, Fig. 2.) The context of the claim language indicates the relationship between those two, defined building blocks of the invention. Accordingly, the ALJ should not adopt HTC's proposal because the definition of those terms needs no further elaboration.

- C. **"access to the service context is allowed for the application on the basis of the access control information if the application is authorized on the basis of access control information associated with the service context"; "allow the application to access the service context on the basis of the access control information if the application is authorized on the basis of access control information associated with the service context"**

Actual Claim 1 language	HTC & Google Proposal
access to the service context is allowed for the application on the basis of the access control information if the application is authorized on the basis of access control information associated with the service context.	"the application can access the service context based on the access control limitation, if the application is <u>predetermined in the</u> access control limitation associated with the service context."
Actual Claim 10 language	HTC & Google Proposal
allow the application to access the service context on the basis of the access control information if the application is authorized on the basis of access control information	the application can access the service context based on the access control limitation, if the application is <u>predetermined in the</u> access control

associated with the service context	limitation associated with the service context
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HTC's continued misconception of this patent further reveals itself in its proposed construction for this term. HTC seeks to rewrite an entire paragraph of claims 1 and 10 to cure a purported lack of antecedent basis problem and a purported limitation from the prosecution history. (HTC Br. at 45, 48.) Neither contention is correct. Rather, rewriting the claim would exclude preferred embodiments in the specification and is not justified by any clear disavowal of claim scope in the intrinsic evidence.

1. There is no antecedent basis problem in independent claims 1 and 10.

The disputed claim language is part of a larger claim element:

1. A method comprising,

* * *

checking access control information for defining a right of an application in the device to access a configuration data set in response to an indication from an application in the device requiring access to a configuration data set, and

in response to the application being entitled to access the configuration data set, on the basis of the access control information, arranging access to the configuration data set for the application, wherein at least one service context is stored in the device, the service context comprising at least the configuration data set, and access to the service context is allowed for the application on the basis of the access control information if the application is authorized on the basis of access control information associated with the service context,

* * *

('650 patent, claim 1)

10. A data processing device comprising,

* * *

at least one processor, wherein the memory and the computer program code are configured to ... cause the device at least to:

store multiple configuration data sets and access control information for defining a right of an application in the device to access a configuration data set,

* * *

the data processing device is caused to *allow the application to access the service context on the basis of the access control information if the application is authorized on the basis of access control information associated with the service context.*

* * *

('650 patent, claim 10)

In each italicized phrase there are two references to access control information. The first reference (highlighted in yellow) is to the configuration data set access control information referenced earlier in the claim: “access control information for defining a right of an application to access a configuration data set.” ('650 patent, claim 1, 10:29-31; claim 10, 11:43-45.)

The second reference to access control information is highlighted in green. That refers to access control information “associated with the service context.” ('650 patent, claims 1, 10.) Thus, the inventors were clear that the claim requires permission to access the configuration data set (“set of data comprising configuration information”) and the service context, which, in the context of claims 1 and 10, comprises “at least a configuration data set.”

As HTC argues (HTC Br. at 43, n.142), certain embodiments of the specification distinguish among certificates, settings, and other type of data. (*E.g.*, '650 patent, Fig. 2, 4:52-59.) The specification describes occasions when “different access control rules or right levels” might be used:

In accordance with an embodiment, the *contents of a service context 203 may be associated with different access control rules and/or access right levels on the basis of the access control information 212*. In a further embodiment, different access rules are applied to different portions of the service context 203. For instance, *settings 205 of the service context 203* specifying a connection to a corporate email server may be read (by an application 202 authorized to access the service context 203) but not modified, *whereas access to data 208 in a file system 207 associated with the service context*

203 may be both read and modified. In this embodiment, the contents of service contexts 203 may be differentiated in respect of access control.

(’650 patent, 9:24-36.) In this embodiment, there is different protection for server connection settings, part of the configuration data set (*e.g.*, 2:40-43), and service context data. This feature of the invention was important to the inventors and explained in the file history to enable sophisticated, complex devices:

These features enable provision ***of various usage and configuration service contexts for devices with multiple configurations***, into which service context configuration data sets (possibly with some other information) may be grouped and for which an external entity may grant access privileges. The service context may be regarded as an area in the device to which access is controlled. There may be a plurality of service contexts, each storing specific configuration data set(s) managed by a specific external entity, such as a corporate IT device management entity and/or telecom operator device management entity. ***For example, only a specific corporate-installed application may be authorized to access the service context storing a corporate access configuration.*** Thus, a highly sophisticated device configuration access control arrangement is enabled.

(Nokia Br. Ex. 23, (NKHTC0002625-26).) That embodiment is covered by the independent claims, but HTC’s proposed construction would not cover that embodiment. *See, e.g., Oatey Co. v. IPS Corp.*, 514 F.3d 1271, 1276-77 (Fed. Cir. 2008) (“We normally do not interpret claim terms in a way that excludes embodiments disclosed in the specification.”). Though there may be cases where the access control information for the configuration data set is the same as the access control information for the service context, requiring such a limitation (as HTC proposes) would narrow the scope of the claims, eliminate coverage of a preferred embodiment, and contradict the intent of the inventors. *See, e.g., id.; Optical Disc Corp. v. Del Mar Avionics*, 208 F.3d 1324, 1334 (Fed. Cir. 2000) (“Without evidence in the patent specification of an express intent to impart a novel meaning to a claim term, the term takes on its ordinary meaning.”); *Home Diagnostics, Inc. v. LifeScan, Inc.*, 381 F.3d 1352, 1359 (Fed. Cir. 2004) (reversing

district court's claim construction where it limited claim term to a preferred embodiment, finding that "[the] claim terms . . . require revision based on the full scope of the claim language as understood by those of skill in the art at the time of invention").

2. The prosecution history does not compel HTC's construction

HTC asserts that the prosecution history requires adopting its proposed construction. But the prosecution history neither indicates a disavowal of claim scope or an intent to rewrite the claim language, as HTC proposes. *E.g., Ecolab, Inc. v. FMC Corp.*, 569 F.3d 1335, 1342 (Fed. Cir. 2009) (internal quotation marks omitted) ("[W]e will find [prosecution disclaimer] only if the allegedly disclaiming statements constitute a clear and unmistakable surrender of subject matter."). Instead, the applicants highlighted the advantages of the invention over the prior art, including an explanation of an example embodiment that highlights the flexibility and improvement over the prior art. (See Nokia Br. Ex. 23, (NKHTC0002625-26).) HTC misinterprets the prosecution history in its attempt to narrow and rewrite the claim language.

During prosecution the applicants distinguished a reference by White (US Pat. Pub. No. 2004/0123147). (See '650 Prosecution History, Mar. 4, 2010 Office Action (Ex. 36 NKHTC0002550).) In an January 3, 2011 amendment and response to a non-final rejection (the amendment HTC cites (HTC Br. at 48)), the applicants, among other things, amended independent claims 1 and 7 (current claim 10) to include the disputed phrase, and clarified (1) that the claimed method checked an application's access control information for the right of the application to access a configuration data set and (2) that the application gets access to a service context if it has the proper access control information. (Nokia Br. Ex. 23, NKHTC0002617-28.)

1. (Currently amended) A method comprising:

storing multiple configuration data sets manageable by one or more external managing entities and a plurality of applications in a device,

checking access control information that originated and/or is controlled by an external managing entity for defining a right of an application in the device to access a configuration data set ~~by the device~~ in response to an indication from an application in the device requiring access to a configuration data set, and

in response to the application being, on the basis of the access control information, entitled to access the configuration data set, arranging access to the configuration data set for the application, wherein at least one service context is stored in the device, the service context comprising at least the configuration data set, and access to the service context is allowed for the application on the basis of the access control information if the application is authorized on the basis of access control information associated with the service context.

7. (Currently amended) A data processing device ~~for a device management system, the device~~ comprising

at least one memory including computer program code, and

at least one processor, wherein the memory and the computer program code are configured to, with the at least one processor, cause the device at least to:

store multiple configuration data sets manageable by one or more external managing entities and access control information for defining a right of an application in the device to access a configuration data set,

check the access control information in response to an indication from an application in the device, of a plurality of applications, requiring access to a configuration data set, and

arrange access to the configuration data set for the application in response to the application being, on the basis of the access control information, entitled to access the configuration data set, wherein the data processing device is caused to store at least one service context comprising at least the configuration data set, and

the data processing device is caused to allow the application to access the service context on the basis of the access control information if the application is authorized on the basis of access control information associated with the service context.

(Nokia Br. Ex. 23, NKHTC002617-19.) The applicants amended the claims to “more explicitly characterize that the right to access the configuration data set is that of an application.” (Nokia Br. Ex. 23, NKHTC0002624.) Additionally, the applicant amended the claims, because the White reference does not address the concept of using service contexts:

In addition, White fails to teach or suggest the use of service contexts, as originally claimed in claims 2, 10, and 26. Specifically, there is no indication towards a service context comprising one or more configuration data sets and allowing access to a service context for the application if the application is authorized on the basis of access control information associated with the service context. Independent claims 1, 7, 17, 20, 22, and 25 have been amended to include the limitations of original claims 2, 10, and 26. Since these limitations were already present in the claims, the changes do not introduce new matter.

(Nokia Br. Ex. 23, NKHTC002625.) HTC selectively quotes the last sentence of that paragraph in its opening brief (HTC Br. at 49), but fails to acknowledge the purpose of that amendment. The applicants incorporated the “service context” concept into independent claims 1 and 7 and affirmed that no new matter was added during the amendment in accordance with statute and Patent Office regulations. *See, e.g.*, 35 U.S.C. § 132(a) (“No amendment shall introduce new matter into the disclosure of the invention.”); MPEP (8th ed. Rev. 8, June 2010) § 706.03(o) (“[An amended] claim [adding new matter] is rejected on the ground that it recites elements without support in the original disclosure under 35 U.S.C. 112....”); *id.* § 714.13.III (listing among the reasons for non-entry of an amendment “[t]he claims, if amended as proposed, would raise the issue of new matter”). The applicants never stated that they intended to insert

the verbatim language of dependent claims 2 and 10 into independent claims 1 and 7.³⁵ And the applicants did not “explicitly equate[]” the text from (original) dependent claim 2 with HTC’s proposed construction.³⁶

Finally, HTC again selectively quotes the specification in an attempt to shoehorn its proposed “predetermined in access control information” language into the claim. (HTC Br. at 50.) Though the specification references that phrase, it does not limit the claim language:

According to an embodiment, at least one service context is stored in the device, wherein the service context comprises at least the configuration data set. Access to the service context is allowed for the application on the basis of the access control information only if the application is, by the external managing entity, predetermined in access control information associated with the service context. Various usage contexts, possibly

³⁵ Moreover, even if that was the applicants’ intent — which it was not — (original) dependent claim 10 contained the *exact same language* as the present claim. (WO 2006/070045, (Ex. 36, NKHTC0002213) (“10. A data processing device as claimed in anyone of claims, 7 to 9, . . . the data processing device is arranged to allow the application to access the service context on the basis of the access control information if the application is authorized *on the basis of access control information associated with the service context*.”).) That language happened to be incorporated verbatim into amended claim 7, presently issued claim 10. (Nokia Br. Ex. 23, NKHTC0002618-19.) So, even assuming that HTC’s logic is sound as to claim 1 — which it is not — its proposed construction cannot apply to issued claim 10.

³⁶ *Honeywell Int’l Inc. v. Hamilton Sundstrand Corp.*, 370 F.3d 1131 (Fed. Cir. 2004) is inapposite. *Honeywell* addressed narrowing amendments’ effect on the use of the doctrine of equivalents and whether “rewriting a dependent claim into independent form . . . constitutes a narrowing amendment.” *Honeywell*, 370 F.3d at 1140-42. That issue is not before the ALJ, and does not describe the applicants’ action in this case. The applicants did not rewrite original claim 2 into independent form, but (as HTC concedes) amended claim 1 to add the service context limitation and pointed to claim 2 as evidence that no new matter was introduced in the amendment. (HTC Br. at 48 (“Nokia . . . amended independent claim 1 . . .”); Nokia Br. Ex. 23, NKHTC0002617, 2625.) Further, neither *Typhoon Touch Techs., Inc. v. Dell*, 659 F.3d 1376 (Fed. Cir. 2011) nor *Springs Window Fashions LP v. Novo Indus.*, 323 F.3d 989 (Fed. Cir. 2003) stand for the proposition that referencing a prior dependent claim in informing the PTO that no new matter was added to a pending amendment somehow imports the verbatim language into those claims.

comprising also non-settings related data, such as user related data stored by an application in the device, may then be provided in the device.

(’650 patent, 2:52-62.) The full quotation demonstrates that the inventors are describing an embodiment of the invention and fails to “make[] clear that the invention does not include a particular feature” such that “that feature is deemed to be outside the reach of the claims of the patent.” *Microsoft Corp. v. Multi-Tech Sys., Inc.*, 357 F.3d 1340, 1347 (Fed. Cir. 2004). Unlike in *Microsoft*, the inventors did not “broadly describe the overall invention[]” using the “predetermined” language HTC quotes and seeks to thrust into the claim language. *Id.* at 1348. Furthermore, that phrase further confirms that the inventors meant to embrace embodiments with two different levels of access control — application access to a configuration data set and application access to the service context.

HTC’s proposed construction is not supported by the claim, specification, or the prosecution history. The ALJ should reject HTC’s constructions.

VII. U.S. PATENT NO. 8,363,824

A. HTC Mischaracterizes the ’824 Patent

As with other asserted patents, HTC’s technology background mischaracterizes the ’824 patent. HTC describes the ’824 patent in an overly narrow manner by attempting to limit it to exemplary figures and embodiments:

- HTC alleges that the ’824 patent is limited to “a flip phone where the battery and circuit board would slide into the lower section of a flip phone, through an opening in the hinge between the upper and lower sections of the phone.” (Resp. Br. at 35-36.) But the ’824 patent is not so limited; indeed, the specification passage cited by HTC confirms that this is just an exemplary embodiment “[i]n accordance with *one* aspect of the invention.” (’824 patent, 1:37-44.) (emphasis added)
- HTC alleges that the ’824 patent requires the use of physical buttons. (Resp. Br. at 37.) This is not true. The ’824 patent discloses an exemplary embodiment that uses physical buttons “[i]n accordance

with *one* aspect of the invention” (’824 patent, 1:58-65) (emphasis added), but is not so limited.

- HTC alleges that the ’824 patent requires a “side by side” arrangement of structures. While the ’824 patent covers “side by side” arrangements, it is not so limited. Indeed, the ’824 patent contains a dependent claim directed toward the “side-by-side” implementation, suggesting that the broader independent claims that are not so limited (*Compare* ’824 patent claim 1 with claim 7.)

In short, the ’824 patent is not as limited as HTC alleges in its technology background section.

B. “user input is located in a hole”

Nokia Proposal	HTC Proposal
No construction necessary Alternative: “user input is located in a hollow place in the housing”	“user input, which is not part of the housing, with portions that pass through an opening”

Because the term “user input is located in a hole” is simple and straightforward, no construction of the term is necessary. Nokia’s alternative proposed construction of the term is similarly simple, straightforward, and consistent with the intrinsic record. In contrast, HTC’s construction does not comport with the intrinsic evidence and effectively seeks a premature infringement ruling regarding whether hypothetical touch screen products infringe certain claim limitations.

First, HTC fails to show that the prosecution history requires inclusion of HTC’s overly-preclusive negative limitation “which is not part of the housing.” HTC mischaracterizes the prosecution history as well as its relationship to the amended claims, which show that HTC’s negative limitation is neither necessary nor appropriate. (HTC Br. at 39-41.) In short, HTC fails to sustain its heavy burden of showing that its proposed

negative limitation is required. *See, e.g., Cadence Pharm., Inc. v. Paddock Labs. Inc.*, 886 F. Supp. 2d 445, 464-65 (D. Del. 2012) (indicating that defendant failed to meet their “heavy burden of establishing a prosecution history disclaimer.”) (citing *Omega Eng’g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1325-26 (Fed. Cir. 2003)).

By way of background, the examiner initially rejected the original claims over the Spence reference, which had a particular type of two-part housing, comprising an “outer housing part 312 and a[n] [] inner housing part 314 which are coupled together by screws.” (HTC Br. Ex. 17, Spence at [0019]; *see also id.* at [0001] (“More particularly, the present invention relates to the mechanical layout and component placement for thin handheld communication devices, **which have at least a two part housing**, where the first housing part is adapted to rotate relative to the second housing part.”).)³⁷ The applicants thereafter proposed several claim amendments, including adding the limitations “**a one piece housing** forming enclosed exterior lateral sides and a rear side” as well as “the user input is located in a hole through the **front side of the [one piece] housing**.” (Nokia Br., Ex. 27 at NOK885ITC00002299). In support of those amendments, the applicants noted that the Spence reference “show[s] a housing **having two parts** (346 and 332), not a one piece housing as in applicant’s claimed invention” and that the input in Spence was not located in a hole through the front side of Spence’s housing. (Nokia Br., Ex. 27, at NOK885ITC00002302 (emphasis in original).)

Here, the prosecution history does not support HTC’s proposed negative limitation for multiple reasons. As an initial matter, HTC ignores the entire claim language and the context in which the disputed term appears. The issued claims reflect

³⁷ HTC assumes that the Spence reference discloses the Motorola Razr. (Resp. Br. at 41.) But there is no evidence that Spence covers the Razr, HTC provides no evidence supporting that allegation, and, thus, at this stage, it remains mere attorney conjecture.

the amendments and the applicants' statements to the Patent Office. Consistent with those statements, the applicants added limitations providing for a "one-piece housing" and requiring that the "user input is located in a hole." But those statements do not require reading any additional limitations, let alone HTC's proposed negative limitation, because they do not "constitute a clear and unmistakable surrender of subject matter." *Ecolab, Inc. v. FMC Corp.*, 569 F.3d 1335, 1342 (Fed. Cir. 2009); *see CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1367 (Fed. Cir. 2002) (finding that the accused infringer did not show "anything in the specification or prosecution history [to] overcome[] the 'heavy presumption' that [the claim term] carries its ordinary meaning").

In addition, HTC's proposed negative limitation contradicts the claims themselves. The applicants amended the relevant claims to state that "the user input is located in a hole *through the front side of the housing*." ('824 Patent at 6:20-21 (emphasis added).) HTC interprets those statements (which were made *in support* of the amended claim language) as unequivocally and unambiguously limiting the scope of the amended claims, such that the user input cannot be part of the one-piece housing. (Resp. Br. at 40.) But those statements simply describe a limitation of the claimed device: that the user input is located in a hole formed by the one piece housing; they do not add to or further constrict that limitation by requiring that the user input "not [be] part of the housing," or that "portions [of the user input] pass through an opening." (Resp. Br. at 39.) Thus, HTC's proposed construction does not credit a clear disclaimer of scope, but contradicts the very claim language it is intended to support. For this additional reason,

HTC fails to sustain its burden of showing that a prosecution history disclaimer requires the imposition of its proposed negative limitation.³⁸

Second, HTC's allegation that its construction is supported by certain disclosed embodiments both misstates the specification and confirms that HTC is attempting to confine the claims to particular embodiments. HTC alleges that "the only embodiments that the Nokia applicants disclosed in the specification show an input that is not part of the housing and that has 'portions' that pass through an opening," and therefore that the claims should be limited to those disclosed embodiments. (Resp. Br. at 41.) But HTC's assertion lacks merit. As an initial matter, HTC does not and cannot point to a single part of the claims or the specification that requires portions of the input to pass through a hole. Furthermore, HTC's argument contravenes claim construction law because it attempts to limit the claim language by importing into the claim a preferred embodiment disclosed in the specification. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc) ("[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments".)³⁹

³⁸ Based on this misinterpretation of applicants' statement before the patent examiner and the limitation that "the user input is located in a hole," HTC draws the dubious conclusion that the claims are narrowed "to those devices where a 'portion' *passes through a hole*." (emphasis added) (Resp. Br. at 41) HTC's conclusion does not make sense. As Nokia pointed out in its opening brief, the words "located" and "pass through" are not synonymous and HTC's substitution of "pass through" for "located in" is neither supported by the intrinsic record nor natural linguistically. (Nokia Br. at 86-87).

³⁹ HTC also argues that its construction is consistent with the plain understanding of "hole." (Resp. Br. at 42). But HTC's equating "hole" with an "opening" is not, in fact, consistent with the claim language of the '824 patent. The patent requires that the "user input is located in a hole." Plainly, the user input cannot be located in just an opening – it must be located in a hollow place, such as the hole described in the claims. Accordingly, the proper definition of a "hole" is a hollow place in the housing.

Third, HTC does not demonstrate that “HTC’s proposed construction is also consistent with the understanding of one of skill in the art in 2006.” (Resp. Br. at 41.) HTC’s sole argument in support of that allegation is that “[i]n 2006, touchscreen input for mobile devices was well known,” (Resp. Br. at 41-42.) But there is no requirement that an applicant disclose every conceivable embodiment for every limitation in the claim language. *See, e.g., SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 880 (Fed. Cir. 2004) (internal quotation marks omitted) (quoting *SRI Int’l v. Matsushita Elec. Corp. of Am.*, 775 F.2d 1107, 1121 (Fed. Cir. 1985)) (“The law does not require that an applicant describe in his specification every conceivable and possible future embodiment of his invention.”).⁴⁰ Even assuming that touchscreens were known to Nokia, that would not justify or support HTC’s attempt to read a “pass through” limitation into the claim; rather, it would tend to show why the claims should *not* be so limited. The inventors explain “in alternate embodiments, *any* suitable user input section could be provided.” (’824 Patent, 3:47-48.) That recognition of alternate, suitable embodiments militates against inserting a negative limitation that would exclude such an embodiment from the scope of the claims.⁴¹ *See Spansion, Inc. v. Int’l Trade Comm’n*, 629 F.3d 1331, 1347

⁴⁰ Nor does HTC cite any legal authority to support its conclusion that the ’189 patent — which is a different patent asserted in this case and directed to a different subject matter — is relevant at all to the construction of the terms in the ’824 patent.

⁴¹ The ALJ need not consider HTC’s remaining allegations about touchscreens because they are not directed toward issues of claim construction. Rather, they prematurely seek rulings on HTC’s apparent non-infringement positions by: (1) substituting HTC’s proposed construction (“portions of the input must pass through an opening”), which is not supported by the intrinsic record, in place of the actual limitation contained in the claim language (“the user input is located in a hole”) and then (2) arguing without evidence that a hypothetical embodiment, such as a touchscreen display, allegedly does not meet that limitation. But whether HTC’s products infringe the patents under HTC’s own claim construction is an issue that should be decided only *after* the claims are

(Fed. Cir. 2010) (finding impermissible limitation excluding embodiments considered conventional where the specification referred generally to such embodiments as satisfying claim language).

At bottom, HTC’s brief confirms that HTC is attempting to alter the meaning of this straightforward term by reading in extraneous limitations and exclusions through the claim- construction process. Accordingly, the ALJ should reject HTC’s proposed claim construction and find that this term either requires no construction or should be accorded the alternative construction proposed by Nokia.

C. “adjacent”

Nokia Proposal	HTC Proposal
No construction necessary Alternative: “next to”	“side by side, not overlapping”

The next term, “adjacent,” is similarly straightforward and requires no construction. HTC attempts to limit this term by recasting exemplary embodiments from the specification as claim limitations, mischaracterizing embodiments in the specification, and misstating the prosecution history.

First, HTC’s argument that the specification supports its “side-by-side” (Resp. Br. at 43) construction contravenes Federal Circuit precedent, which prohibits importing

construed and the parties have produced, analyzed, and had the opportunity to make argument about the relevant evidence. In short, claim construction is not the place for HTC to argue whether its products infringe. *See, e.g., Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1454 (Fed. Cir. 1998) (citations omitted) (“An infringement analysis involves two steps. ***First***, the court determines the scope and meaning of the patent claims asserted, and then the properly construed claims are compared to the allegedly infringing device.”) (emphasis added).

particular embodiments into the claims. *See, e.g., Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc) (“[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments”). Although the specification discloses embodiments where the engine and battery are laid out in a “side-by-side” arrangement, HTC identifies no language in the claims or the specification that **requires** that the engine and battery be laid out “side-by-side.” HTC is simply reading this disclosed embodiment into the claim.

Indeed, as Nokia pointed out in its opening brief, the claim language itself and the doctrine of claim differentiation militate **against** HTC’s proposed construction. Claim 1 requires “a battery located adjacent the engine section”, and claim 7, which depends on independent claim 1, is directed more specifically to a device where “the battery is located alongside the engine section in a substantial side by side arrangement.” Therefore, the claim language itself and the doctrine of claim differentiation suggest that “a battery located adjacent the engine section” is not limited to a “side by side arrangement.” (Nokia Br. at 90-91; *e.g., Curtiss-Wright Flow Control Corp. v. Velan, Inc.*, 438 F.3d 1374, 1380 (Fed. Cir. 2006) (“‘[C]laim differentiation’ refers to the presumption that an independent claim should not be construed as requiring a limitation added by a dependent claim.”).)

Second, HTC’s allegation that “every disclosed embodiment in the specification of the ’824 patent that is covered by the asserted claims shows a battery which is side by side and not overlapping the engine” (Resp. Br. at 44) is demonstrably incorrect. As an initial matter, there is no requirement that a patentee disclose every conceivable embodiment for every limitation in the claim language, especially where the claims themselves do not suggest that they are limited to any disclosed embodiment.

SuperGuide Corp. v. DirecTV Enters., Inc., 358 F.3d 870, 880 (Fed. Cir. 2004) (citation omitted) (internal quotation marks omitted) (“The law does not require that an applicant describe in his specification every conceivable and possible future embodiment of his invention.”). Thus, contrary to HTC’s assertion, the claim language requiring that “user input section [be] located directly opposite the battery without a portion of the engine section therebetween” does not preclude embodiments where the engine and battery sections do overlap and still meet the claim limitation, consistent with the plain and ordinary meaning of the disputed term.

Moreover, HTC’s assertion that every disclosed embodiment shows a non-overlapping battery and engine section is demonstrably false and contradicts the specification and claims. For example, figure 13 shows a portion of the engine “138 located between the battery and the keypad,” thus overlapping with the battery.⁴² (’824 patent at 5:39-49) Figure 7 depicts a similar architecture that falls within the independent claims, but with possible overlap between the battery and engine sections. (’824 patent, 3:63-67 (describing Fig. 7: “The keypads are located above engine section 30 and the battery 32, wherein the user input section 34 is located directly opposite the battery 32 ***without a significant portion*** of the engine section 30 therebetween.”)) And dependent claim 7, adding a limitation to independent claim 1, expressly provides for a “substantial side by side arrangement.” (’824 Patent at 6:46-48) HTC’s proposed negative “not overlapping” limitation contradicts the patent.

⁴² HTC also argues that the embodiment in Figure 13 cannot satisfy the claim limitation “without a portion of the engine therebetween. This is not true: the embodiment shown in Figure 13, which is only a two-dimensional cross section of the device, allows for substantial portions of the battery and input sections to be placed opposite one another “*without a portion of the engine therebetween.*” Contrary to HTC’s assertions, this allowance clearly meets the claim limitation.

Third, HTC’s allegation that Nokia surrendered claim scope by arguing that Spence did “not teach, disclose, or suggest a circuit board adjacent to an edge of the battery, as the battery is placed near the hinge area there is no further space for any circuit board” (Resp. Br. at 45) lacks merit. HTC asserts that this statement only makes sense if “adjacent means ‘side-by-side, not overlapping’” but does not explain how it arrived at this conclusion. In fact, the applicants’ statement that “there is no further space for any circuit board” is consistent with Nokia’s “next to” construction, and does not in any way warrant the negative limitation HTC proposes. Finally, while Nokia submits that applicants’ statement contains no disclaimer, any arguable disclaimer does not rise to the level required to limit the scope of the claim. *See, e.g., Ecolab, Inc. v. FMC Corp.*, 569 F.3d 1335, 1342 (Fed. Cir. 2009) (internal quotation marks omitted) (“[W]e will find [prosecution disclaimer] only if the allegedly disclaiming statements constitute a clear and unmistakable surrender of subject matter.”).

Accordingly, Nokia respectfully requests that the ALJ accept its construction of plain and ordinary meaning, or if it deems necessary, the alternative proposed construction “next to.”

VIII. U.S. PATENT NO. 7,366,529

A. “user message”

Nokia Proposal	HTC Proposal
“a message capable of being sent to or by a user”	“a message capable of being sent to or by a user that is the length of a SOC, SMS, R data, or USSD message”

A user message is one of the ways taught and claimed by the ’529 patent for sending data to and from applications on a mobile device. Indeed, HTC acknowledges in

its opening brief in that “[t]he parties *agree* that a ‘user message’ is ‘a message capable of being sent to or by a user.’” (Resp. Br. at 48 (emphasis added).) The parties’ only dispute concerns HTC’s attempt to append to that otherwise agreed-upon construction the extraneous limitation that the user message must be “the length of a SOC, SMS, R data, or USSD message,” which improperly seeks to import into the claims an incomplete subset of exemplary embodiments disclosed in the specification. (See ’529 patent, 2:27-47.)

HTC fails to justify its attempt to rewrite the straightforward term “user message” in such an ambiguous and overly narrow manner. As an initial matter, HTC’s proposed additional limitation creates rather than resolves ambiguity:

- What does it mean for a user message to be “the length of a SOC, SMS, R data, or USSD message?”
- Must the user message be exactly that length?
- May the user message be a little longer, and if so how much longer?
- What if the user message is shorter than that length?
- What if the user message is variable in length?
- What if the user message is the length of other exemplary messages discussed in the ’529 patent but not referenced in HTC’s proposed construction?

In short, HTC’s proposed additional limitation does not resolve but rather injects ambiguity into the meaning of this otherwise straightforward term.

In any event, HTC does not and cannot justify its proposed limitation in view of the law of claim construction. It is well established that claim construction cannot be used to import embodiments from the specification into the claims. *See, e.g., Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc) (“[A]lthough the

specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments"); *see also Kara Tech. Inc. v. Stamps.com Inc.*, 582 F.3d 1341, 1348 (Fed. Cir. 2009) ("The patentee is entitled to the full scope of his claims, and we will not limit him to his preferred embodiment or import a limitation from the specification into the claims."). Here, HTC attempts to do just that. As the '529 patent demonstrates, Service Operator Code (SOC) messages, Short Message Service message (SMS) messages, R data field messages, and Unstructured Supplemental Service Data (USSD) messages are merely *examples* of user messages. (*E.g.*, '529 patent, 2:64-66 ("The intention is that *any* user messages can be used, but . . . short messages will be referred to *as an example*.")) (emphasis added).) HTC identifies no language from the claims, specification, or prosecution history that *requires* user messages to be limited to "the length of a SOC, SMS, R data, or USSD message." Therefore, the rules of claim construction themselves require rejecting HTC's proposed construction.

In addition, HTC does not and cannot show that its proposed construction comports with the intrinsic record. For instance, the examples of user messages that HTC reads into its proposed construction are discussed in the specification to explain that the user message does not reserve the voice call channel — *not* to identify a specific length of the user message. (*See* '529 patent, 2:27-47.) And the '529 patent explicitly is *not* limited to SOC, SMS, R data, and USSD messages; the specification also discloses *other* examples of user messages that HTC does not account for in its proposed construction, such as General Packet Radio Service (GPRS) messages and other packet radio transmissions. (*See* '529 patent, 2:40-63.) In short, HTC's construction not only reads in particular embodiments without basis, but also reads out other expressly disclosed

embodiments. *See, e.g., Oatey Co. v. IPS Corp.*, 514 F.3d 1271, 1276-77 (Fed. Cir. 2008) (noting that “[w]e normally do not interpret claim terms in a way that excludes [disclosed] embodiments” and that claims are interpreted to exclude disclosed embodiments only where they have been clearly disclaimed).⁴³

Further, HTC’s allegation that Nokia’s proposed construction “ignores *the requirement in the specification* that ‘user messages contain a limited amount of information and are, therefore, quick to transmit’” (Resp. Br. at 48 (emphasis added)) illustrates the problem with HTC’s approach. It is the claim language — not the specification — that governs the scope of the claims. *See, e.g., Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (citing *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115-16 (Fed. Cir. 2004) (“It is a ‘bedrock principle’ of patent law that ‘the claims of a patent define the invention to which the patentee is entitled the right to exclude.’”)); *see also Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1253 (Fed. Cir. 2011). The claim language itself does not limit the user message to any exemplary disclosed embodiment. In addition, consistent with the claim language and contrary to HTC’s reading, the specification expressly discloses that “[t]he intention is that *any* user messages can be used” and that “short

⁴³ Indeed, *none* of the excerpts of the specification cited by HTC for its construction discuss limiting the length of the user message to particular exemplary embodiments. For example, HTC cites to the specification’s discussion of a prior art system — an electronic-greeting-card communication system — but this reference offers no support for HTC’s limitation. (Resp. Br. at 50.) The specification’s discussion of the electronic-greeting-card communication system concerns the disadvantages of prior art systems, such as requiring engagement of the telephone line during data transmission and the system being quite slow due to the large amount of information in the transmission. (’529 patent, 1:54-61.) The specification’s explanation of why the exemplary embodiments are preferable to the prior art does not support HTC’s conclusion that the user message *must* be limited to those particular embodiments. (See Resp. Br. at 50.)

messages will be referred to *as an example*.” (’529 patent, 2:64-66 (emphasis added).) In alleging a narrower “*requirement* in the specification” (Resp. Br. at 48) — including restricting the claims to an incomplete subset of examples of user messages — HTC effectively admits that it is importing limitations into the claims based on the specification. *See, e.g., Phillips*, 415 F.3d at 1323 (“[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments.”); *see also Medegen MMS, Inc. v. ICU Med., Inc.*, 317 F. App’x 982, 986-87 (Fed. Cir. 2008) (rejecting the argument that the construction should reflect a “single, preferred embodiment,” finding this argument “specifically rejected” by *Phillips*).

Finally, HTC’s citation to extrinsic evidence from Inv. No. 337-UTC-847 (“the 847 Investigation”) is unavailing. (*See* Resp. Br. at 49) Nothing that took place in the 847 Investigation requires limiting the length of user messages to the exemplary embodiments disclosed in the specification, let alone *only* an incomplete subset of those embodiments. As stated by Nokia in the 847 Investigation, a person of ordinary skill in the art would understand the parameters associated with the “user message” in applying that claim term in the context of the overall claim (*See, e.g.,* Resp. Br. Ex. 24 at 686:2-11) — a concept with which HTC itself agrees. (*See e.g.,* Resp. Br. at 51 (“Although HTC’s construction does not provide any specific limits on the size of user messages by characters or bytes, the range of those limits would have been clear to a person of ordinary skill in the art at the time in view of the published standards disclosed in the specification for each of the message forms, such as GSM and IS-136.”).) HTC identifies no inconsistency in Nokia’s construction of “user message,” let alone an inconsistency

that would warrant HTC's effort to materially rewrite the otherwise agreed-upon meaning of that term: "a message capable of being sent to or by a user."

At bottom, HTC's arbitrary limit on the length of the user message — based on reading in only a subset of exemplary embodiments disclosed in the specification — is improper. Accordingly, HTC's attempt to add the extraneous limitation that the user message must be "the length of a SOC, SMS, R data, or USSD message" should be rejected and Nokia's construction should be adopted.

IX. CONCLUSION

For the foregoing reasons Nokia respectfully requests that the ALJ adopt Nokia's proposed constructions and reject HTC and Google's proposed constructions.

DATED:

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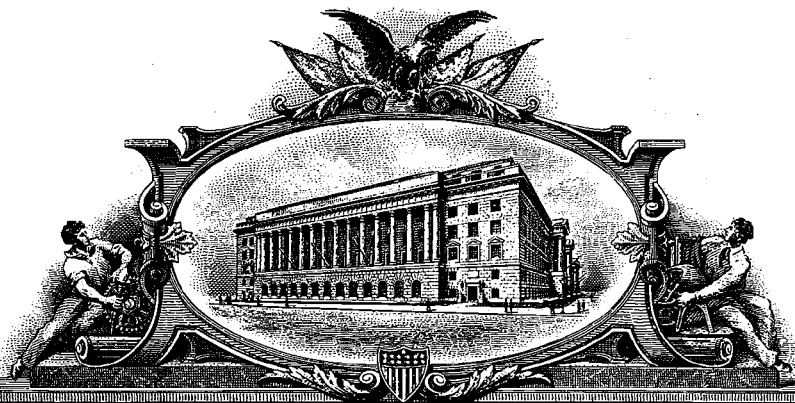
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EXHIBIT 30

IW 7413954



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TO ALL TO WHOM THESE PRESENTS SHALL COME:

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May 08, 2013

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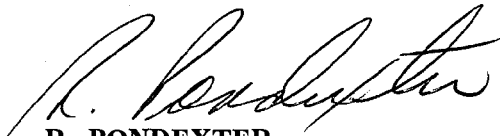
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PART (1) OF (2) PART(S)


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Certifying Officer

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07/22/1997 EKURTZ 00000014 DA#161350 08867296
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PTO-1556
(5/87)

Method for using services offered by a telecommunication network, a telecommunication system and a terminal for it.

BACKGROUND OF THE INVENTION

- 5 The invention relates in general to the use of services offered to users of a telecommunication network using the services via individual terminals and particularly to a method for easily bringing the continuously changing and developing services of an intelligent telecommunication network within the reach of private users. The invention also relates to a telecommunication system wherein changing services are
10 offered to users, and a terminal for such a system.

Intelligent network (IN) is a known concept in telecommunication technology and it generally refers to a telecommunication network control method wherein the services offered by a telephone network have been made more versatile than in the
15 ordinary public switched telephone network (PSTN). Basic services of a modern intelligent network include call transfers and alternative billing, for example. It is also possible to include in a PSTN switching centre a service that supports user mobility. It is typical of intelligent networks that the switching centres include some kind of programming facility with which the network operators or somebody
20 authorized by them can alter the operation and services of the network without changing a significant part of the system software of the switching centre. It is presumable that in the future the amount and range of telecommunication services offered will be considerably higher and wider, thereby making those services an important factor in the competition between network operators.

25 Services provided by intelligent networks can be divided into free services and services liable to charges. Free services are accessible to all subscribers of the network and instructions for their use are published in announcement and information material, such as telephone directories and customer newsletters. Use of
30 services liable to charges normally requires that some kind of an agreement be signed by the user and the service provider. The service provider is not necessarily the same as the company maintaining the network but the service provider has got a programming connection to the switching centre(s) of the intelligent network. When the agreement has been signed, the service provider programs the switching centre to
35 accept the service in question for that particular subscriber ID code.

In modern intelligent networks, the free and non-free services are usually activated and controlled by the user issuing commands from his terminal (phone) which are

directed via the network to a command interpreter in the switching centre and therefrom to the unit controlling the operation of the switching centre. The switching centre responds by enabling or disabling a certain service (having checked that the user is authorized to use the service in question, if the service is liable to charges) or by performing some other function required by the user. As the interfaces of most of the phones in PSTN networks comprise only a handset and a dial pad, the commands issued by users are usually series of digits with occasional special characters, like # and *. Presses of buttons are transformed into dual-tone multifrequency (DTMF) signals in the network. Certain networks, such as the integrated services digital network (ISDN), have, in addition to the specific digit and character sequences, special signalling practices that can be used for transferring commands from the users to the switching centre of the intelligent network.

As the number of services increases and the supply becomes more versatile, it is presumable that the currently used commands consisting of character sequences will become impractically long. Even today, users have to memorize several rather long command sequences in conjunction with certain services. Such services include voice mail and the use of bank services by phone, wherein users have several options the commands for which they have to learn by heart or look them up in the operating instructions of the service every time they use the service in question.

One solution to the problem caused by the diversity of services and commands was to include in the phone special function keys so that standard functions associated with those keys could replace some of the digit sequence commands. There is, however, the problem that the services offered may change and develop very rapidly as both the network operators and the service providers compete for market shares and develop their operations. Solutions based on the technical implementation of the telephone quickly become outdated and it is probable that the users are not willing to acquire a new terminal very often.

SUMMARY OF THE INVENTION

An object of this invention is to provide a method for efficiently bringing the continuously changing and developing services of an intelligent telecommunication network within the reach of private users. Another object of the invention is to provide a method for making the use of changing services independent of the technical implementation of the terminal when the terminal meets certain minimum requirements. A further object of the invention is that the method according to the invention is easy to use and does not require unreasonable learning or memorizing

efforts of the user. Yet another object of the invention is to provide a method with which the billing of services liable to charges is easy to implement.

5 The objects of the invention are achieved with a programmable telephone user interface which is updated by conveying the information required for the programming of the terminal from the service provider to the user.

10 The method according to the invention for using services offered by a telecommunication network which includes at least one switching apparatus and user terminals communicating with it, wherein said switching apparatus can be arranged to offer services via said telecommunication network and said user terminals include output means for displaying information about said services to the user and input means for making selections concerning said services, is characterized in that

- 15 - a certain service is created and said switching apparatus is made to operate according to said service,
- a set of instructions is drawn up which, when loaded in a terminal, controls said terminal in a manner such that said service can be used via the terminal, displaying on the output means of the terminal information about the service in question and using the input means to make selections concerning the service in question, and
- 20 - said set of instructions is conveyed to the user to be loaded in the terminal.

25 The invention also relates to a telecommunication system to implement the method described above. The telecommunication system according to the invention is characterized in that it comprises means for conveying sets of instructions concerning new services to the user to be loaded in a user terminal.

30 The invention also relates to a terminal for the telecommunication system described above. The terminal according to the invention is characterized in that it comprises means for loading sets of instructions concerning new services, means for displaying to the user information about said new services in a manner specified by the sets of instructions and means for making user selections concerning said new services in a manner specified by said sets of instructions.

35 The invention is based on the idea that the concept of the intelligent network can be extended towards the user and the terminal. Embedded software controlling the operation of the terminal includes an extension interface whereby the user or the service provider can add features to the operation of the terminal, advantageously a telephone, which both indicate to the user the services offered and the actions

required to use them and see to that the commands corresponding to the user's selections are sent to a switching centre of the network. The extension can be called a programmable user interface and in the preferred embodiment it comprises menu-driven functions so that the user can browse through the range of options on the display of the phone and advantageously advance with one-button commands through various selections to the desired goal. Services and commands are added by sending an extension program or code from the service provider to the user to be loaded in the phone where it produces new menus and/or options and handles the corresponding command traffic between the phone and the switching centre of the network. The extension program can be delivered to the user on a separate storage medium, such as an intelligent card, or it can be transferred as a data message over the telecommunication network.

In the arrangement according to the invention a terminal, advantageously a telephone, serves as a platform which only has to include certain minimum functions related to updating menus and options and to displaying those menus and options to the user and to interpreting user selections as well as to handling the transmission and reception of the command traffic corresponding to those user selections between the phone and the switching centre of the intelligent network. These functions will be described in more detail later. For phones from different manufacturers to be compatible as regards the services of a certain network the characteristics of the phones have to be standardized at least to some level.

Extension and update information, which is programmed into the phone for a new service, has to be expressed in the form of a computer program or corresponding instructions which can be loaded in the storage media used by the processor controlling the operation of the phone. The programming language or the like, in which the extension and update programs are implemented, is advantageously a set of sentences with a standardized syntax so that in principle anyone can draw up an extension program for a particular service, hire network capacity from a network operator and offer his services to users.

The invention is described in greater detail with reference to the preferred embodiments, presented for the sake of illustration, and to the accompanying drawings, wherein

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 shows a simple telecommunication network in which the method according to the invention can be applied,

Fig. 2 shows in a schematic way a mobile phone that can be used in the manner according to the method according to the invention, and

Fig. 3 shows in a schematic way the parts of the mobile phone shown in Fig. 2 on the operation of which the invention has effect.

Like elements in the drawings are denoted by like reference designators.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 shows in a schematic manner part of a cellular radio telephone network capable of intelligent network operation, wherein the method according to the invention can be applied. The central unit in the network is a mobile switching centre 1 (MSC) which includes all the data processing, switching and data base properties that are needed for network control and maintenance. Under the mobile switching centre there are several base station subsystems 2 (BSS), of which only one is shown, for reasons of simplicity. The subsystems 2 include base station controllers and base stations (not shown), the latter providing a radio interface for mobile stations 3 (MS) operating in the network. In the network shown, the mobile switching centre 1 has a wire link to a separate intelligent network service control point 4 (IN SCP) which may be located e.g. in the premises of the telecommunications company 5 providing the services, which can be very far away from the mobile switching centre 1.

In the embodiment illustrated by Fig. 1, network services can be used with an intelligent card 6, which is given to a user by a company selling telecommunication services to be connected to a mobile station 3. One such intelligent card is the subscriber identity module (SIM) in the known GSM mobile phone system, which is given to a user when he becomes a subscriber to a network operator. According to the prior art, the SIM card can be used as permanent memory to store data needed for identifying the subscriber and possibly a lot of other data, such as user-programmable short-dial numbers and telephone directory notes, short text messages received by the phone, network selections by the user or data related to billing. According to an embodiment of the invention, the intelligent card 6 is also used for programming and updating the user interface of the mobile station 3. However, the invention as such does not require an intelligent card of the phone or other terminal equipment, if the equipment otherwise has the storage capacity needed.

Fig. 2 shows schematically a mobile phone 3 which is here used as terminal equipment. It is obvious to one skilled in the art that the application of the invention is not

limited to mobile phones but the method according to the invention can be applied to all kinds of terminal equipment in a telecommunication network that are used for conveying intelligent network services. The mobile phone in Fig. 2 particularly comprises a display 7 and keypad 8. Within the keypad there are function keys 8a which are located near the display 7. It is intended that the function keys 8a can be used for various purposes in various situations, wherein texts or symbols are displayed on the display 7 beside the function keys to remind the user of the functions of the function keys in that particular situation. The display 7 may also be a touch-sensitive display known to a person skilled in the art, in which case the keypad 8 is not necessarily required but the user can give the commands to the mobile phone by touching the screen at the appropriate locations. Then certain locations of the touch screen, displaying texts or symbols corresponding to the functions, correspond to the function keys 8a. As speech recognition technology improves, it is also possible to achieve a situation wherein the user gives all input to the mobile phone as voice commands instead of key presses.

Fig. 3 shows schematically the parts of the mobile phone 3 that in the preferred embodiment participate in implementing the method according to the invention. Operation of the telephone 3 is controlled by a central processing unit 9 which comprises a microprocessor and has storage means 10 at its disposal. The central processing unit 9 is connected to an intelligent card reader 11 which can communicate bidirectionally with an intelligent card 6 connected to it. The central processing unit receives input from the keypad 8 and produces output on the display 7. In addition, the mobile phone includes a telephone part 12 for data transmission and for processing transmitted speech and data, used by the mobile phone to communicate between the nearest base station (not shown). The implementation in the drawing is shown as an example.

The use of the method according to the invention is described referring to the implementations shown in the drawings. Let a telecommunication company 5 develop a new service with the intention that a user can browse on his mobile phone 3 the films that are showing at the movie theatres that week and reserve tickets for a show. To implement the service, the names and phone numbers of all movie theatres in that area together with the films showing that week are programmed in the storage means (not separately shown) of the mobile switching centre 1. This kind of programming as such is known to one skilled in the art and is not included in the scope of the present invention. A user who wishes to gain access to the service brings his intelligent card 6 to be programmed at the company 5, where data that are

required to control the mobile phone in the manner described below will be loaded in the intelligent card. When the user inserts the intelligent card back in the mobile phone 3, the new services are available to him.

- 5 The mobile phone 3 includes a function wherein a list of all available intelligent network services is shown on the display 7 when the user presses a certain key. In the illustrative embodiment of Fig. 3 this means that the central processing unit 9 receives the keystroke as input and responds by reading from the intelligent card 6, by means of the reader 11, the character sequences representing the services and
 10 sends them to the display 7. The user browses through the list by means of arrow keys (not separately shown) included in the mobile phone's keypad 8 and in this case selects the option "Cinema" from the list. As a response to the keystroke indicating the selection the central processing unit 9 sends via the telephone part 12 to a base station and further to a switching centre a request for the films showing that week.
 15 The switching centre provides the requested information via the base station and the mobile phone receives it through the telephone part 12 and saves it in the storage means 10.

- 20 The display shows beside the function keys 8a certain options characteristic to this application, such as "Theatres", "Films", "End". When the user presses the function key corresponding to the text or symbol "Films", the display 7 shows an alphabetical listing of the films showing that week. Similarly, option "Theatres" would display an alphabetical listing of the movie theatres in that area. The user can browse through the lists using the phone's arrow keys. When he selects a film, for instance, the
 25 display will show the theatre in which that film is on and a list of the playing times. Using the arrow keys the user can select a playing time he wants. Then the markings beside the function keys may change so that a certain key corresponds to text "Reserve" and another certain key corresponds to text "Call". If the user presses numeric key 2 on the keypad followed by the "Reserve" function key, the central
 30 processing unit 9 sends via the telephone part 12 an automatic message to the telephone number of that particular movie theatre, making a reservation by the name corresponding to the intelligent card of the user in question for two tickets for the show selected. Instead of the automatic reservation the user could select "Call" to make an ordinary voice call to the theatre in question. In the case described above,
 35 the procedure ends simply by pressing the "End" function key.

Use of the service described above requires certain functions of the mobile phone 3, such as reading of character sequence data from the intelligent card 6, reading of

input from the keypad 8 in the form of keystrokes and sending of output to the display 7 in the form of character sequences. Furthermore, automatic bidirectional signalling is required between the central processing unit 9 of the mobile phone and the mobile phone network. Signalling can take place on the speech or data channel.

- 5 All aforementioned functions are known from the prior art and they are advantageously implemented by programming the commands corresponding to their execution in the form of a computer program in the storage means 10 of the mobile phone's central processing unit.
- 10 Instructions and programming data concerning the use of a new service need not necessarily be delivered from the service provider to the user in such a way that the intelligent card 6 is separately brought in to be programmed. The information can also be conveyed via the same telecommunication network in which the other data are transferred. The GSM system includes a specification for a so-called short
- 15 message function which can be used for sending data messages. The received data can be stored on the SIM card or in the storage means in the mobile phone. In ISDN networks, the arrangement applicable for transferring data according to the invention is known as D-channel data transmission. In the arrangement involving the programming of the intelligent card the user can pay the service provider in cash
- 20 when the intelligent card is updated. If the data are transferred via the telecommunication network, the billing can be carried out using the same system that is used for the user's telephone bills.

- There may be several intelligent cards that can control the operation of the phone.
- 25 Let us assume that the debit card as it is known today will be developed into an intelligent debit card and the social security card as it is known today will be developed into an intelligent social security card. Then the user can have different, specialized application programs and user interfaces in the different cards. When the user inserts said intelligent debit card in his phone or other terminal equipment, the user interface of the phone is adapted to especially providing bank services, such as
- 30 information on currency exchange rates, user's bank accounts and pay services. By inserting the intelligent social security card in the phone the user activates a reservation service whereby he can make an appointment in the nearest health centre the phone number of which is stored in the intelligent card. As the user's personal data
- 35 are also stored in the card, the user need not type or dictate his name and social security code but they are automatically conveyed to the recipient in the form of a short message, for example.

The loading and activation of a certain user interface or other application program can be functionally separated from each other in the terminal equipment. For marketing or service reasons, a service provider may send the loading data to all active terminals in which they are stored in temporary memory. Then the service provider may send to the users a short message, for example, indicating which new service is loaded. If the user accepts the new service, the temporary loading is changed permanent and the service is activated; otherwise it is removed from the memory. The terminal may also automatically decide on the loading and/or activation e.g. on the basis of auxiliaries connected to it. An example of separate loading and activation is a situation wherein the user receives a short message "Wanna bet?" from a local bookmaker. After a positive response the user immediately receives on the display of his phone a betting form loaded previously in the memory which he then fills out and sends to the bookmaker as a short message, for example. Certain user interface loadings and activations, such as gallup polls, may also be disposable and they would be automatically removed from the phone's memory after being used once.

Above it was mentioned that it is advantageous to standardize or otherwise harmonize the programming language or other method used for adding new features in the phone's programmable user interface according to the invention. Standardization brings wide compatibility and even competition between network operators and other service providers. A standardized script language advantageously comprises commands such as the ones below (commands are typed in upper-case letters):

25 DEFINE APPLICATION = "Cinema"
- defines the name of an application shown in the list brought to the display,

DEFINE KEY xx = "(any series of DTMF signals)"
- automatically assigns to a certain key (here xx) a series of tone frequency commands which will be sent when that key is pressed,

DISPLAY STRING = "Sold out"
- shows on the display a certain character string in a response to a certain situation,

35 DISPLAY SOFTKEY a = "Films"
- assigns to a certain function key (here, key a) a certain text or symbol shown on the display beside the function key in question,

IF KEY xx PUSHED SEND STORED STRING = "Cancel reservation"

- in a response to a certain keystroke the mobile phone automatically sends a certain text message.

- 5 The commands above are presented for illustrative purposes only and are not intended to restrict the invention. In order for the translation of the program from the script language not to strain the data processing capacity of the mobile phone the program can be translated to a machine-readable form before loading it in the intelligent card. This, however, requires that the machine language program format
- 10 required by the user's terminal equipment be known.

- 15 According to the invention, intelligent network services can be easily and flexibly made available to all users and the users or service providers need not learn new or hard-to-remember function sequences. The invention sets only minor requirements on the system hardware, so it does not require significant hardware changes. The billing related to the services can be handled in a simple and straightforward manner.

Claims

What is claimed is:

1. A method for using services offered by a telecommunication network comprising at least one switching apparatus (1) and user terminals (3) communicating with it, wherein said switching apparatus (1) can be arranged to offer services via said telecommunication network and said user terminals (3) include output means (7) for displaying information about said services to the user and input means (8, 8a) for making selections concerning said services, **characterized** in that
- a certain service is created and said switching apparatus (1) is made to operate according to said service,
 - a set of instructions is drawn up which, when loaded in a terminal (3), controls said terminal in a manner such that said service can be used via the terminal, displaying on the output means (7) of the terminal information about the service in question and using the input means (8, 8a) to make selections concerning the service in question, and
 - said set of instructions is conveyed to the user to be loaded in the terminal.
2. The method of claim 1, **characterized** in that said set of instructions is delivered to the user by storing it in a separate storage means (6) and delivering said storage means to the user to be loaded in a terminal (3).
3. The method of claim 2, **characterized** in that said storage means (6) is an intelligent card.
4. The method of claim 1, **characterized** in that said set of instructions is delivered to the user by means of data transmission via said telecommunication network.
5. The method of any one of the preceding claims, **characterized** in that said terminal includes pushbuttons (8, 8a) and said set of instructions includes at least instructions
- on the indication of the pushbuttons (8a) that have a special meaning in relation to the service in question, and
 - on how the terminal is to respond when said indicated pushbuttons are pressed.
6. The method of any one of the preceding claims, **characterized** in that said set of instructions is delivered to the user to be automatically loaded in a terminal.

SN. 08/867296

Abstract

The invention relates to the use of intelligent network services from a terminal (3) of a telecommunication network and particularly to the introduction of new services and a programmable user interface of a terminal. A service provider (5) programs service functions in a switching centre (1) of a telecommunication network and delivers to a user a program which is loaded in the user's terminal (3). According to the loaded program the terminal, advantageously a telephone apparatus equipped with a display (7), shows to the user the available services and the corresponding commands assigned to the function keys (8a) of the terminal. The user gives the required commands which advantageously are one-push-of-a-button long and the meanings of which at each particular situation are shown on the terminal's display. Advantageously the program is delivered to the user by loading it in an intelligent card (6) controlling the operation of the terminal.

Fig. 1

Art Unit: 2744

DETAILED ACTION

Claim Rejections - 35 U.S.C. § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371© of this title before the invention thereof by the applicant for patent.

2. Claims 1 and 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Orlen et al, U.S. Patent # 5,579,535.

Regarding claim 1, Orlen et al discloses a telecommunication network (system 10 of figure 1) comprising at least one switching apparatus (network control center 32 in figure 1 and 300 of figure 4) and user terminals (radiotelephones 20, 22 and 24 of figure 1 and 600 of figure 7) communicating with it, wherein said switching apparatus (network control center 32 in figure 1) can be arranged to offer services via said telecommunication network and said user terminals (radiotelephones 20, 22 and 24 of figure 1 and 600 of figure 7) include output means (display 630 of figure 7) for displaying information about said services to the user and input means (keyboard 602 and cursor keys 632, 634, 636 and 638 of figure 7) for making selections concerning said services (column 1 line 49 to column 2 line 7). Orlen et al further discloses a telecommunication network (system 10 of figure 1) which is characterized in that; a certain

Art Unit: 2744

service is created and said switching apparatus (network control center 32 in figure 1 and 300 of figure 4) is made to operate according to said service (column 7 line 50 to column 8 line 25); a set of instructions is drawn up which, when loaded in a terminal (radiotelephones 20, 22 and 24 of figure 1 and 600 of figure 7), controls said terminal in a manner such that said service can be used via the terminal, displaying on the output means (display 630 of figure 7) of the terminal information about the service in question and using the input means (keyboard 602 and cursor keys 632, 634, 636 and 638 of figure 7) to make selections concerning the service in question (column 8 line 54 to column 9 line 46); and said set of instructions is conveyed to the user to be loaded in the terminal (column 8 line 54 to column 9 line 46).

Regarding claim 4, Orlen et al discloses that all of the limitations as set forth in claim 1. Orlen et al further discloses that the said set of instructions is delivered to the user by means of data transmission via said telecommunication network (column 1 lines 49-60).

Claim Rejections - 35 U.S.C. § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2, 5, 6 and 7-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Orlen et al, U.S. Patent # 5,579,535 in view of Johansson et al, U.S. Patent # 5,418,837.

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Regarding claim 2, Orlen et al discloses all of the limitations as set forth in claim 1. However, Orlen et al does not disclose that the said set of instructions is delivered to the user by storing it in a separate storage means (6) and delivering said storage means to the user to be loaded in a terminal (3). Johansson et al discloses a card (22 of figure 1A) to deliver, to a user's mobile terminal, program information to be loaded (column 2 lines 17-41). Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the telecommunication system of Orlen et al with the card of Johansson et al. Many mobile phones now contain a general purpose microprocessor and as such can run a verity of programs. Having a removable card containing program data allows different programs to be implemented on a mobile phone depending on what program is contained on the card used. The card format allows the data to be easily loaded onto the user's phone.

Regarding claim 5, Orlen et al discloses all of the limitations as set forth in claim 1. Orlen et al further discloses a radiotelephone (600 of figure 7) which includes pushbuttons (keyboard 602 and cursor keys 632, 634, 636 and 638 of figure 7). Cursor keys 632, 634, 636 and 638 of figure 7 have a special fixed meaning in relation to the service in question. It is well known in the art that softkeys can also be utilized in such a device. Softkeys' functions are usually defined by an image on a display and therefore there functions are program specific. Orlen et al further discloses that the cursor keys are associated with specific functions within the devices program (column 9 lines 3-47 and figure 7). However, Orlen does not disclose that the set of instructions includes the instructions to relate the keys to specific program functions. Nonetheless

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it would have been inherent if not obvious that in the software the keys of Orlen et al must be associated with specific program functions. Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made that the software in the radiotelephone would associate the keys with specific program functions. Orlen arrow keys, when pressed, cause a cursor on the display to move. This relationship must be set up in the program which is running the service on the radiotelephone. Otherwise the user will not be able to actively utilize the service.

Regarding claim 6, Orlen et al discloses that all of the limitations as set forth in claim 1. Orlen et al further discloses that the set of instructions is received, and hence delivered to, and then stores the instructions (column 10 lines 60-67). However, Orlen does not specifically disclose that the instructions are automatically loaded in a terminal. Nevertheless, it would have been obvious if not inherent that the instructions would be automatically loaded into the terminal. Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made that the instructions would be automatically loaded into the terminal. Having the instruction automatically load into the terminal would ease the use the device for the user.

Regarding claim 7, Orlen et al discloses a telecommunication system (10 of figure 1) for offering intelligent network services to users which comprises at least one switching apparatus (network control center 32 in figure 1 and 300 of figure 4) and user terminals (radiotelephones 20, 22 and 24 of figure 1 and 600 of figure 7) communicating with it, said switching apparatus (network control center 32 in figure 1 and 300 of figure 4) comprising a

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programming interface (remote entry data port 302 of figure 4) for the programming of new services and said terminals radiotelephones 20, 22 and 24 of figure 1 and 600 of figure 7) comprising output means (display 630 of figure 7) for displaying information about said services to the users and input means (keyboard 602 and cursor keys 632, 634, 636 and 638 of figure 7) for making selections concerning said services. Additionally, Orlen et al discloses that transceiver stations (12, 14, 16 and 18 of figure 1) are used for delivering to the users sets of instructions to be loaded in a terminal. However, Orlen et al does not disclose that the telecommunication system is characterized in that it comprises means (6) for delivering to the users sets of instructions concerning new services to be loaded in a terminal (3). Johansson et al discloses a card (22 of figure 1A) used to load sets of instructions to a mobile phone. Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the telecommunication system of Orlen et al with the card of Johansson et al. Many mobile phones now contain a general purpose microprocessor and as such can run a verity of programs. Having a removable card containing program data allows different programs to be implemented on a mobile phone depending on what program is contained on the card used.

Regarding claim 8, Orlen et al discloses a terminal (radiotelephones 20, 22 and 24 of figure 1 and 600 of figure 7) for a telecommunication system (10 of figure 1) which comprises output means (display 630 of figure 7) for displaying to a user information about services offered by said telecommunication system and input means (keyboard 602 and cursor keys 632, 634, 636 and 638 of figure 7) for making selections concerning said services, characterized in that it

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comprises means (654, 660, 652 and 650 of figure 8) for loading sets of instructions concerning new services, means (668, 664, 654 and 660 of figure 8) for displaying information about said new services to the user in a manner determined by said sets of instructions, and means (666, 670, 660 and 654 of figure 8) for making user selections concerning said new services in a manner determined by said sets of instructions. However Orlen et al does not disclose that the means for loading sets of instructions concerning new services includes element 11 (card reader). Johansson et al discloses a card reader (20 of figure 1A) used to load sets of instructions to a mobile phone. Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the telecommunication system of Orlen et al with the card reader of Johansson et al. Many mobile phones now contain a general purpose microprocessor and as such can run a verity of programs. Having a removable card containing program data allows different programs to be implemented on a mobile phone depending on what program is contained on the card used.

Regarding claim 9, Orlen et al in view of Johansson et al discloses all of the limitations as set forth in claim 8. Johansson et al further discloses that mobile terminal comprises a reader (20 of figure 1A) for loading said sets of instructions from a card (22 of figure 1A).

Regarding claim 10, Orlen et al in view of Johansson et al discloses all of the limitations as set forth in claim 8. Orlen et al further discloses that terminal (radiotelephones 20, 22 and 24 of figure 1 and 600 of figure 7) is a telephone apparatus (column 2 lines 44-54).

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Regarding claim 11, Orlen et al in view of Johansson et al discloses all of the limitations as set forth in claim 10. Orlen et al further discloses that terminal (radiotelephones 20, 22 and 24 of figure 1 and 600 of figure 7) is a mobile phone in a cellular radio network (system 10 of figure 1) (column 2 lines 44-54).

5. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Orlen et al, U.S. Patent # 5,579,535 in view of Kurgan, U.S. Patent # 5,615,260.

Regarding claim 3, Orlen et al discloses all of the limitations as set forth in claim 1. However, Orlen et al does not disclose that said storage means (6) is an intelligent card. Kurgan teaches of a smart card insertable into a phone that contains memory (column 1 lines 22-40). Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the telecommunication system of Orlen et al with the card of Kurgan. The card format allows the data to be easily loaded onto the user's phone. Such data could be intelligently used to provide services to the specific user.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Novis et al, U.S. Patent # 5,867,795.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Raymond Persino whose telephone number is (703) 308-7528.

Art Unit: 2744

The examiner can normally be reached on Monday-Thursday from 8:00 AM to 5:30 PM. The examiner can also be reached on alternate Fridays from 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dwayne Bost, can be reached on (703) 305-4778. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-9508.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 308-9051, (for formal communications intended for entry)

Or:

(703) 305-305-9058 (for informal or draft communications, please label

"PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA., Sixth Floor (Receptionist).

Ray Persino

RP

February 26, 1999


DWAYNE D. BOST
SUPERVISORY PATENT EXAMINER
GROUP 2700



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

K. Ward
7/12/99
#8/Amend B
Int.

In re PATENT APPLICATION of: Ali-Vehmas et al.

SERIAL NO.: 08/867,296

ART UNIT: 2744

FILED: 06/02/97

EXAMINER: Persino, R.

TITLE: METHOD FOR USING SERVICES OFFERED BY A
TELECOMMUNICATION NETWORK SYSTEM AND A TERMINAL
NETWORK, A TELECOMMUNICATION SYSTEM AND A TERMINAL
FOR IT

ATTORNEY DOCKET NO.: 297-007262-US (PAR)

Hon. Commissioner of Patents and Trademarks
Washington, DC 20231

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GROUP 2700

AMENDMENT

Dear Sir:

In response to the Official Action dated March 5, 1999, (Paper No. 6). Please amend this application as follows:

IN THE SPECIFICATION

On Page 1 at Line 5, before this line, insert the heading --BACKGROUND OF THE INVENTION--.

On Page 2 at Line 31, before this line, insert the heading --SUMMARY OF THE INVENTION--.

On Page 4 at Line 37, before this line, insert the heading --BRIEF DESCRIPTION OF THE DRAWING--.

07/07/1999 SSANDARA 00000015 08867296

01 FC:115

110.00 OP

07/07/1999 SSANDARA 00000015 08867296

02 FC:102

156.00 OP

1

On Page 5 at Line 9, before this line, insert the heading --DETAILED DESCRIPTION OF THE INVENTION--.

On Page 11, before Claim 1, insert --What is claimed is:--.

IN THE CLAIMS

B1
Cmt

1. (Amended) A method for using services offered by a telecommunication network comprising at least one switching apparatus [(1)] and user terminals [(3)] communicating with [it] the network, wherein said switching apparatus [(1)] can be arranged] is operative to offer services via said telecommunication network, and said user terminals [(3)] include output means [(7)] for displaying information about said services to [the] a user and input means [(8, 8a)] for making selections concerning said services, [characterized in that] wherein the method comprises steps of :

[-] creating a [certain] service [is created] and operating said switching apparatus [(1)] is made to operate] according to said service[,];

[-] drawing up a set of executable instructions [is drawn up] which, when loaded in [a] one of said terminals [(3)], controls said terminal in a manner such that said service can be used via the terminal[,];

displaying on the output means [(7)] of the terminal information about the service [in question] and using the input means [(8, 8a)] to make selections concerning the service [in question,]; and

[-] conveying said set of executable instructions [is conveyed] to the user to be loaded in the terminal.

B1
Amended

2. (Amended) The method of claim 1, [characterized in that] wherein said set of instructions is delivered to the user by storing [it] the set of instructions in a separate storage means [(6)] and delivering said storage means to the user to be loaded in [a] said terminal (3).

3. (Amended) The method of claim 2, [characterized in that] wherein said storage means [(6)] is an intelligent card.

4. (Amended) The method of claim 1, [characterized in that] wherein said set of instructions is delivered to the user by means of data transmission via said telecommunication network.

B2

5. (Twice amended) The method of claim 1, [characterized in that] wherein said input means of said terminal includes pushbuttons [(8, 8a)] and said set of instructions includes at least instructions [- on the] defining an indication of the pushbuttons [(8a)] that have a special meaning in relation to the service [in question], and defining [- on] how the terminal is to respond when said [indicated] pushbuttons are pressed.

6. (Twice amended) The method of claim 1, [characterized in that] wherein said set of instructions is delivered to the user to be automatically loaded in a terminal.

B3
Cont
14

7. (Amended) A telecommunication system for offering intelligent network services to users [which comprises], the system comprising at least one switching apparatus [(1)] and

13
Cont.

user terminals [(3)] communicating with [it] a network,
wherein

said switching apparatus [(1) comprising] comprises a
programming interface [(4)] for [the] programming of new
services [and];

said terminals [(3) comprising] comprise output means
[(7)] for displaying information about said services to
[the] users, and input means [(8, 8a)] for making selections
concerning said services[, characterized in that it]; and

said system further comprises means [(2; 6)] for
delivering to the users sets of executable instructions
concerning the new services to be loaded in a terminal
[(3)].

8. (Amended) A terminal [(3)] for a telecommunication
system [which comprises], the terminal comprising output
means [(7)] for displaying to a user information about
services offered by said telecommunication system and input
means [(8, 8a)] for making selections concerning said
services, [characterized in that it] wherein

said terminal further comprises means [(9, 10, 11,
12)] for loading sets of executable instructions concerning
new services, means [(7, 9, 10)] for displaying information
about said new services to [the] a user in a manner
determined by said sets of executable instructions, and
means [(8, 9, 10)] for making user selections concerning
said new services in a manner determined by said sets of
executable instructions.

9. (Amended) The terminal [(3)] of claim 8,
[characterized in that it comprises] further comprising

means [(11)] for loading said sets of instructions from a portable storage means [(6)].

B3
Cmcl

10. (Amended) The terminal [(3)] of claim 8, [characterized in that it] wherein said terminal is a telephone apparatus.

11. (Amended) The terminal [(3)] of claim 10, [characterized in that it] wherein said terminal is a mobile phone in a cellular radio network.

[Please enter the following claims.]

B4
Cmcl

12. A method for using services offered by a telecommunication network comprising at least one switching apparatus and user terminals communicating with the switching apparatus, wherein said switching apparatus is operative to offer services via said telecommunication network, and said user terminals include output means for displaying information about said services to a user and input means enabling the user to make selections concerning said services, the method comprising steps of:

creating a service and directing said switching apparatus to operate according to said service;

conveying a set of executable instructions to the user to be loaded in one of said user terminals; and

applying said set of instructions to the user terminal, and controlling said terminal by said executable instructions to operate with said service, displaying on the output means of the terminal information about the service, and using the input means of the terminal to make selections concerning the service.

13. A telecommunication system for offering intelligent network services to users, the system comprising at least one switching apparatus and user terminals communicating with a network, wherein

BY
Cond
said switching apparatus comprises a programming interface for a programming of new services;

said terminals comprise output means for displaying information about said services to users, and input means for making selections concerning said services;

said system further comprises means for delivering to the users sets of executable instructions concerning new services to be loaded in a terminal; and

said terminals are responsive to said executable instructions in accordance with a user selected one of a plurality of services for communicating data via said network.

REMARKS

In the Official Action, Claims 1 and 4 were rejected under 35 U.S.C. 102(e) as being anticipated by Orlen (US 5,579,535). Claims 2, 5, 6, and 7-11 were rejected under 35 U.S.C. 103 as being unpatentable over Orlen in view of Johansson (US pat. 5,418,837), and Claim 3 was rejected under 35 U.S.C. 103 as being unpatentable over Orlen in view of Kurgan (US pat. 5,615,260) for reasons set forth in the Action.

Reconsideration of these rejections is requested respectfully in view of the amendment and argument herein.

To facilitate an understanding of the difference between the present invention and the teachings of Orlen, the following discussion of Orlen is presented.

Orlen discusses the combination of simple textual messaging to other telephony services. Orlen uses the designation "positional information" for the (relative) locations of the base stations, and "localized information" for such simple textual matter that describes some activity of commercial value taking place at a certain location. As an example of positional information, Orlen mentions a coverage map of the cellular radio system, and as examples of localized information he mentions e.g. service station gas prices and location, restaurant and hotel location, retail store sale information, movie guides, airline departure and arrival information and so forth.

The difference between the Orlen reference and the present invention arises from the fact that according to Orlen, the portable terminals of the cellular radio system must be previously aware of the information distribution system so that they just download the information transmitted by the base stations and present it to the user. The present invention covers a much wider application field: it is not just simple textual (or graphical) user-presentable information that is downloaded "from the sky" to the portable terminals, but even completely new service procedures. In other words, the invention provides the opportunity to load a kind of a "computer program" into the terminal, so that after the downloading, the terminal is able to function in a way of which it had no idea

previously. This "remote programming" of the terminal is examined in greater detail.

The present specification (page 3, beginning at line 35) teaches that software controlling the operation of the terminal includes an extension interface whereby the user or the service provider can add features to the operation of the terminal. There is an indication to the user of the services offered, and the actions required by the user to use them. The commands corresponding to the user's selections are sent to the switching center of the network. In other words, such additions can be made to the operational alternatives offered to the user of a terminal where two-way communication between the terminal and the network takes place in a completely unprecedented manner.

It is useful to analyze the Orlen reference against this background. Starting at the abstract, Orlen calls for a database to be stored in at least a base station; a database is a collection of records, each holding a piece of information. A terminal may request the transmission of the database, receive it and present at least a part thereof to the user. It is necessary that the terminal must have been previously programmed so that the terminal knows how to request the database transmission, how to receive it and how to present at least part thereof to the user. The only thing that is downloaded from the base station to the Orlen terminal is the database itself, i.e. the collection of records, each holding a piece of information. No additional operational features can be downloaded to the Orlen terminal.

The details of downloading information start at column 10, line 45 of Orlen. At the occurrence of a certain initiation from the user, the terminal establishes a signaling connection with a telepoint base station and receives the available positional information and a "directory" or a menu of available localized information options. The contents of the positional information and the menu may naturally vary from time to time and from place to place, but the terminal knows beforehand that what it will receive is a piece of positional information and a menu. The user may select an item from the menu, whereby the terminal may request further information to be transmitted concerning that menu item.

The above-described terminal of Orlen does not comprise any software extension interfaces, so that no features can be added to the operation of the terminal. The Orlen terminal is able to request database transmissions, present at least part of received information to the user and further request for additional information about a selected menu item. Downloading a different database or a different piece of information does not add any features to the operation of the terminal. As a comparison to the situation of reading a book, it is noted that opening a different book does not add anything to a human reader's ability to read. While the downloaded features in Orlen may indicate to a user the services offered, nevertheless, the actions required to use the services must be present in the terminal prior to the downloading step; and the actions required to insure that the commands corresponding to the user's selections are sent to the switching center must be present in the terminal prior to the downloading step.

Present claim 1, at the third paragraph thereof, recites that a set of instructions is drawn up which, when loaded in a terminal, controls the terminal in a manner such that the service can be used via the terminal, displaying on the output means of the terminal information about the service and using the input means to make selections concerning the service. This passage emphasizes that the instructions which will be loaded to the terminal are executable instructions, and not just pieces of information in a database as taught in Orlen. Claims 1, 7, 8, as amended, and claims 12 and 13 recite "executable instructions" to emphasize this distinction between the present invention and Orlen. This finds support in the present specification on page 4, lines 24-26, which teaches that the programming of extension and update information into the telephone for a new service must be expressed in the form of a computer program or corresponding instructions. Also, in the present specification on page 8 at lines 6-7, there is a teaching of implementing, by programming, the commands corresponding to their execution in the form of a computer program.

The claims have also been amended for clarification and for emphasis of the novel features of the present invention.

Thereby, this amendment of the claims and the argument are believed to overcome the rejections under 35 U.S.C. 102 and 103 so as to secure allowance of the claims.

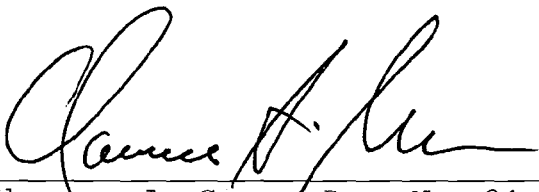
The foregoing amendment is believed to meet all the points raised by the Examiner so as to place the claims in condition for allowance. If any of the matters raised in the Action or any further matters have not been adequately resolved by this amendment, a telephone interview between Applicant's representative and the Examiner is requested in order to resolve any such outstanding matters.

Formal drawings conforming to the requirements of PTO form 948 are to be provided in due course, and upon an indication of allowable subject matter.

Please charge deposit account No. 16-1350 for any fee deficiencies with regard to the filing of this Amendment.

It is submitted respectfully that all the claims are now in condition for allowance in that they patently distinguish over the art. Accordingly, a favorable action indicating such condition is earnestly solicited.

Respectfully submitted,



Clarence A. Green, Reg. No. 24,622

30 June 99
Date

Perman & Green, LLP
425 Post Road
Fairfield, CT 06430
(203) 259-1800

CERTIFICATE OF MAILING

I hereby certify that the attached correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, DC 20231.

Francy J. Smyke
Name of Person Making Deposit

6/30/99
Date

EXHIBIT 31



US005579535A

United States Patent [19]**Orlen et al.**[11] **Patent Number:** **5,579,535**[45] **Date of Patent:** **Nov. 26, 1996****[54] PERSONAL COMMUNICATION SYSTEM
PROVIDING SUPPLEMENTAL
INFORMATION MODE****[75] Inventors:** **Noah P. Orlen; Robert L. Breeden;
Richard E. Bessom**, all of Boca Raton,
Fla.**[73] Assignee:** **Motorola, Inc.**, Schaumburg, Ill.**[21] Appl. No.:** **369,553****[22] Filed:** **Jan. 6, 1995****Related U.S. Application Data****[63]** Continuation of Ser. No. 8,117, Jan. 25, 1993, abandoned,
which is a continuation-in-part of Ser. No. 724,279, Jul. 1,
1991, abandoned.**[51] Int. Cl.⁶** **H04Q 7/22; H04Q 7/26****[52] U.S. Cl.** **455/33.1; 455/56.1; 455/89;
340/905; 340/995****[58] Field of Search** **455/33.1, 53.1,
455/54.1, 54.2, 56.1, 89; 340/905, 995;
345/145, 146, 147****[56] References Cited****U.S. PATENT DOCUMENTS**

4,974,170	11/1990	Bouve et al.	364/518
5,068,838	11/1991	Klausner et al.	455/51.1
5,133,081	7/1992	Mayo	455/66
5,173,691	12/1992	Sumner	340/905

5,402,117 3/1995 Zijderhand 340/905

FOREIGN PATENT DOCUMENTS

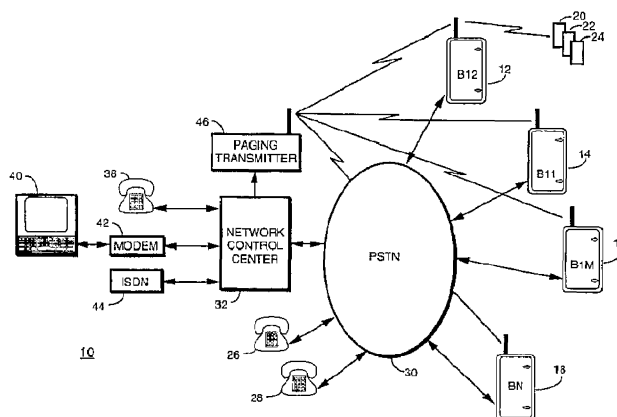
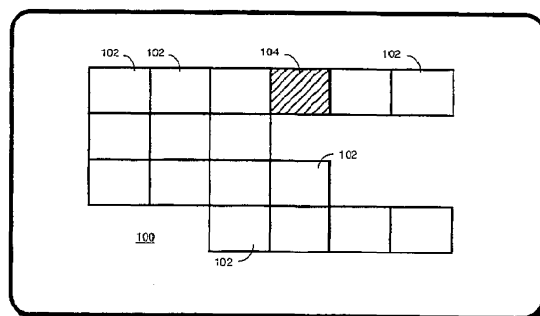
0349430	1/1990	European Pat. Off.	340/905
2216319	10/1989	United Kingdom	379/61

OTHER PUBLICATIONS

Motorola Catalog Sheet R3-23-01, Silverlink 2000 Personal Telephone, CT2/CAI Compatible, published 1990.
Motorola Catalog Sheet R3-23-03, Silverlink Telepoint Base Station, CT2/CAI Compatible, published 1990.
Motorola Catalog Sheet R3-23-04, Silverlink MNCC and MBBS, published 1990.

Primary Examiner—Edward F. Urban*Attorney, Agent, or Firm*—Kelly A. Gardner**[57] ABSTRACT**

A personal communication system (10) comprises transceiver stations (12, 14, 16, 18) providing communication capability between one or more portable radiotelephones (20, 22, 24) and a telephone network (30). One or more of the transceiver stations (12, 14, 16, 18) is further capable of storing a data base and of transmitting the same in response to a request for such transmission being received from a portable radiotelephone (20, 22, or 24) communicating therewith. The portable radiotelephone (20, 22, or 24) communicating therewith is capable thereafter of receiving the data base and of presenting at least a portion of the same to the radiotelephone subscriber.

16 Claims, 11 Drawing Sheets

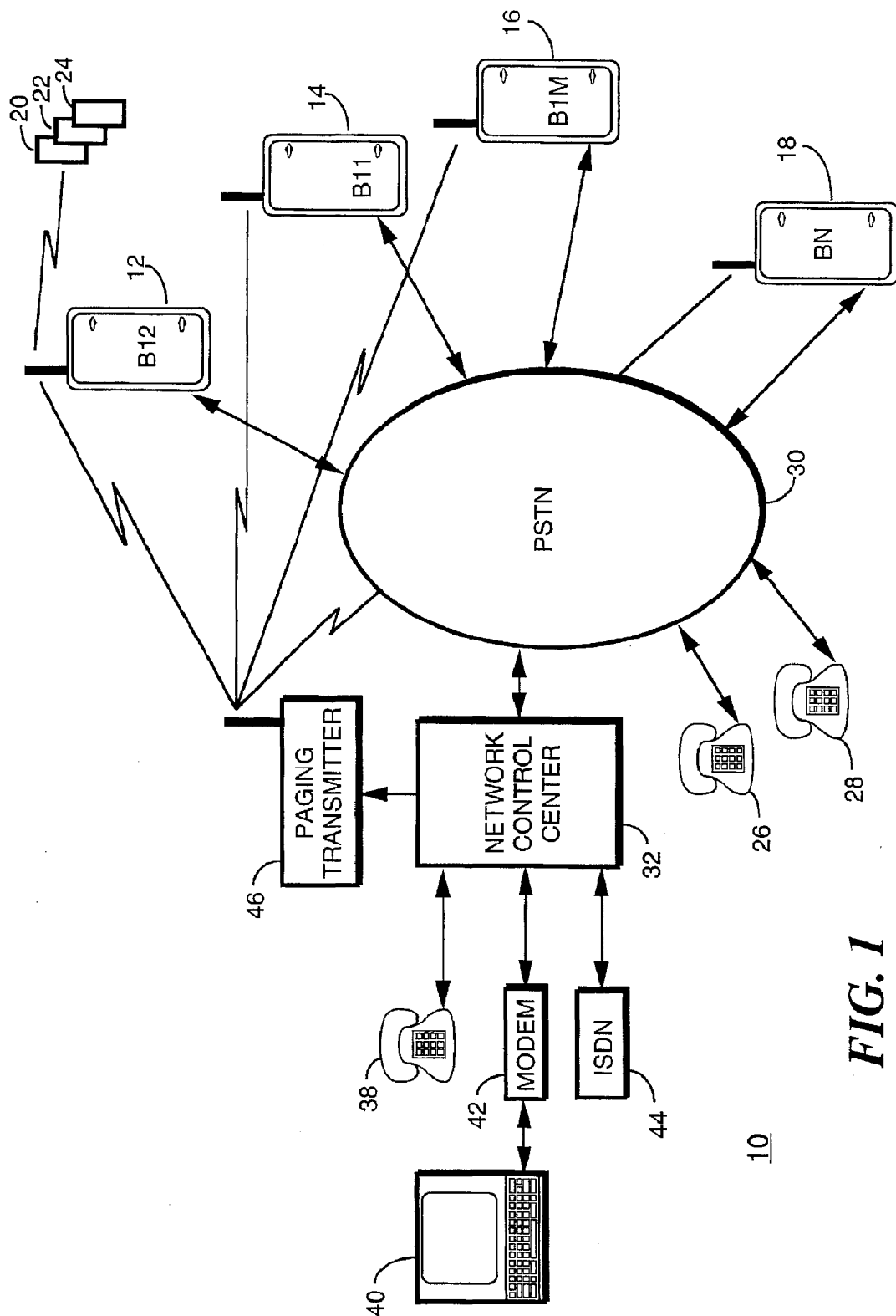


FIG. 1

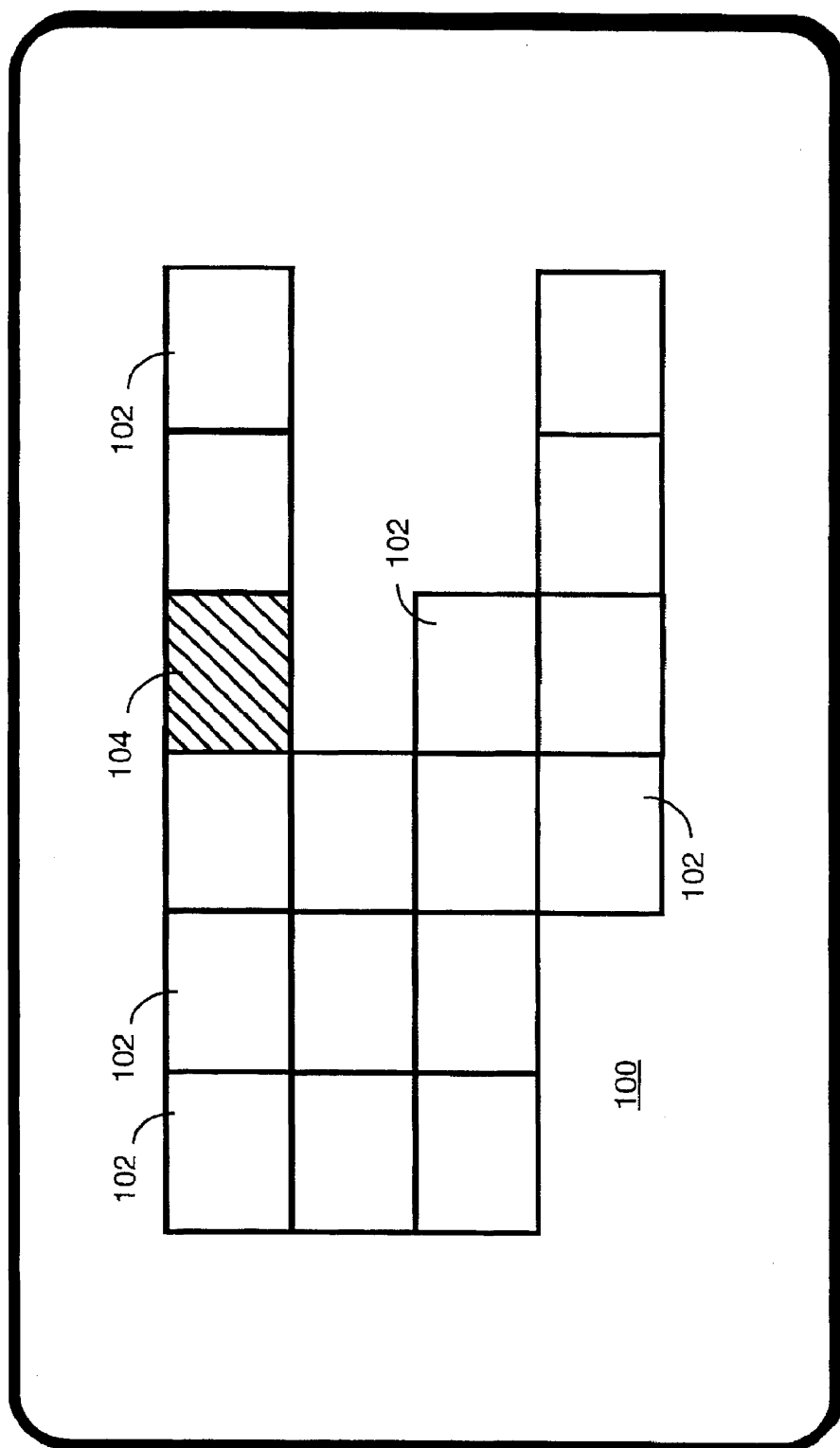
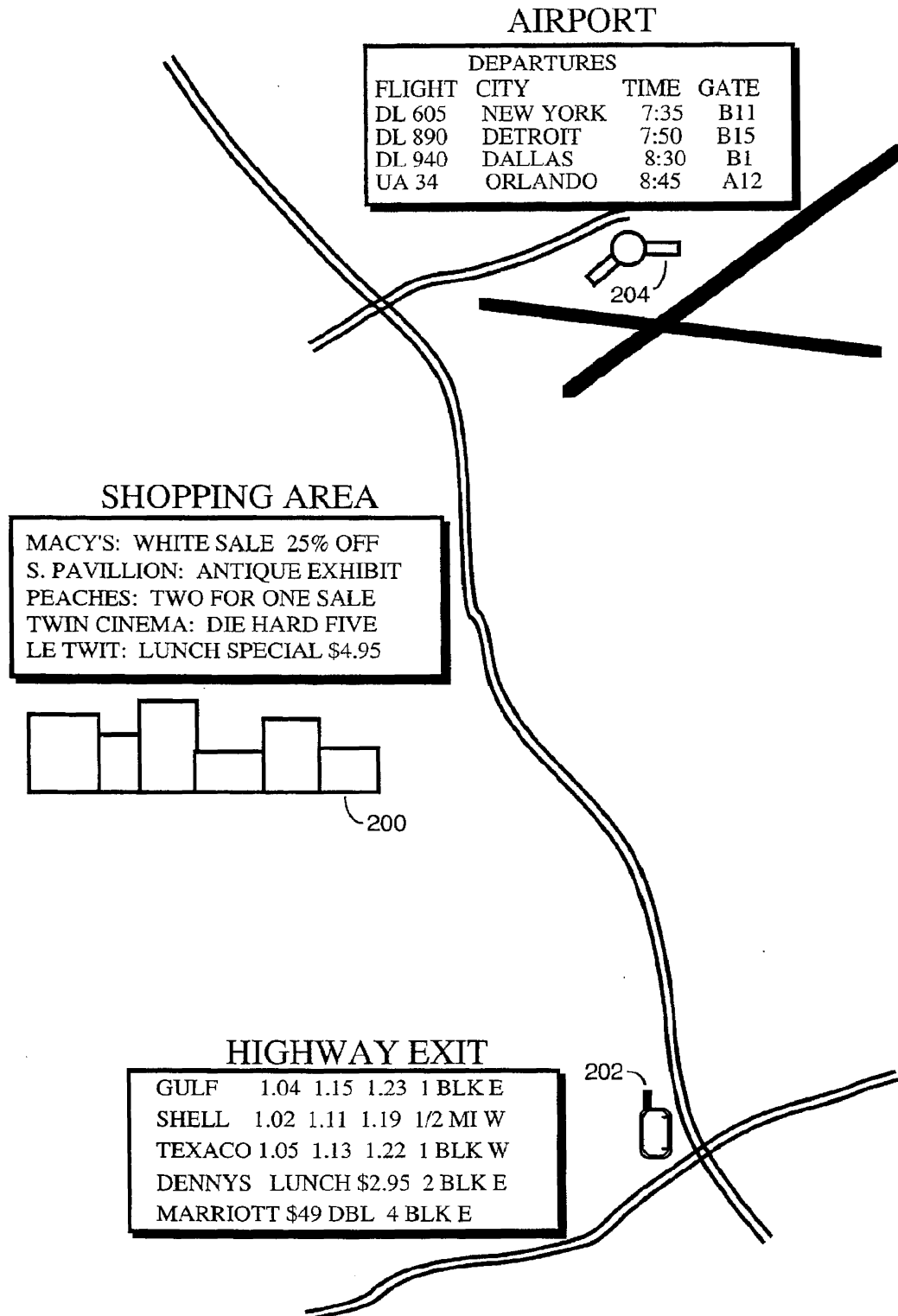


FIG. 2

**FIG. 3**

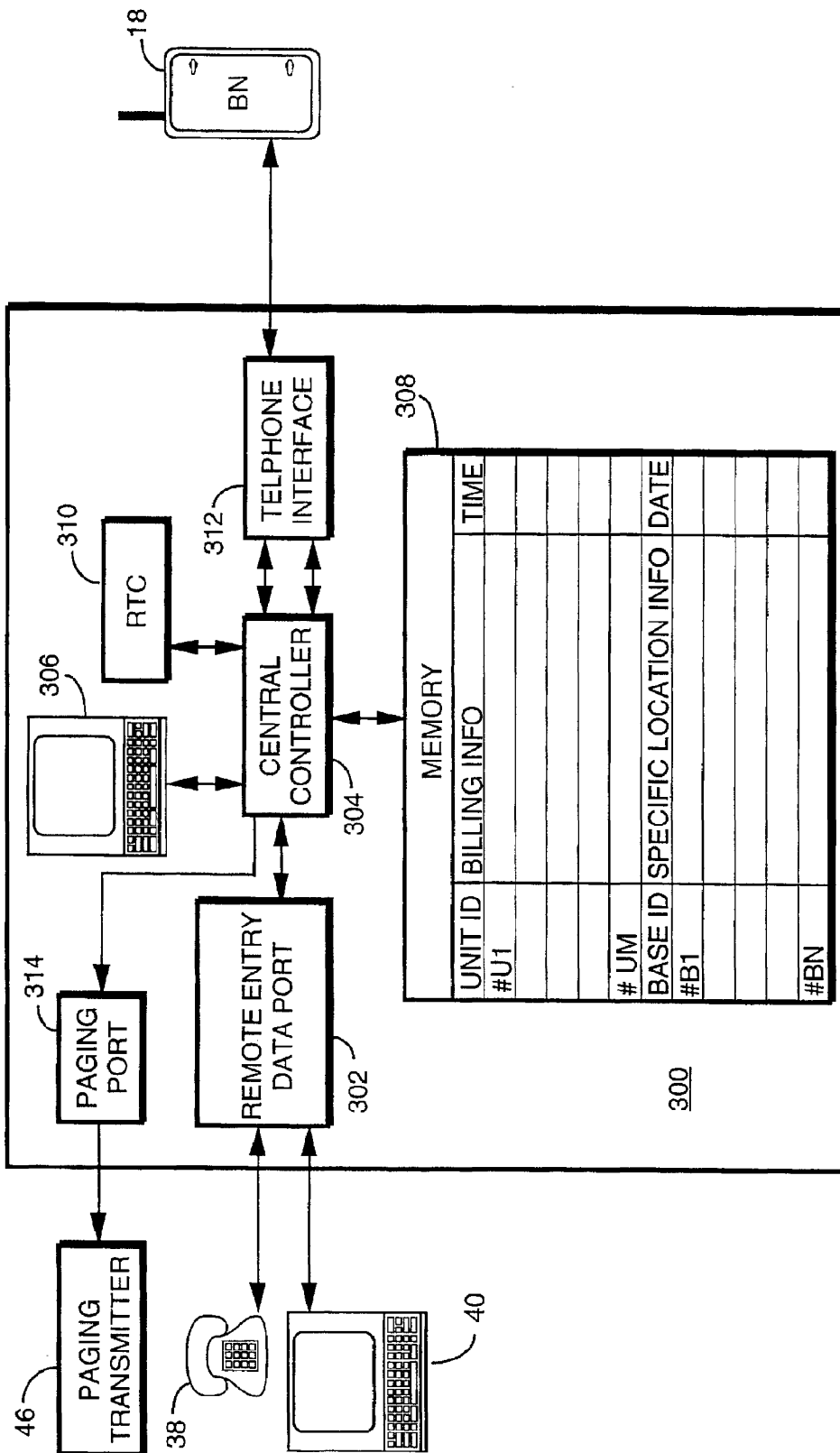
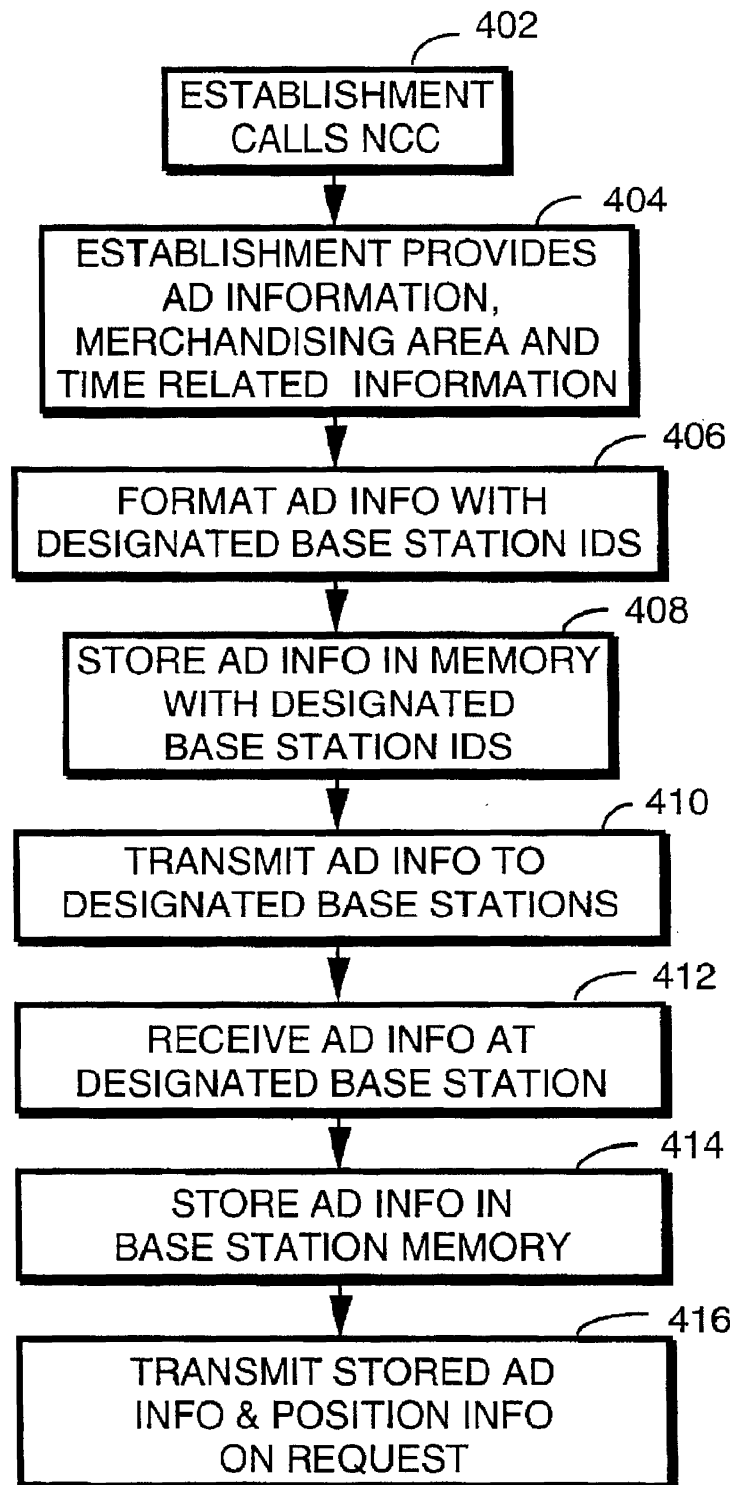


FIG. 4

**FIG. 5**

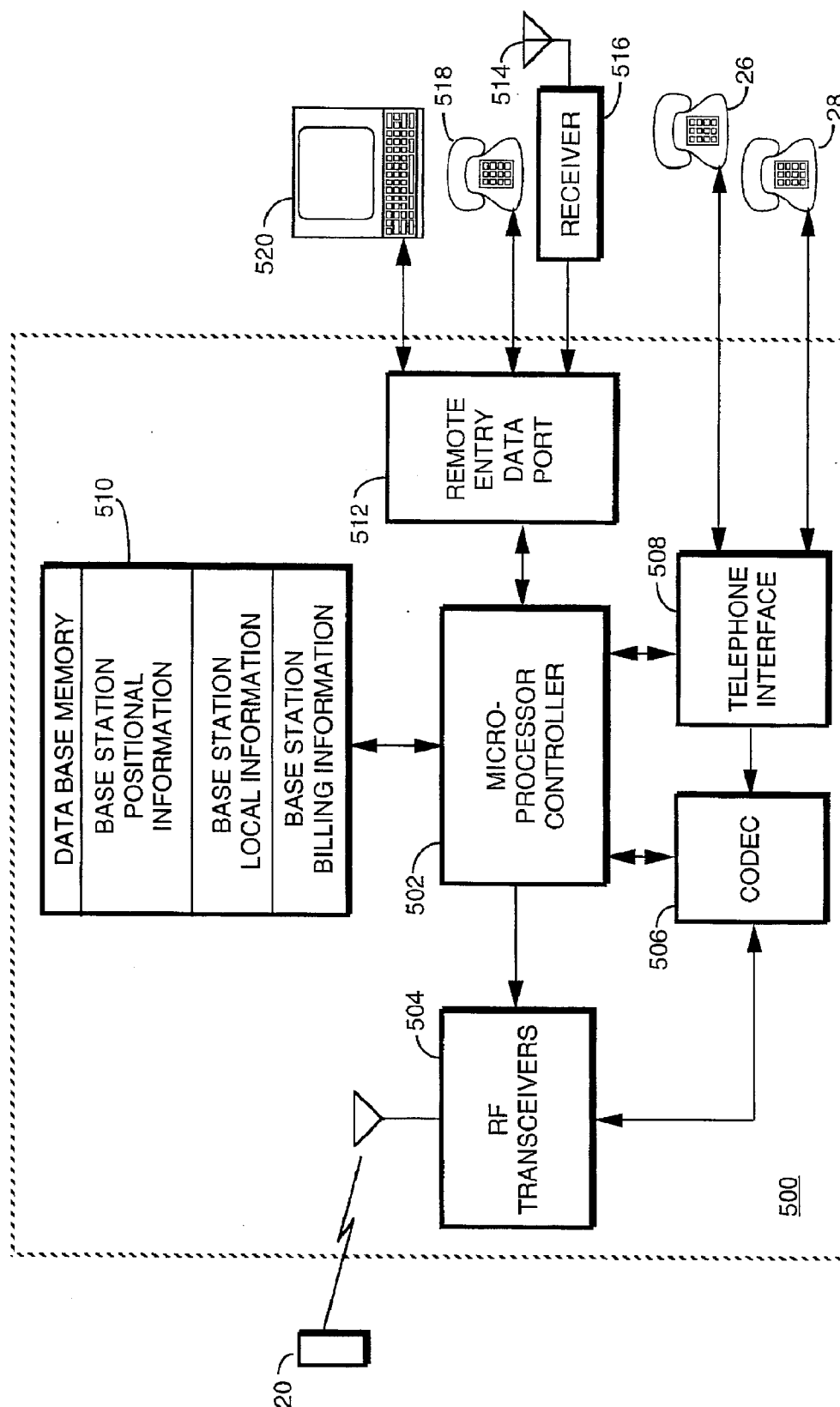
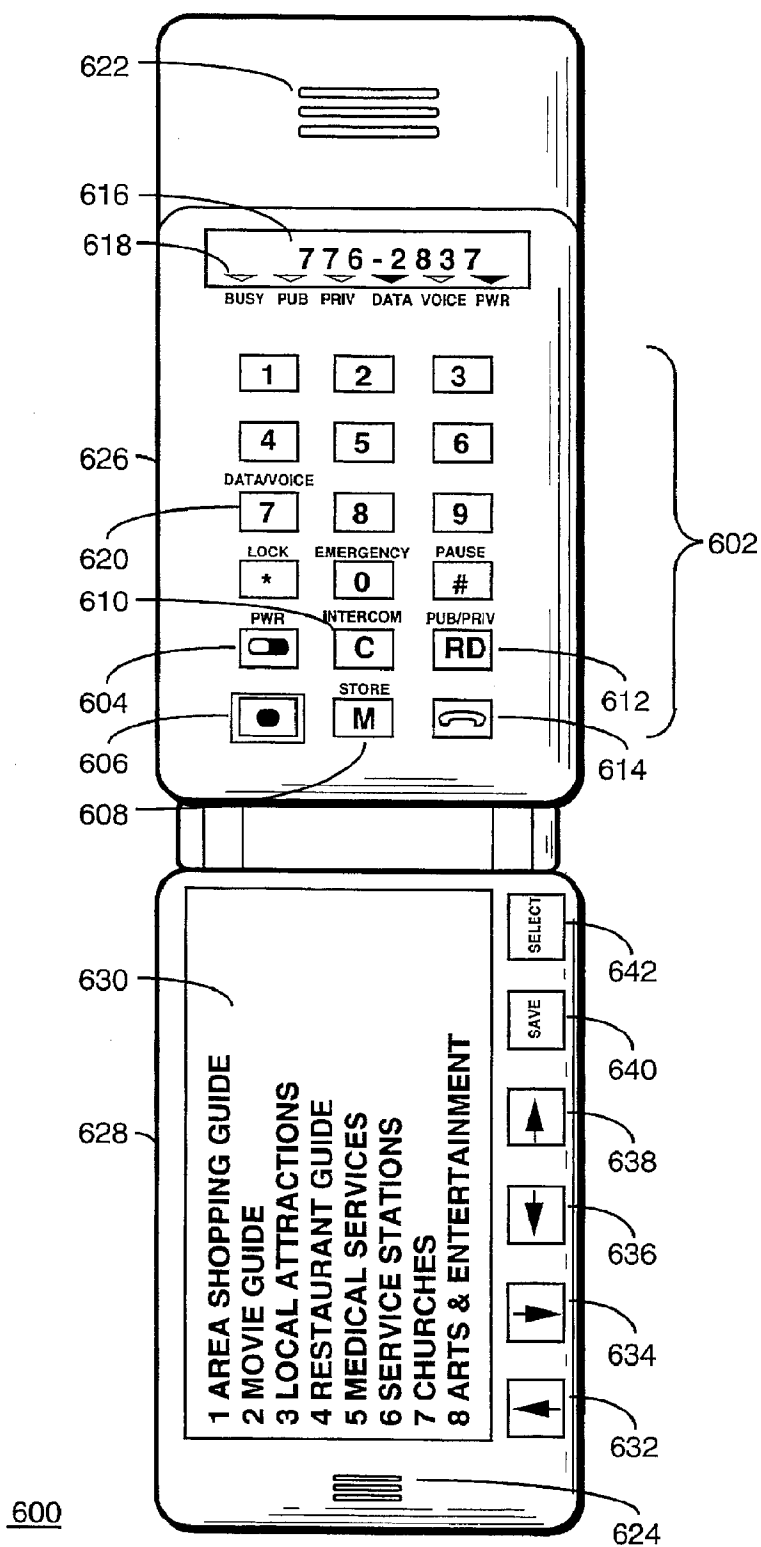
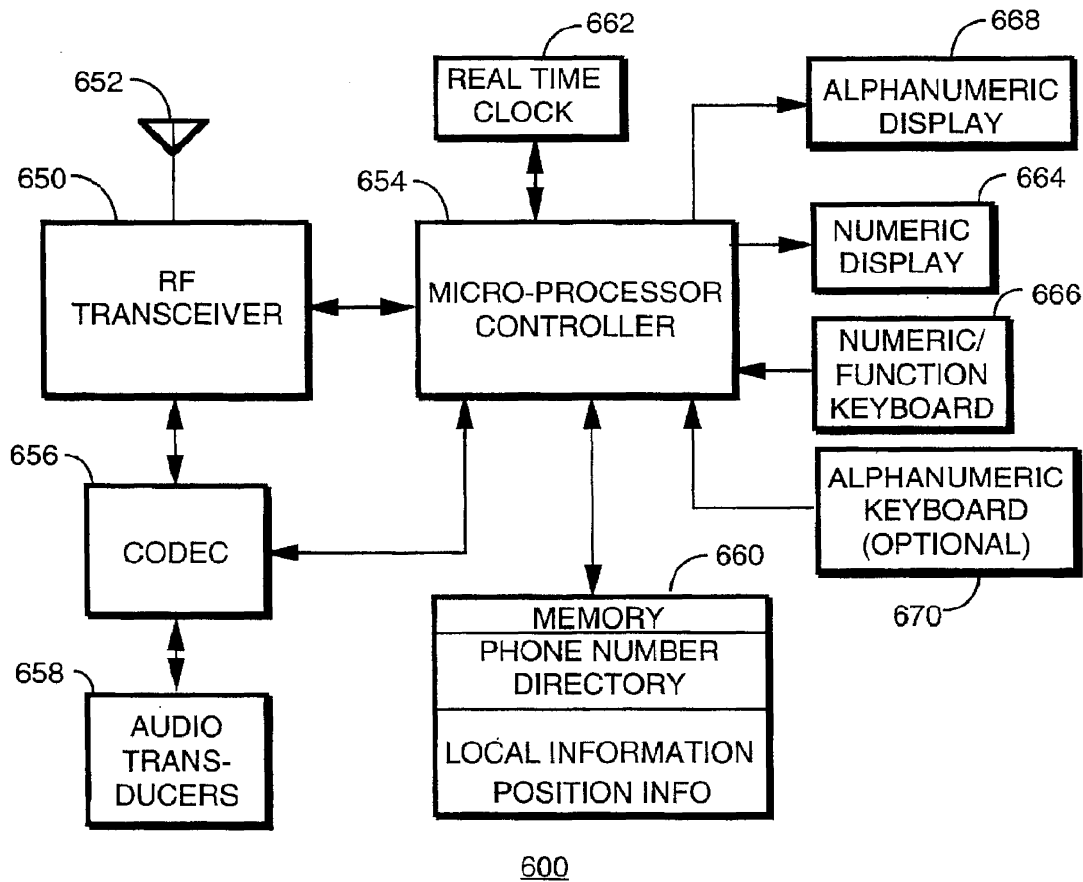


FIG. 6

**FIG. 7**

**FIG. 8**

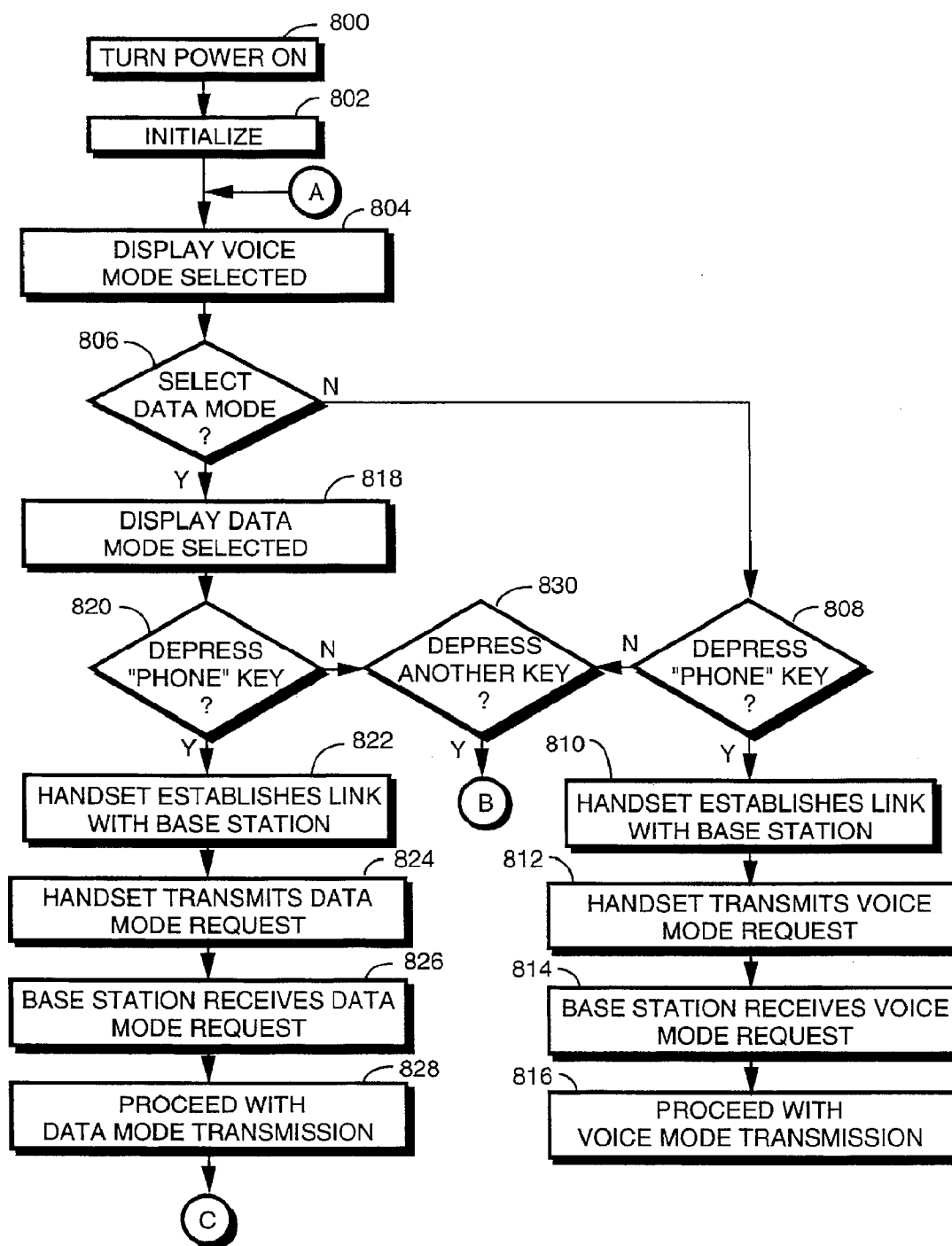


FIG. 9

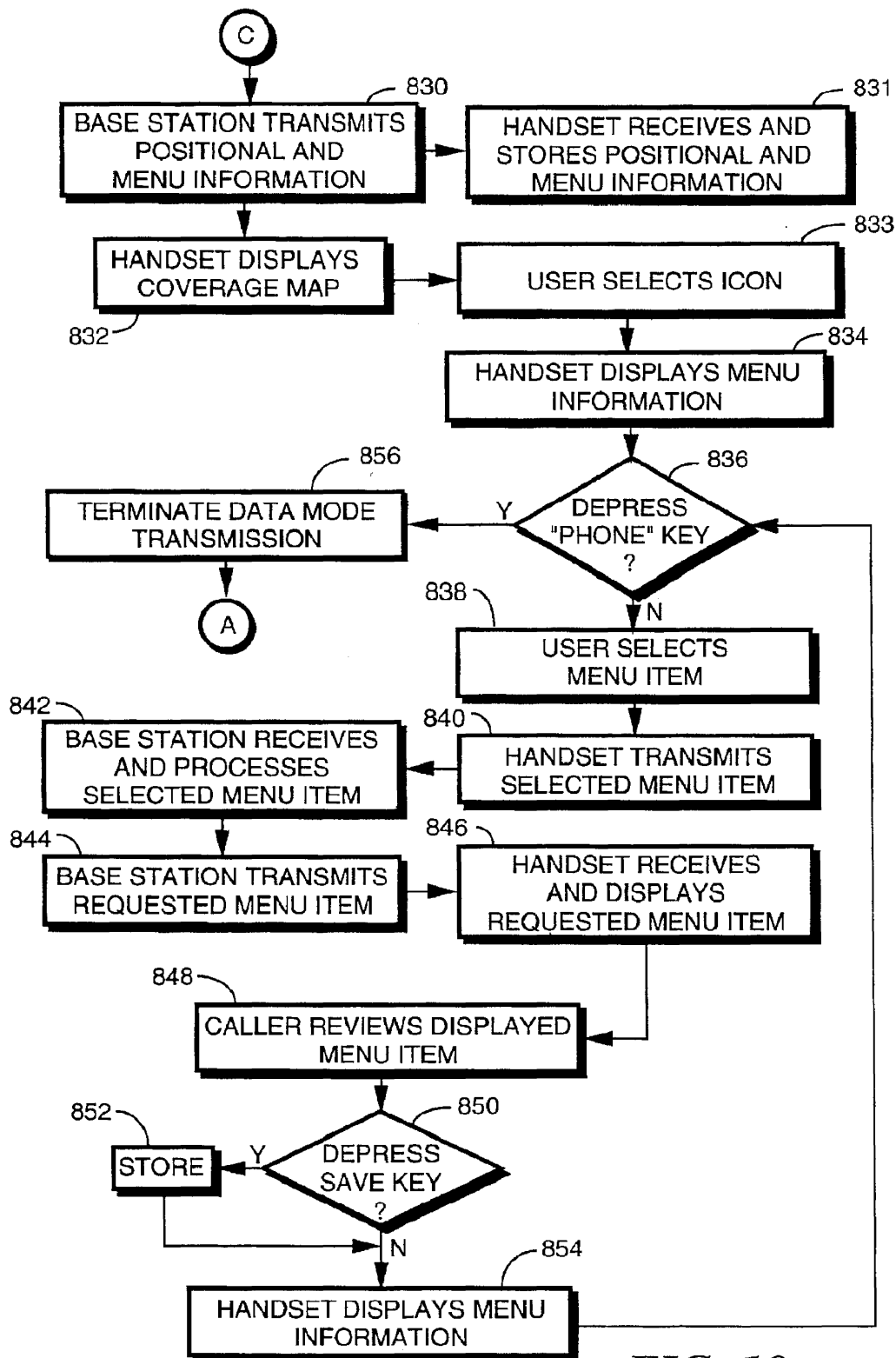
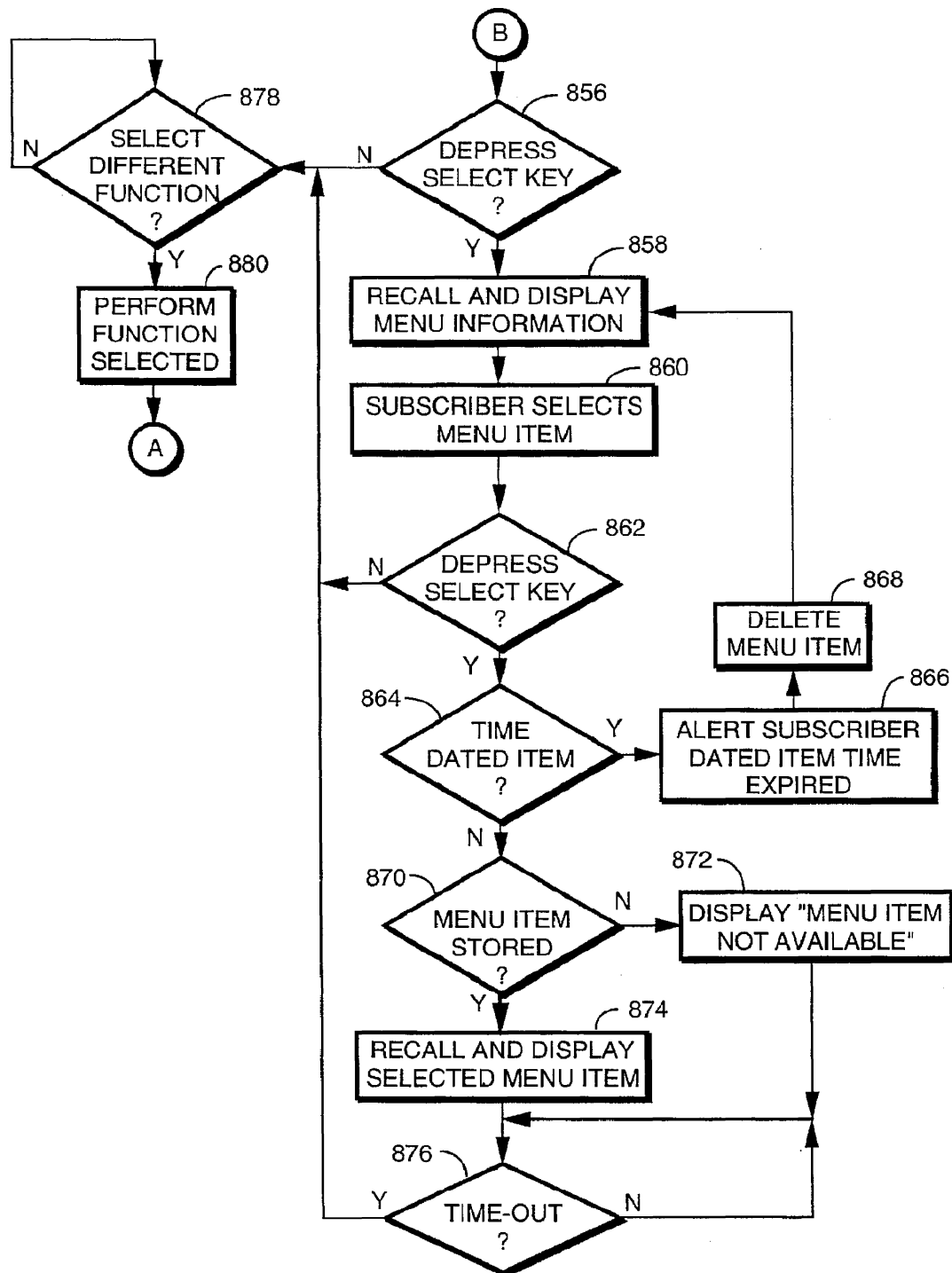


FIG. 10

**FIG. 11**

1

PERSONAL COMMUNICATION SYSTEM PROVIDING SUPPLEMENTAL INFORMATION MODE

RELATED APPLICATIONS

This is a continuation of application Ser. No. 08/008,117 filed on Jan. 25, 1993, now abandoned, which is a CIP of application Ser. No. 07/724,279, now abandoned.

FIELD OF THE INVENTION

The present invention relates generally to the field of personal communication systems, and more particularly to wireless data communication systems.

BACKGROUND OF THE INVENTION

Personal communication systems have greatly enhanced and expanded telecommunications in the United States and throughout the world. Examples of such personal communications systems include both cellular communication systems and cordless radiotelephone systems such as the CT-2 (second generation cordless telephone) and DECT (digital European cordless telephone) systems. These systems have provided wireless communication access to the Public Switched Telephone Network (PSTN) with the use of a plurality of fixed location telepoint base stations which have provided voice communication capability between a plurality of portable radiotelephone handsets and conventional telephone receivers.

In conventional cellular communication systems, a number of cells, i.e., base stations and their associated coverage areas, are widely distributed throughout different geographic areas. In CT-2 systems, as compared to cellular communication systems, a greater number of telepoint base stations have had to be distributed throughout different geographic areas because of the relatively low power outputs provided in the portable radiotelephone handsets. Both systems, however, generally include landmarks such as shopping malls, airports, restaurants, etc., within the coverage areas of the base stations. There is a need, therefore, to be able to provide not only conventional telecommunication capability to the system subscribers, but also data communication capability in which information of interest could be relayed to system subscribers.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention, a personal communication system comprises transceiver stations providing communication capability between one or more portable units and a wireline network, wherein one or more of the transceiver stations is further capable of storing a data base and of transmitting the same in response to a request for such transmission being received from a portable unit communicating therewith. The data base includes at least positional information pertaining to relative locations of the transceiver stations, and the portable unit communicating therewith is capable of receiving the data base and of presenting at least a portion of the same.

According to a second aspect of the present invention, in a personal communication system which includes transceiver stations to provide communication between a portable unit and a wireline network, wherein the transceiver stations further are capable of storing and transmitting a data base, the portable unit comprises means for generating and transmitting a request to receive the data base stored within a

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transceiver station through which communication is established. The data base includes at least positional information pertaining to relative locations of the transceiver stations. The portable unit further comprises a receiver for receiving the data base transmitted by the transceiver station and a presentation device for presenting at least a portion of the data base.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an electrical block diagram of a personal communication system in accordance with the preferred embodiment of the present invention.

FIG. 2 is a pictorial diagram of an application of the positional information in accordance with the preferred embodiment of the present invention.

FIG. 3 is a pictorial diagram depicting the application of providing localized information in accordance with the preferred embodiment of the present invention.

FIG. 4 is an electrical block diagram of the network control center in accordance with the preferred embodiment of the present invention.

FIG. 5 is a flow chart depicting the formatting of the localized information in accordance with the preferred embodiment of the present invention.

FIG. 6 is an electrical block diagram of the transceiver station in accordance with the preferred embodiment of the present invention.

FIG. 7 is a pictorial diagram depicting the portable radiotelephone in accordance with the preferred embodiment of the present invention.

FIG. 8 is an electrical block diagram of the portable radiotelephone in accordance with the preferred embodiment of the present invention.

FIGS. 9-11 are flow charts depicting the operation of the portable radiotelephone and the transceiver station in accordance with the preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the figures, FIG. 1 is an electrical block diagram of a personal communication system in accordance with the preferred embodiment of the present invention. As shown in FIG. 1, a personal communication system 10 includes a plurality of transceiver stations 12, 14, 16 and 18 (of which four are shown) which are used to provide data and/or voice communication between one or more portable units, such as radiotelephones 20, 22 and 24 (of which three are shown) and conventional telephone handsets 26, 28 through a wireless data network, e.g., the Public Switched Telephone Network (PSTN) 30. Examples of such a personal communication system 10 which provides voice communication and/or data transmission capability are well known in the art, and include such personal communication systems as the newer cordless radiotelephone systems such as the CT-2 (second generation cordless telephone) and DECT (digital European cordless telephone) systems. In such cordless radiotelephone systems, voice communication is originated by one of the portable radiotelephone handsets, such as handset 20, which is in range of a transceiver station, such as a CT-2 telepoint base station 12.

For purposes of illustration, the description to follow will focus on a personal communication system, such as the CT-2 cordless radiotelephone system, although it will be appre-

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ciated that other forms of personal communication systems, such as other cordless telephone and cellular communication systems can also provide the voice communication capability between a portable radiotelephone handsets, such as handset 20, and a transceiver station, such as a cellular or telepoint base station 12.

In accordance with a further embodiment of the present invention, a wireless data communications system, such as a cellular paging system, could include wireless data units, such as paging receivers or transceivers, for receiving data transmissions from base stations coupled to a wireline data network.

Portable radiotelephone handsets suitable for use in a CT-2 systems are well known in the art, such as the SILVERLINK™ 2000 Personal Telephone manufactured by Motorola Inc. Telepoint base stations suitable for use in a CT-2 systems are also well known in the art, such as the SILVERLINK™ Telepoint Base Station manufactured by Motorola Inc. Such portable radiotelephone handsets and telepoint base stations provide voice communication utilizing the well known CT2/CAI communication protocol.

As calls are originated by the radiotelephone handsets, or portable radiotelephones, the calls are logged for billing purposes, among other things, by the telepoint base station, or transceiver station, through which the call is placed. Periodically, such as once a day, the call information collected at each of the telepoint base stations 12, 14, 16 and 18 is transferred to a central control point, such as the network control center 32. One such network control center is the Motorola Network Control Center (MNCC) and Business Management and Billing System (BMBS) for Public Telepoint Systems, which provides, among other things, automatic supervision of all system base stations and flexible billing cycles and automatic entry of recurring charges.

Unlike the prior art personal communication systems, the personal communication system in accordance with the preferred embodiment of the present invention provides a means for transmitting positional information, which includes the relative locations of the telepoint base stations, to the portable radiotelephones. This positional information is preferably fixed and changes only when telepoint base stations are added or deleted from the personal communication system. Therefore, the positional information will generally only need to be transmitted to or stored in the telepoint base stations once, unless telepoint base stations are added or deleted from the system.

Additionally, the personal communication system according to the present invention provides a means for collecting localized information pertaining to landmarks located within the vicinity of one or more of the telepoint base stations. When the landmarks are business establishments, such as shopping malls or airports, information pertaining to the conduct of business for the business establishments may also be collected. When the localized information includes more than a simple listing of landmarks, the localized information will generally be periodically transmitted to the telepoint base stations to provide updated information to the telepoint base stations.

The positional information and the localized information are preferably stored as a system information data base by the network control center 32 for transmission to the telepoint base stations, which are equipped to provide the positional and localized information, or a portion thereof, to requesting radiotelephone handsets, as will be described in detail below. The entry of the information to be included within the system information data base into the network

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control center 32 can be provided in any of a number of ways, such as through the use of conventional telephone handsets 38, through the use of computers or video displays terminals 40 which are coupled to the network control center 32 through the PSTN (public switched telephone network) using modems 42, or through an ISDN (integrated services data network) network 44, just to name a few. The nature and type of information provided for the system information data base will become more apparent in the description to follow.

Once the localized information to be included within the system information data base has been collected within the network control center 32, the localized information is distributed to the appropriate telepoint base stations 12, 14, 16 or 18, using preferably an RF transmission system, such as provided by paging transmitter 46 and a receiver located at the appropriate telepoint base stations. Other distribution methods, such as through the PSTN 30 or other wireline networks, could be utilized as well. Thereafter, when requested by a portable radiotelephone, positional and localized information, or a portion thereof, is transmitted from a telepoint base station with which the portable radiotelephone has established communication to the portable radiotelephone for storage and subsequent presentation thereby. Distribution of information included in the system information data base to the telepoint base stations and the portable radiotelephones will be described in greater detail below.

Reference is now directed to FIG. 2, which is a pictorial diagram depicting an application of the system information database. As mentioned above, the system information data base includes positional information pertaining to the telepoint base stations. This positional information is preferably displayed by the portable radiotelephone in the form of a coverage map 100 of at least a portion of the personal communication system, in which each telepoint base station is represented by icons 102. However, in a public telepoint system, such as the personal communication system described as the preferred embodiment, there may be hundreds, or even thousands, of telepoint base stations included within the personal communication system. It is not always feasible, therefore, to display a coverage map of the entire personal communication system. Rather, the telepoint base stations within a limited geographic area, such as a small suburb, may be represented by the icons on the coverage map. When the portable radiotelephone user relocates to a different geographic area, different positional information, stored by a different cluster of telepoint base stations, can be transmitted to the portable radiotelephone for generation of a different coverage map.

In a cellular data communication system, such as a cellular telephone system, on the other hand, each icon 102 represents a cell, or a portion thereof, included within the system. Because the cells are generally much larger than the coverage areas of the telepoint base stations, a coverage map of a larger geographic area may then be generated by a wireless data unit, e.g., a cellular telephone, included within the system.

Preferably, the icon 102 associated with the telepoint base station with which the portable radiotelephone has established communication is indicated in such a manner as to be discernible by the user. This may be done, for example, by flashing the icon or perhaps by shading the icon 104, as shown. As the portable radiotelephone moves from the coverage area of a first telepoint base station to the coverage area of a second telepoint base station, the icon associated with the second telepoint base station, rather than the icon associated with the first telepoint base station, will be shaded. In this manner, the user can conveniently determine

an approximate direction of travel. Additionally, in a cellular data communication system, the user can determine whether or not he is in danger of traveling out of the system coverage range.

Included within the portable radiotelephone according to the present invention is a keypad or a touch activated screen by which a user may select any of the displayed icons, in response to which localized information pertaining to the associated telepoint base station will be displayed, as may be better understood by referring to FIG. 3.

FIG. 3 illustrates the use of the localized information in accordance with the preferred embodiment of the present invention. As stated above, personal communication systems, such as a CT-2 cordless telephone system, provide wireless communication access to a wireline network, e.g., the PSTN in isolated islands of coverage, such as, but not limited to, shopping areas or malls 200 including restaurants and other places of business, spread throughout a geographic area or city, such as at Interstate Highway interchange 202, and in places providing public transportation, such as bus stations, railway stations and airports 204. Depending upon the location, access to the public switched telephone network may be through a single telepoint base station having but a single communication channel, such as at a highway interchange or other low traffic area, to multiple telepoint base stations employing multiple communication channels such as at an airport where the telepoint station would be distributed throughout the terminal and parking areas.

As shown in FIG. 3, the localized information includes information pertaining to the conduct of business for establishments located within the vicinity of a given telepoint base station. Examples of such localized information data base information includes service station related information such as gas prices and station location, restaurant location and motel information at typical highway interchanges, such as Interstate Highway interchange 202. Examples of such localized information include retail store sale information, movie guides and restaurant information, such as at shopping malls 200, or other shopping and entertainment districts. Still other examples of such localized information include airline departure or arrival information at airports 204. While the type of information described relates generally to the immediate vicinity of any particular telepoint base station, it will be appreciated other forms of information relating to the conduct of business, such as information on churches, police and fire, hospitals, and the like may include larger geographic areas beyond the immediate vicinity of any given telepoint base station.

In a cellular data communication system, as mentioned above, each icon 102 (FIG. 2) may represent a cell having a typically larger coverage area than a single telepoint base station. As a result, it may not always be practical to include detailed localized information that could consume extremely large blocks of memory. Alternatively, therefore, the localized information in a cellular data communication system could simply include a listing of landmarks, such as business establishments, located in each cell.

FIG. 4 is an electrical block diagram of a network control center 300 in accordance with the preferred embodiment of the present invention. The network control center 300 includes a remote data entry port 302 which is utilized for the entry of information intended for the various localized information data bases throughout the personal communication network using such data entry devices as a telephone handset 38 or a computer or video display terminal 40. The remote entry data port 302 provides the required interface

between the various remote entry devices and the network control center 300. The output of the remote entry data port 302 is coupled to a central controller 304, which is preferably microcomputer controlled using any of a number of well known microcomputer devices. Coupled to the central controller 304 are data entry devices, one of which is shown, such as a video display terminal 306. The data entry device 306 enables control of the personal communication system from the network control center 300, and entry of new subscriber numbers, or cancellation of old subscriber numbers from the personal communication system. A memory 308, which may be random access memory (RAM), floppy or hard disk drive memory, or magnetic tape, or any combination thereof, provides a subscriber data base listing all active and inactive portable radiotelephones, call billing information collected periodically from the telepoint base stations, and in the preferred embodiment of the present invention a general data base containing the system information data base, which includes the positional information and the localized information for each of the telepoint base stations throughout the personal communication system, as well as any associated billing information which may be derived therefrom. As shown, the localized information includes, but is not limited to, such data entries as the telepoint base station number, the specific location information, or localized information associated with the particular telepoint base station, and where appropriate, time or date information which may indicate such information as the date the information was posted on the system, and the length of time, or end date after which the information is to be removed from the system. It will be appreciated, the entry of the localized information may be either automatically or manually, as will be described in further detail below. When the localized information is time stamped, or dated, a real time clock 310 is used in conjunction with the central controller 304 to control the automatic deletion of the localized information, as well as to control such other system operations as call billing collection. The central controller 304 couples to a telephone interface 312 which couples the network control center 300 through the public switched telephone network 30 to the individual telepoint base stations, such as base station 18, located throughout the personal communication system. The central controller 304 also couples to the input of paging port 314. The output of paging port 314 is coupled to paging transmitter 46 which is used to distribute the localized information, as described below.

FIG. 5 is a flow chart depicting the entry and formatting of the localized information in accordance with the preferred embodiment of the present invention. The establishment wishing to place information into the system information data base places a call the network communication center (NCC), at block 402 which functions as a means for collecting the information pertaining to the conduct of business. The call may be originated as described above using a telephone handset or computer or video display terminal over the public switched telephone network, or over an integrated services data network (ISDN). The establishment provides the information which is to be presented, which may include the establishment's name and location, any advertisement information, the merchandising area or area for which data distribution is to be provided, and any time related information, such as the length of time the information is to be available, at block 404. The information is formatted by the central controller which functions as a means for formatting the localized information for storage in the network control center memory together with the des-

ignated telepoint base station information, at block 406, and stored in memory, at block 408. The localized information is then, at predetermined time intervals such as daily, transmitted using the paging transmitter or public switched telephone network to the designated base stations, at block 410. The designated base stations receive the localized information intended for that station, at block 412 using any of a number of well known data transmission and receiving device selection protocols, such as the POCSAG or Golay Sequential Code signalling protocols for RF paging transmissions, or the X.25 communication protocol for communication over the public switched telephone network. The telepoint base station, after receiving the localized information, stores the information in the base station memory as will be described in detail below, at block 414, and then transmits the requested localized information, as well as positional information, to portable radiotelephones communicating therewith, as will be described below, at block 416.

FIG. 6 is an electrical block diagram of the telepoint base station, or transceiver station 500, in accordance with the preferred embodiment of the present invention. The telepoint base station 500, includes a microprocessor controller 502 which controls the overall operation the telepoint base station 500 regarding voice communication between the telepoint base station and the portable radiotelephones in a manner well known in the art. Calls originated by a portable radiotelephone handset, such as handset 20, are received by one of the RF transceivers 504, or the RF transceiver in single transceiver telepoint base stations. The calls are coupled through codec 506 which processes the information in a manner well known in the art to provide an analog voice output which is coupled to telephone interface 508 under the control of the microprocessor controller 502. The outbound call is coupled from the telephone interface 508 through the public switched telephone network to the telephone handset 26, 28 to which the call is directed. The inbound call responses are directed from the telephone handset 26, 28 through the public switched telephone network to the telephone interface 508, which couples the inbound call response to the codec 506 which then converts the analog voice information into digital information for transmission under the control of microprocessor controller 502. The digitized call response is coupled to the RF transceiver 504 for transmission to the portable radiotelephone handset 20 originating the call. A data base memory 510 which is coupled to the microprocessor controller, stores such information as an active/inactive subscriber data base as well as the information related to billing of call placed through the telepoint base station 500.

Unlike the prior art telepoint base stations, the telepoint base station in accordance with the preferred embodiment of the present invention includes a remote data entry port 512 which is coupled to the microprocessor controller 502. The localized information and the positional information which is transmitted from the network control center is received at the telepoint base station 500 through antenna 514 which is coupled to receiver 516. Receiver 516 processes the received information in a manner well known in the art to provide at the output a stream of digital information corresponding to the positional information, when received, and the localized information, which includes also address information specifying the telepoint base station to which the localized information is directed. The received address information is processed in a manner well known in the art by the microprocessor controller 502 which functions as an address decoding means. When the received address corresponds to the address assigned to the telepoint base station, the cor-

responding localized information and positional information is stored in the data base memory 510 under the control of the microprocessor controller 502.

In addition to the transmission of information from the network control center, localized information can also be directly entered into the telepoint base station 500 through the remote entry data port 512. When localized information is directly entered, such as through the use of a TOUCH-TONE™ telephone handset 518 or a computer or video display terminal 520, the microprocessor controller 502 controls the reception and storage of the information into the data base memory 510. In this instance, the microprocessor controller 502 provides a means for directly collecting the information pertaining to the conduct of business for the establishments located within the vicinity of the telepoint base station, enabling the generation of the localized information at the telepoint base station 500. Such direct entry of localized information is especially useful in such geographic areas as in airports, where the airlines directly control the ever changing arrival and departure information. Other geographic areas, such as in shopping malls could also route the localized information through a central collection point, such as the mall manager's office, who would then be responsible for posting the localized information to the telepoint base stations located throughout the mall.

FIG. 7 is a pictorial diagram depicting a preferred embodiment of the portable radiotelephone 600 in accordance with the preferred embodiment of the present invention. The portable radiotelephone 600 includes an eighteen key keyboard 602 which includes ten digit keys and eight function keys. The function keys include the conventional asterisk (*) and pound (#) keys, a unit power selection key 604, a shift key 606, memory recall/store key 608, intercom/page key 610, redial/public-private selection key 612, and a call activation (phone) key 614. Secondary key functions are selectable using the shift key 606. A liquid crystal (LCD) display 616, which utilizes preferably twelve numeric digits, provides display of the selected telephone number. A row of display indicators 618 is also provided which indicate which of a number of preselected functions are active, such as BUSY, public (PUB), private (PRIV), DATA, VOICE and unit power on (PWR). Several function annunciators (not displayed) are also provided. In particular, the VOICE indicator indicates when the portable radiotelephone is in the voice mode for conventional telephone conversations, whereas the DATA indicator indicates when the portable radiotelephone has been placed in the data mode for reception of positional information and selected localized information. Selection of the voice and data modes is controlled by the shift key 606 and the DATA/VOICE mode selection switch 620. The dual keystroke selection prevents inadvertent mode alteration, thereby insuring voice or data mode calls are not inadvertently interrupted.

The portable radiotelephone 600 includes an earpiece 622 located in the keypad section 626 and a mouthpiece 624 located in the hinged keyboard cover section 628. Also within the hinged keyboard cover section 628 is a second liquid crystal (LCD) display 630 which provides for the display of icons and alphanumeric characters. The display 630 may be, for example, a dot matrix display capable of displaying pixel images. Preferably, the icons are utilized to display the coverage map 100 (FIG. 2) in which the positional information is included. The alphanumeric characters preferably are utilized for display of the localized information. It will be appreciated that other display formats and character sizes can be utilized as well, depending upon the amount of information which is to be displayed at any given

time and the capabilities of the implemented user interface, for example, graphical user interface, pen input, etc.

Cursor keys **632**, **634**, **636**, **638** enable the portable radiotelephone subscriber to select an icon when the positional information, i.e., the coverage map **100**, is displayed, as described above. Upon selection of an icon, localized information pertaining to the associated telepoint base station is displayed, preferably as a directory or an image generated from graphic primitives as defined by the user interface. A typical "directory" level display is shown on LCD display **630**, and includes such directory entries as "area shopping guide", "movie guide", "local attractions" guide, "restaurant guide", "medical services" directory, "service station" directory, "church" directory, and "arts and entertainment" guide. The "directory" level display is typical of a first portion of the localized information which would be transmitted upon request to the portable radiotelephone. Cursor keys **632**, **634**, **636** and **638** further enable the portable radiotelephone subscriber to select from particular categories which are representative of the telepoint base station geographic location, and which can vary from telepoint base station to telepoint base station in located different geographic areas. In particular, cursor keys **632** and **634** enable movement up and down within the directory or menu. Cursor keys **636** and **638** enable movement within a particular menu item, such as would be required when reading a lengthy message. As each menu, or level, of information is received from the telepoint base station, particular information can be saved within the portable radiotelephone using the "SAVE" key **640**. The "SELECT" key initiates each data communications session with the telepoint base station when the DATA mode is selected, and further enables the recovery of selected localized information, when the portable radiotelephone is in the voice mode, thereby allowing retrieval and review of information which has been received and stored while the portable radiotelephone was in range of a telepoint base station, as will be described below.

In summary, the portable radiotelephone enables the subscriber to request positional and localized information from a telepoint base station with which communication is established. The information when received is displayed and can be stored for retrieval at a later time, thereby enabling the portable radiotelephone subscriber to obtain information when in range of a telepoint base station, and thereafter review the information on an as needed basis while the subscriber is in the geographic area covered by the received information.

FIG. **8** is an electrical block diagram of the portable radiotelephone **600** in accordance with the preferred embodiment of the present invention. The portable radiotelephone **600** includes an RF transceiver **650** which is coupled to an antenna **652** for transmitting and receiving voice and data information. The RF transceiver is synthesized to enable the selection of one of the forty communication channels assigned to the CT-2 system. Selection of the channel of operation is controlled by the microprocessor controller **654**, such as implemented using an MC 68HC05 microcomputer manufactured by Motorola, which also enables the codec **656** for encoding the analog voice information derived from audio mouthpiece transducer **658** into the digital format, and the decoding of the digitally encoded voice information into an analog format for delivery by the audio earpiece transducer **658**. A memory **660**, such as a random access memory (RAM) or electrically erasable programmable read only memory (EEPROM) stores such information as often used phone numbers in a phone number directory file, and the positional and localized information

which was received and stored, as described above. A real time clock **662** is coupled to the microprocessor controller **654** and enables such functions as automatic deletion of localized information as described above. A numeric display **664**, as described above, is coupled to the microprocessor controller **654**, and provides for displaying telephone numbers, and other information relative to the operation of the portable radiotelephone. A numeric/function keypad **666**, as described above, is coupled to the microprocessor controller **654**, and enables entry of phone numbers, and control of the operation of the portable radiotelephone, including such functions as the selection of voice or data modes of operation. An alphanumeric or dot matrix display, as described above, is also coupled to the microprocessor controller **654**, and provides display of the positional information and selected localized information. An alphanumeric keyboard **680** can also be provided which is coupled to the microprocessor controller which would allow the portable radiotelephone subscriber to enter specific alphanumeric information which could be utilized to select information to be transmitted from the telepoint base station, or which could be used in the retrieval of information stored in the device memory **660**.

FIGS. **9-11** are flow charts depicting the operation of the portable radiotelephone and the transceiver station in accordance with the preferred embodiment of the present invention. In particular, referring to FIG. **9**, when the portable radiotelephone subscriber turns the unit power on, at step **800**, the microprocessor controller is initialized, at step **802**. Initialization includes selection of the voice mode of transmission, in which instance, the numeric display indicator indicates the voice mode is selected, at step **804**. When the data mode is not selected, at step **806**, and the "phone" key is actuated, at step **808**, the handset establishes a link with the telepoint base station using the well known CT2 MUX1 signaling protocol, at step **810**. The handset next transmits the well known MUX2 signaling protocol, at step **812** indicating a voice mode request is being made, which is received and processed by the telepoint base station, at step **814**. Upon completion of the voice mode log-on procedure, the portable radiotelephone and the telepoint base station switch to the well known MUX3 signalling protocol, at step **816**, to enable voice communication in a manner well known in the art.

However, when the data mode is selected, by actuating the "shift" key followed by the "data/voice" key, at step **806**, the numeric display indicators indicates the data mode is selected, at step **818**. When the data mode is selected, and the "phone" key is actuated, at step **820**, the handset establishes a link with the telepoint base station, at step **822**, using the MUX1 signaling protocol as described above. The handset next transmits a modified MUX2 signaling protocol, at step **824**, indicating a data mode request is being made, which is received and processed by the telepoint base station, at step **826**. Upon completion of the data mode log-on procedure, the portable radiotelephone and the telepoint base station switch to a further modified MUX2 signaling protocol, at step **828**, to enable data communication as described above, and will be further described below.

Referring to FIG. **10**, when the data mode is selected and the portable radiotelephone has established communication with the telepoint base station, the telepoint base station transmits the positional information and the "directory" or "menu" information (at least a portion of the localized information) as described above, at step **830**. The handset receives and stores the positional information and the "menu" information, at step **831**, and displays the iconic

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"coverage map" screen, including the positional information, at step 832. Thereafter, the user selects, at step 833, one of the displayed icons using the cursor keys, as described above. The "menu" information for the telepoint base station associated with the selected icon is subsequently displayed, at step 834. It will be appreciated that where only a limited amount of information is required to be transmitted, the "menu" screen may include all the information associated with the particular telepoint base station. An example of a representative "menu" information screen is presented in Table I below.

Table I

1	AREA SHOPPING GUIDE
2	MOVIE GUIDE
3	LOCAL ATTRACTIONS
4	RESTAURANT GUIDE
5	MEDICAL SERVICES
6	SERVICE STATIONS
7	CHURCHES
8	ARTS AND ENTERTAINMENT

When the "phone" key is not actuated, at step 836, and the subscriber selects one of the "menu" items, at step 838, using the cursor keys, the handset transmits an indication of the "menu" item selected, at step 840. The telepoint base station receives and processes the selected "menu" item, at step 842, and proceeds to transmit the selected "menu" item to the portable radiotelephone, at step 844. The handset then receives and displays the selected "menu" item, at step 846.

TABLE II

ORANGE BLOSSOM MALL HIGHLIGHTS	
SHEARS & SAWBUCK	>
LORD TAYLOR'S	>
MAZZIES	>
PENNIES	>
CAROL'S BOUTIQUE	>
JEANS N' THINGS	>
NEXT SCREEN	

The subscriber can review the selected "menu" item, at step 848. As shown in TABLE II, a continuation character (>) can be provided which indicates additional information has been received which can be reviewed using the additional cursor keys, as described above. The subscriber can elect to save the received "menu" item, at step 850, by depressing the SAVE key. When the SAVE key is depressed, the selected menu item which is currently being displayed is stored in the memory, at step 852.

After the subscriber has elected to save the selected "menu" item, at step 850, or after a predetermined time-out, the handset reverts to the "menu" information display, at step 854. The subscriber can then depress the "phone" key, at step 836, thereby terminating the communication with the telepoint base station, at step 856, or can select another "menu" item, at step 838. When another "menu" item is selected, at step 838, steps 840 through 854 are repeated to receive the next selected "menu" item. In this manner, as many "menu" items can be selected and saved by the subscriber, as the subscriber desires to receive. When the data call is terminated, at step 856, the microprocessor controller returns to the voice mode of operation, as indicated in FIG. 9, and the numeric display indicator indicates the voice mode is selected, at step 804. Independent of the mode of operation selected, when any key is actuated, at step

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830, other than the "phone" key at steps 808 or 820, the operation continues as shown in FIG. 11. When the key depressed is the SELECT key, at step 856, the "menu" information is retrieved and displayed, at step 858. The subscriber can then select a "menu" item, at step 860, using the cursor keys as described above. When the SELECT key is depressed, at step 862, the date field is evaluated, when present, at step 864. When the date field indicates the "menu" item information is out-of-date, i.e. the current real time clock date is later than the date stored in the date field, at step 864, the subscriber is alerted that the "menu" item information is out of date, at step 866, and the out-of-date "menu" item is deleted from memory, at step 868, after which the "menu" information is again retrieved and displayed, at step 858. It will be appreciated that in the alternate, the "menu" item information can be displayed for the subscriber to review prior to deleting the out-of-date "menu" item information.

When the date field is present and the date information is current, or the date field is absent, at step 864, the controller determines whether the "menu" item selected is stored, at step 870. When the "menu" item is stored, at step 870, the "menu" item is recalled from memory and displayed, at step 874. A display timer is set following the selection of the "menu" item at step 870. When the "menu" item is not stored in memory after being selected at step 870, a message, such as "menu item not available" is displayed. Following the time-out of the display timer at step 876, program control returns to either steps 856 or 878. When the SELECT key is again depressed at step 856, steps 858 through 876 are again repeated, as described above. When a function key other than the SELECT key is actuated, at step 878, the function associated with the selected function key is performed at step 880. Program control then returns to step 804, and continues as described above.

It may be appreciated by one skilled in the art that, when localized information is programmed directly into telepoint base stations by local business establishments, the telepoint base station with which the portable radiotelephone has established communication may not be able to provide more than rudimentary information about other telepoint base stations. For example, if the portable radiotelephone subscriber chooses, on the "coverage map" screen, to receive localized information about a different telepoint base station, the menu information provided to the portable radiotelephone might consist of nothing more than a list of landmarks or business establishments located in the vicinity of the different telepoint base station. However, when the portable radiotelephone subscriber chooses to receive localized information pertaining to the telepoint base station with which communication has been established, all localized information, such as information directly input by manufacturers, is once again available, as described in FIGS. 9-11.

In summary, a personal communication system for collecting and distributing information pertaining to the conduct of business for establishments located within the vicinity of transceivers station is described above. The portable communication system utilizes portable radiotelephones having a selectable data mode of operation. When the data mode of operation is selected, positional and localized information, preferably specific to one or more telepoint base stations included within a geographic area or a complete system, is selectively transmitted from the telepoint base station to which the portable radiotelephone has established communication. The received information can be stored within the portable radiotelephone for recall at a later time. The information can also be dated, or "time stamped",

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thereby enabling alerting the subscriber of recalled information which is out-of-date, or "stale". The particular type of information stored at any particular telepoint base station can be customized to include establishments only within the immediate vicinity of the telepoint base station, such as that of service stations, restaurants and motels, or can also include information of a less immediate, or more regional nature, such as that of lists of doctors, churches, public safety groups, etc. Additionally, the information may include establishments or other information about regions covered by other telepoint base stations. The localized information can include such information as the location of the establishments, or other information pertaining to the establishments, such as operating hours, sales information, or other information of interest to the portable radiotelephone subscriber.

We claim:

1. A personal communication system comprising:

stationary transceiver stations located within a predetermined geographic region for providing communication capability between one or more portable units and a wireline network within the predetermined geographic region and for transmitting a data base including at least positional information indicative of relative locations of the stationary transceiver stations within the predetermined geographic region; and

a portable unit for receiving the data base including the positional information and for presenting an iconic representation indicative of the relative locations of the stationary transceiver stations within the predetermined geographic region, wherein the iconic representation further indicates to the user the stationary transceiver station with which the portable unit has established communication such that, as the portable unit is relocated between different areas within the predetermined geographic region and communication is established with different stationary transceiver stations, the iconic representation indicates to the user when the portable unit is approaching an area in which communication with the stationary transceiver stations included in the predetermined geographic region cannot be established.

2. The personal communication system according to claim 1, wherein the stationary transceiver stations are telepoint radiotelephone base stations.

3. The personal communication system according to claim 1, wherein the stationary transceiver stations are cellular base stations.

4. The personal communication system according to claim 1, wherein the data base further includes localized information pertaining to landmarks located within the vicinities of the stationary transceiver stations.

5. The personal communication system according to claim 4, wherein at least a portion of the landmarks are business establishments, and wherein the localized information includes information pertaining to the conduct of business for the establishments.

6. The personal communication system according to claim 1, wherein the stationary transceiver stations within the predetermined geographic region comprise all stationary transceiver stations within the personal communication system such that, as the portable unit is relocated to an area near an edge of the predetermined geographic region, the shading of an icon included in the iconic representation indicates to the user that the portable unit is approaching an area that is out of range of the personal communication system and in which communication cannot be established with any of the stationary transceiver stations.

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7. The personal communication system according to claim 1, wherein the iconic representation includes one icon for each of the stationary transceiver stations, wherein the icon associated with the stationary transceiver station with which communication has been established is shaded such that a shaded icon near an edge of the iconic representation indicates to the user that the portable unit is approaching a geographic area in which communication cannot be established with the stationary transceiver stations within the predetermined geographic region.

8. The personal communication system according to claim 7, wherein lack of shading of any icon included within the iconic representation indicates that the portable unit is out of range of communication with the stationary transceiver stations located within the predetermined geographic region.

9. The personal communication system according to claim 1, wherein the stationary transceiver stations within the predetermined geographic region comprise only a subset of all stationary transceiver stations within the personal communication system.

10. A portable unit for use in a personal communication system which includes stationary transceiver stations located within a predetermined geographic region to provide communication between the portable unit and a wireline network within the predetermined geographic region, the stationary transceiver stations further being capable of storing and transmitting a data base including positional information pertaining to relative locations of the stationary transceiver stations within the predetermined geographic region, the portable unit comprising:

receiving means for receiving the data base transmitted by the stationary transceiver station and decoding therefrom the positional information; and

presentation means for presenting an iconic representation indicative of the relative locations of the stationary transceiver stations and further indicative of the stationary transceiver station with which the portable unit has established communication such that the iconic representation indicates to the user when the portable unit is currently located in an area near an edge of the predetermined geographic region outside of which the portable unit cannot establish communication with the stationary transceiver stations within the predetermined geographic region.

11. The portable unit according to claim 10, wherein the data base further includes localized information pertaining to landmarks located within the vicinities of the stationary transceiver stations.

12. The portable unit according to claim 11, wherein at least a portion of the landmarks are business establishments, and wherein the localized information includes information pertaining to the conduct of business for the business establishments.

13. The portable unit according to claim 11, further comprising:

memory means coupled to the receiving means and the presentation means for storing the data base; and

data entry means coupled to the memory means and the presentation means for receiving a user input selecting a displayed icon.

14. The portable unit of claim 10, wherein the iconic representation includes one icon for each of the stationary transceiver stations within the predetermined geographic region, and wherein the icon associated with the stationary transceiver station with which communication has been established is shaded such that a shaded icon near an edge

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of the iconic representation indicates to the user that the portable unit is approaching a geographic area in which communication cannot be established with the stationary transceiver stations within the predetermined geographic region.

15. The portable unit according to claim 14 wherein lack of shading of any icon included within the iconic representation indicates that the portable unit is out of range of communication with the stationary transceiver stations located within the predetermined geographic region.

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16. The portable unit according to claim 10, wherein the stationary transceiver stations within the predetermined geographic region comprise all of the stationary transceiver stations within the personal communication system such that the iconic representation provides a coverage map of all areas in which communication is provided by the personal communication system.

* * * * *

EXHIBIT 32

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(58) Field of search

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Online databases: WPI, EDOC

(54) Mixer circuits

(57) A frequency multiplier and mixer circuit comprises a frequency multiplier circuit composed of a first differential amplifier, which includes a first differential circuit M1, M2 formed of source-coupled first and second FETs M1, M2 having their sources connected in common to a first constant current source and a second differential circuit formed of source-coupled third and fourth FETs M3, M4 having their sources connected in common to a second constant current source. The first and fourth FETs M1, M4 have the same driving power larger than that of the second and third FETs M2, M3 and have their drains connected to a first output node 6, and the second and third FETs M2, M3 have the same driving power and have their drains connected to a second output node 7. Gates of the first and third FETs are connected in common to one terminal of a first pair of input terminals for receiving a signal to be frequency-multiplied, and gates of the second and fourth FETs are connected in common to the other terminal of the first pair of input terminals. A current mirror circuit network M5 - M9a has an input current path connected to the first output node 6 so as to flow a differential current between the first and second output nodes. A second differential amplifier Q1, Q2, which constitutes a mixing circuit, includes a pair of emitter-coupled bipolar transistors Q1, Q2 having their bases connected to receive a mixing signal. Emitters of the pair of bipolar transistors are connected in common to a mirror current path of the current mirror circuit network. Q1, Q2 may be FETs.

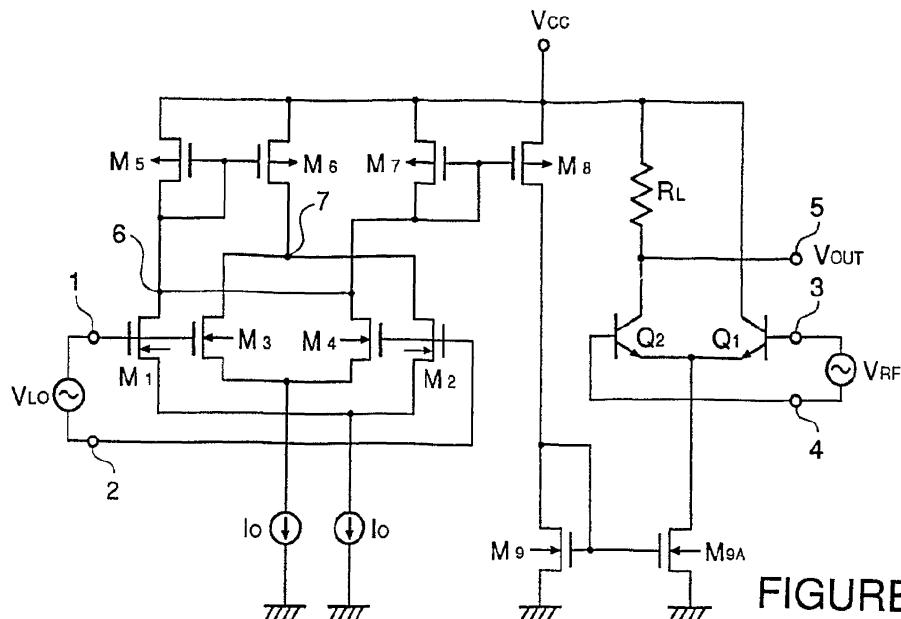
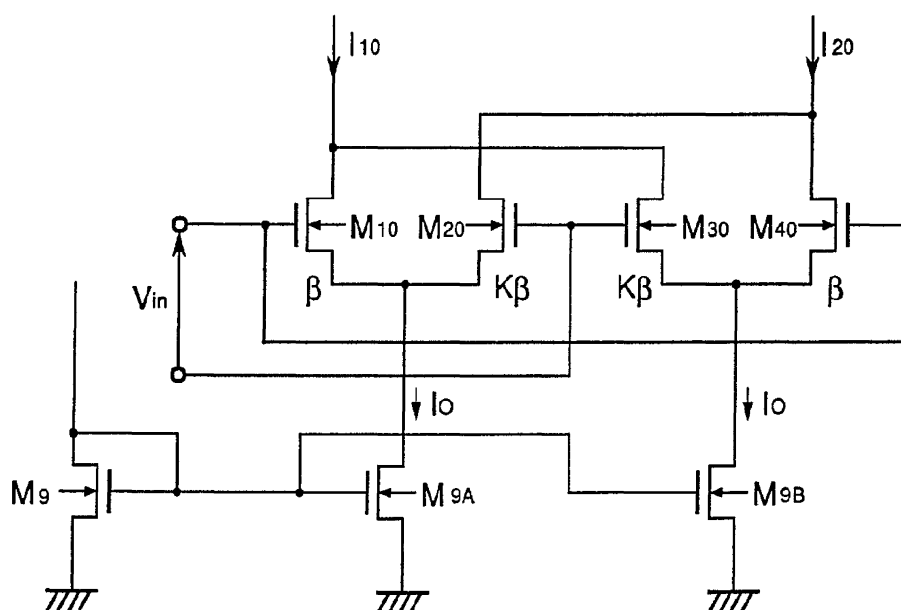


FIGURE 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

$$1/2$$

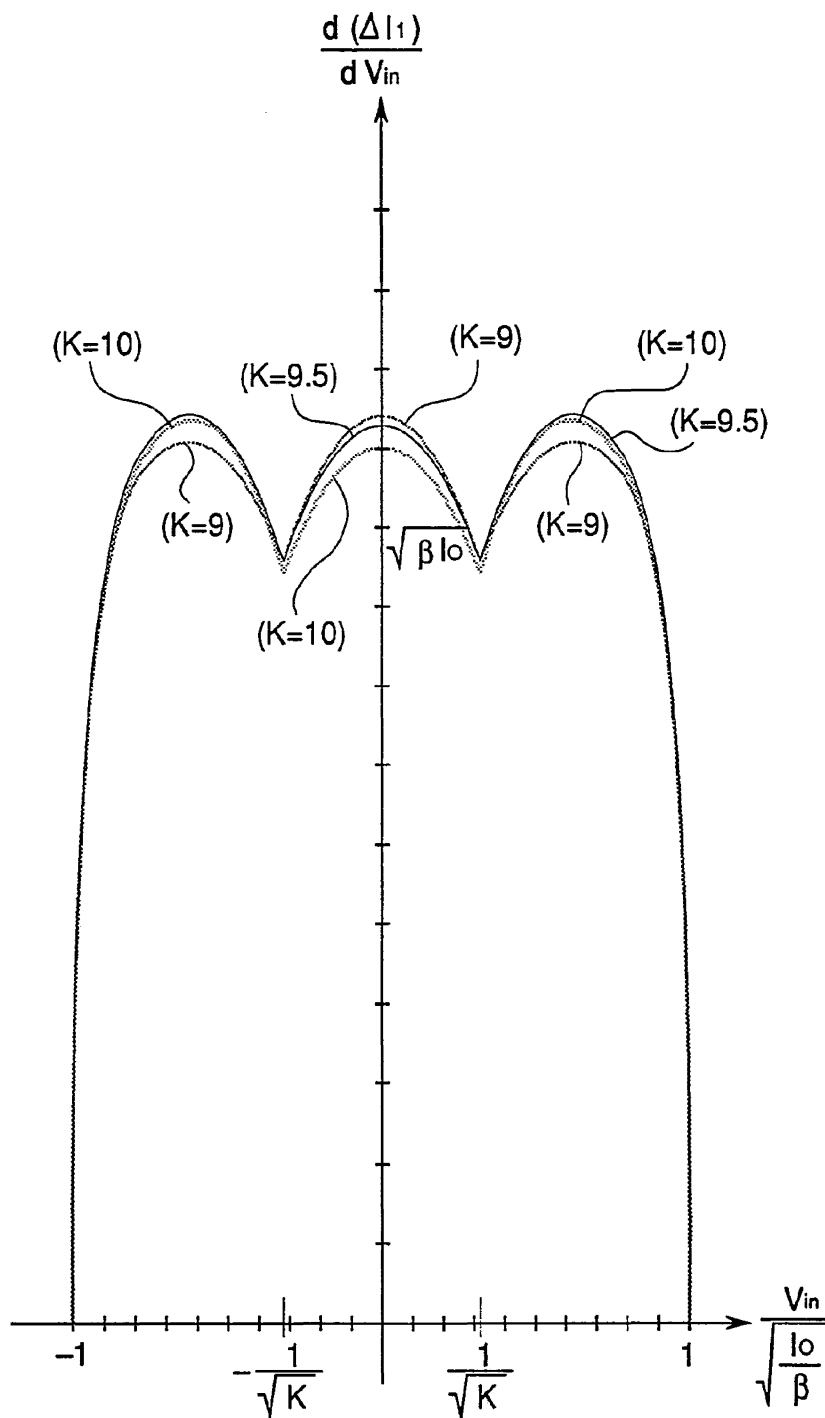
FIGURE 2



10 11 92

2 | 2

FIGURE 3



SPECIFICATION

Title of the Invention

FREQUENCY MULTIPLIER AND MIXER CIRCUIT

Background of the Invention

Field of the invention

The present invention relates to a frequency multiplier and mixer circuit composed of one circuit and capable of executing both of a frequency multiplying operation and a mixing operation.

Description of related art

As well known, in the case of requiring both of the frequency multiplying operation and the mixing operation, for example, a frequency multiplying circuit and a mixing circuit independent of each other have been coupled with a bandpass filter.

However, this prior art frequency multiplying and mixing circuit has been difficult to have a wide operating band. In addition, if the frequency multiplying circuit and the mixing circuit are implemented in a bipolar and MOS semiconductor integrated circuit process, since terminals are required to externally connect the filter, the number of external terminals in the semiconductor integrated circuit has to be increased.

Summary of the Invention

Accordingly, it is an object of the present invention to provide a frequency multiplier and mixer circuit which has overcome the above mentioned defect of the conventional one.

Another object of the present invention is to provide a frequency multiplier and mixer circuit, which requires no external filter and which can be realized in a semiconductor integrated circuit without increasing the number of external terminals.

The above and other objects of the present invention are achieved in accordance with the present invention by a frequency multiplier and mixer circuit comprising:

- a first pair of input terminals for receiving a signal to be frequency-multiplied;

- a second pair of input terminals for receiving a mixing signal;

- an output terminal for outputting an output signal;

- a frequency multiplier circuit composed of a first differential amplifier, which includes a first differential circuit formed of source-coupled first and second field effect transistors having their respective driving powers in a ratio of $K : 1$ where K is a positive real number excluding 1, and a second differential circuit formed of source-coupled third and fourth field effect transistors having their respective driving powers in a ratio of $1 : K$, sources of the first and second field effect transistors being connected in common to a first constant current source, and sources of the third and fourth field effect transistors being connected in common to a second constant current source, gates of the first and third field effect transistors having different driving powers being connected in common to one terminal of the first pair of input terminals, and gates of the second and fourth field effect transistors having different driving powers being connected in common to the other terminal of the first pair of input terminals, drains of the first and fourth field effect transistors having the same driving power being

connected to one node of a pair of output nodes, and drains of the second and third field effect transistors having the same driving power being connected to the other node of the pair of output nodes;

a current mirror means having an input current path connected to the one node of the pair of output nodes so as to flow a differential current between the pair of output nodes, and a mirror current path; and

a mixing circuit composed of a second differential amplifier, which includes a pair of inputs connected to the second pair of input terminals, one end of one main current path of two main current paths of the second differential amplifier being connected to the output terminal, the other end of each of the two main current paths being connected in common to the mirror current path of the current mirror means.

Here, in the case of metal-oxide-semiconductor field effect transistors, the driving power can be expressed by a ratio of a gate width "W" to a gate length "L", namely, "W/L". Alternatively, in the case of junction field effect transistors, the driving power can be expressed by a maximum drain current.

In one embodiment, the frequency multiplier and mixer circuit further includes a first current mirror circuit having an input current path and a mirror current path which are respectively connected between a supply voltage and the one node of the pair of output nodes and between the supply voltage and the other node of the pair of output nodes, and wherein the current mirror means includes a second current mirror circuit having an input current path connected between the supply voltage and the one node of the pair of output nodes and a mirror current path connected at its one end to the supply voltage, and a third current mirror circuit having an input current path connected in series with the mirror

current path of the second current mirror circuit, a mirror current path of the third current mirror circuit being connected to the other end of each of the two main current paths of the second differential amplifier.

In one preferred embodiment, the second differential amplifier includes a pair of emitter-coupled bipolar transistors having their respective bases connected to the second pair of input terminals, respectively, emitters of the pair of bipolar transistors being connected in series to the mirror current path of the third current mirror circuit, and a collector of one of the bipolar transistors is connected to the output terminal.

In another preferred embodiment, the third current mirror circuit having first and second mirror current paths of the same current capacity. The second differential amplifier includes a first differential circuit formed of source-coupled fifth and sixth field effect transistors having their sources connected in common to the first mirror current path of the third current mirror circuit, and a second differential circuit formed of source-coupled seventh and eighth field effect transistors having their sources connected in common to the second mirror current path of the third current mirror circuit, a ratio of a gate width-to-length ratio of the fifth field effect transistor to a gate width-to-length ratio of the sixth field effect transistor being 1 : 9.5, and a ratio of a gate width-to-length ratio of the seventh field effect transistor to a gate width-to-length ratio of the eighth field effect transistor being 9.5 : 1, gates of the fifth and eighth field effect transistors being connected in common to one input of the second pair of input terminals, and gates of the sixth and seventh field effect transistors being connected in common to the other input of the second pair of input terminals, drains of the fifth and seventh field effect

transistors being connected to each other, and drains of the sixth and eighth field effect transistors being connected to each other.

Preferably, the first and second constant current sources have the same current capacity, and the driving power of the first and fourth field effect transistors is larger than that of the second and third field effect transistors.

The above and other objects, features and advantages of the present invention will be apparent from the following description of preferred embodiments of the invention with reference to the accompanying drawings.

Brief Description of the Drawings

Figure 1 is a circuit diagram of a first embodiment of the frequency multiplier and mixer circuit in accordance with the present invention;

Figure 2 is a circuit diagram of a differential circuit of the mixer circuit portion of a second embodiment of the frequency multiplier and mixer circuit in accordance with the present invention; and

Figure 3 is a graph showing a transconductance of the differential circuit shown in Figure 2.

Description of the Preferred embodiments

Referring to Figure 1, there is shown a circuit diagram of a first embodiment of the frequency multiplier and mixer circuit in accordance with the present invention.

The shown frequency multiplier and mixer circuit includes a first differential amplifier composed of field effect transistors (FETs). The first differential amplifier includes two sets of differential transistor

pairs, a first differential transistor pair being formed of source-coupled FETs M1 and M2 having their sources connected through a current source I_o to ground, and a second differential transistor pair being formed of source-coupled FETs M3 and M4 having their sources connected through another current source I_o to ground.

The two sets of differential transistor pairs are configured to have the following driving power ratio:

$$M1 : M2 = M4 : M3 = K : 1$$

where K is a positive real number excluding 1.

A pair of FETs M1 and M4, which have the same driving power but which are connected to the different current sources, respectively, have their drains connected to each other so as to constitute one node 6 of a pair of output nodes. Another pair of FETs M2 and M3, which have the same driving power but which are connected to the different current sources, respectively, have their drains connected to each other so as to constitute the other node 7 of the pair of output nodes.

In addition, a pair of FETs M1 and M3, which have the different driving powers, respectively, and which are connected to the different current sources, respectively, have their gates connected to each other and connected in common to one terminal 1 of a first pair of input terminals for receiving a local voltage signal V_{LO} to be frequency-multiplied. Another of FETs M2 and M4, which have the different driving powers, respectively, and which are connected to the different current sources, respectively, have their gates connected to each other and connected in common to the other terminal 2 of the first pair of input terminals.

The shown frequency multiplier and mixer circuit also includes a second differential amplifier composed of a pair of emitter-coupled

bipolar transistors Q1 and Q2. Bases of these bipolar transistors Q1 and Q2 are respectively connected to a second pair of input terminals 3 and 4 for receiving a mixing voltage signal V_{RF} . In addition, a collector of the transistor Q1 is connected to a supply voltage V_{CC} , and a collector of the transistor Q2 is connected through a load resistor R_L to the supply voltage V_{CC} . The collector of the transistor Q2 is also connected to an output terminal 5 for outputting a mixer output voltage signal V_{OUT} .

Furthermore, the shown frequency multiplier and mixer circuit includes three current mirror circuits. The first current mirror circuit is composed of FETs M5 and M6 having their gates connected to each other and having their sources connected in common to the supply voltage V_{CC} . A drain of the FET M5 is connected to the gate of the FET M5 itself and also to the one output node 6 which is connected in common to the drains of the FETs M1 and M4. A drain of the FET M6 is connected to the other output node 7 which is connected in common to the drains of the FETs M2 and M3. Therefore, the FET M5 constitutes an input current path of the first current mirror circuit, and the FET M6 constitutes a mirror current path of the first current mirror circuit.

The second current mirror circuit is composed of FETs M7 and M8 having their gates connected to each other and having their sources connected in common to the supply voltage V_{CC} . A drain of the FET M7 is connected to the gate of the FET M7 itself and also to the one output node 6 which is connected in common to the drains of the FETs M1 and M4. The FET M7 constitutes an input current path of the second current mirror circuit, and the FET M8 constitutes a mirror current path of the second current mirror circuit.

The third current mirror circuit is composed of FETs M9 and M9A having their gates connected to each other and having their sources connected in common to the ground. A drain of the FET M9 is connected to the gate of the FET M9 itself and also to a drain of the FET M8 of the second current mirror circuit. A drain of the FET M9A is connected to the emitters of the transistors Q1 and Q2 of the second differential amplifier. The FET M9 constitutes an input current path of the third current mirror circuit, and the FET M9A constitutes a mirror current path of the third current mirror circuit.

Thus, a differential current between the two sets of differential transistor pairs in the first differential amplifier flows through the FET M7, and therefore, a corresponding differential current also flows through the FET M8, so as to control an emitter current of the second differential amplifier.

Here, it would be apparent to persons skilled in the art that, in the above mentioned embodiment, the respective FETs can be replaced by bipolar transistors.

In the case that the first differential amplifier is constituted of metal-oxide-semiconductor field effect transistors (MOSFETs), the driving power can be expressed by a ratio of a gate width "W" to a gate length "L", namely, "W/L". Therefore, if the FETs M1 to M4 have their gate width-to-length ratios of "W₁/L₁", "W₂/L₂", "W₃/L₃", and "W₄/L₄", the following relation holds:

$$W_1/L_1 = K (W_2/L_2) = K (W_3/L_3) = W_4/L_4$$

(for example, L₁ = L₂ = L₃ = L₄)

Here, if an effective mobility is expressed by μ_n , and a gate oxide film capacitance per unit area is expressed by C_{ox}, the transconductance

parameter β can be expressed by $(1/2)\mu_n \cdot C_{ox}(W/L)$. Therefore, if the threshold voltage is expressed by V_t and a gate-source voltage is expressed by V_{GSi} ($i=1, 2, 3, 4$), a drain current I_{di} of the respective FETs M1 to M4 can be expressed by the following equations (1) to (4):

$$I_{d1} = K\beta(V_{GS1} - V_t)^2 \quad \text{.....(1)}$$

$$I_{d2} = \beta(V_{GS2} - V_t)^2 \quad \text{.....(2)}$$

$$I_{d3} = \beta(V_{GS3} - V_t)^2 \quad \text{.....(3)}$$

$$I_{d4} = K\beta(V_{GS4} - V_t)^2 \quad \text{.....(4)}$$

In addition, the constant current source I_o has the constant current expressed by the following equation (5), and the input voltage V_{LO} can be expressed by the following equation (6).

$$I_{d1} + I_{d2} = I_{d3} + I_{d4} = I_o \quad \text{.....(5)}$$

$$V_{GS1} - V_{GS2} = V_{GS3} - V_{GS4} = V_{LO} \quad \text{.....(6)}$$

Therefore, a differential current ΔI_1 between the drain currents I_{d1} and I_{d2} can be expressed by the following equation (7), and a differential current ΔI_2 between the drain currents I_{d3} and I_{d4} can be expressed by the following equation (8). Accordingly, a whole total differential current ΔI can be obtained in the following equation (9).

$$\begin{aligned} \Delta I_1 &= I_{d1} - I_{d2} \\ &= \frac{-(1-K) \{ (1+K) I_o - 2K\beta V_{LO}^2 \}}{(1+K)^2} \\ &\quad + \frac{4\beta K V_{LO} \sqrt{(1+K) \frac{I_o}{\beta} - K V_{LO}^2}}{(1+K)^2} \quad \text{..... (7)} \end{aligned}$$

$$\begin{aligned}
\Delta I_2 &= I_{d3} - I_{d4} \\
&= \frac{(1-K) \{ (1+K) I_0 - 2K \beta V_{LO}^2 \}}{(1+K)^2} \\
&\quad + \frac{4\beta K V_{LO} \sqrt{(1+K) \frac{I_0}{\beta} - K V_{LO}^2}}{(1+K)^2} \dots\dots (8)
\end{aligned}$$

$$\begin{aligned}
\Delta I &= (I_{d1} + I_{d4}) - (I_{d2} + I_{d3}) \\
&= \Delta I_1 - \Delta I_2 \\
&= \frac{-2(1-K) \{ (1+K) I_0 - 2K \beta V_{LO}^2 \}}{(1+K)^2} \dots\dots (9)
\end{aligned}$$

The total differential current ΔI is brought into a drain current I_{d8} of the FET M8 by cooperation of the first current mirror circuit composed of the FET M5 and M6 and the second current mirror circuit composed of the FET M7 and M8, and therefore, is also brought into respective drain currents I_{d9} and I_{d9A} of the FETs M9 and M9A of the third current mirror circuit. Namely, $\Delta I = I_{d8} = I_{d9} = I_{d9A}$. This third current mirror circuit composed of the FETs M9 and M9A constitutes a driving current source for driving the second differential amplifier formed of the bipolar transistor Q1 and Q2.

Assuming that the transistors Q1 and Q2 have the same DC common-base current gain factor α_F , respective collector currents I_{c1} and I_{c2} of the transistors Q1 and Q2 can be expressed by the following equations (10) and (11):

$$I_{c1} = \frac{\alpha_F \cdot \Delta I}{1 + \exp\left(-\frac{V_{RF}}{V_T}\right)} \dots\dots (10)$$

$$I_{C2} = \frac{\alpha_F \cdot \Delta I}{1 + \exp\left(\frac{V_{RF}}{V_T}\right)} \quad \text{..... (11)}$$

In addition, a sum and a difference between the two collector currents are respectively expressed by the following equations (12) and (13):

$$I_{C1} + I_{C2} = \alpha_F \Delta I \quad \text{.....(12)}$$

$$I_{C1} - I_{C2} = \alpha_F \Delta I \tanh\left(\frac{V_{RF}}{2V_T}\right) \quad \text{..... (13)}$$

In the equation (13), the thermal voltage V_T is expressed by

$$V_T = (kT/q)$$

where k is Boltzmann's constant;

q is elementary charge (electric charge of unit electron); and

T is absolute temperature (in the degree of Kelvin scale).

Here, $\tanh x$ can be expressed as $\tanh x = x - (1/3)x^3 \dots\dots$, if $|x| \ll 1$. Therefore, when $|V_{RF}| \ll 2V_T$, if it can be approximated as $\tanh x \approx x$, the equation (11) can be modified into the following equation (14):

$$\begin{aligned} I_{C2} &= \frac{1}{2} \alpha_F \Delta I \left\{ 1 - \tanh\left(\frac{V_{RF}}{2V_T}\right) \right\} \\ &\approx \frac{1}{2} \alpha_F \Delta I \left(1 - \frac{V_{RF}}{2V_T} \right) \quad \text{..... (14)} \end{aligned}$$

Therefore, the mixer output voltage V_{OUT} can be expressed by the following equation (15):

$$\begin{aligned}
V_{OUT} &= V_{CC} - R_L I_{C2} \\
&\approx V_{CC} - \frac{1}{2} \alpha_F \Delta I \cdot R_L + \frac{1}{4V_T} \alpha_F \Delta I \cdot V_{RF} \\
&= V_{CC} + \frac{(1-K)}{1+K} \alpha_F I_0 \cdot R_L - \frac{2(1-K)}{(1+K)^2} \alpha_F \beta R_L \cdot V_{LO}^2 \\
&\quad - \frac{1}{2V_T} \frac{(1-K)}{(1+K)} \alpha_F I_0 \cdot V_{RF} \\
&\quad + \frac{1}{V_T} \frac{2(1-K)}{(1+K)^2} \alpha_F \beta R_L \cdot V_{LO}^2 \cdot V_{RF} \quad \dots\dots (15)
\end{aligned}$$

Here, assuming that $V_{LO} = |V_{LO}| \cos 2\pi f_{LO} t$ and $V_{RF} = |V_{RF}| \cos 2\pi f_{RF} t$, the item of $V_{LO}^2 \cdot V_{RF}$ in the equation (15) can be expressed as the following equation (16):

$$\begin{aligned}
V_{LO}^2 \cdot V_{RF} &= |V_{LO}|^2 |V_{RF}| \frac{1 - \cos 2\pi (2f_{LO}) t}{2} \cos 2\pi f_{RF} t \\
&= \frac{1}{2} |V_{LO}|^2 |V_{RF}| \left\{ \cos 2\pi f_{RF} t - \frac{1}{2} \cos 2\pi (2f_{LO} + f_{RF}) t \right. \\
&\quad \left. - \frac{1}{2} \cos 2\pi (2f_{LO} - f_{RF}) t \right\} \quad \dots\dots (16)
\end{aligned}$$

In other words, from the item of $V_{LO}^2 \cdot V_{RF}$ in the equation (15) it is possible to obtain a sum frequency component and a difference frequency component between a doubled frequency $2f_{LO}$ of the local signal V_{LO} and the frequency f_{RF} of the mixing signal V_{RF} . Therefore, by selecting a desired frequency component from the sum frequency component and the difference frequency component by a filter, it is possible to obtain an output of the frequency multiplier and mixer circuit.

In the above mentioned embodiment, the first differential amplifier has been formed of the MOSFETs. However, the first differential amplifier can be formed of junction type FETs (JFET). In the case of JFETs, since the driving power is defined by a maximum drain current I_{DSS} , the above mentioned equations (1), (2) and (5) can be replaced with the following equations (17), (18) and (19), respectively.

$$I_{d1} = K I_{DSS} \left(1 - \frac{V_{GS1}}{V_P} \right)^2 \quad \dots\dots (17)$$

$$I_{d2} = I_{DSS} \left(1 - \frac{V_{GS2}}{V_P} \right)^2 \quad \dots\dots (18)$$

$$I_{d1} + I_{d2} = I_o \quad \dots\dots(19)$$

Namely, a result similar to that of the above mentioned embodiment can be obtained only by replacing V_T and β by V_P and (I_{DSS}/V_P^2) , respectively. This means that the present invention can be similarly applied to the case in which the FETs are implemented in the GaAs MESFET technology.

In particular, as seen from the above mentioned equation (9), undesired frequency components of the output current of the frequency multiplier circuit is as small as -40dB in comparison with a $2f_{LO}$ component in an actual circuit. Namely, the undesired frequency components is at a level which does not require a filter for removing the undesired components. Therefore, it is expected that the frequency multiplier and mixer circuit can be implemented in a semiconductor integrated circuit chip with requiring no external filter between the frequency multiplier and the mixer.

In the above mentioned embodiment, the second differential amplifier has been formed of the bipolar transistors, but can be formed of FETs. For example, a MOSFET differential amplifier, which can be used as the second differential amplifier, is disclosed by A Nedungadi and T. R. Viswanathan "Design of Linear CMOS Transconductance Elements", IEEE Trans. Circuits and Systems, Vol. CAS-31, No. 10, Oct., 1984. The differential amplifier disclosed by A Nedungadi and T. R. Viswanathan has an improved linearity of the transconductance by using a cross-coupled quad cell as a squaring circuit, but needs a large number of transistors and therefore requires a large consumption current. In addition, a large occupying area is required in an integrated circuit.

Referring to Figure 2, there is shown a circuit diagram of a differential circuit which is formed of only FETs and which can be used as the second differential amplifier of the frequency multiplier and mixer circuit in accordance with the present invention. The shown differential amplifier is remarkably simpler in construction than the differential amplifier disclosed by A Nedungadi and T. R. Viswanathan.

The differential amplifier shown in Figure 2 is composed of two sets of differential transistor pairs, a first differential transistor pair being formed of source-coupled FETs M10 and M20 having their sources connected to ground through the FET M9A (first mirror current path) of the third current mirror circuit acting as a current source I_o , and a second differential transistor pair being formed of source-coupled FETs M30 and M40 having their sources connected to ground through a FET M9B (second mirror current path), which is connected to the FET M9A of the third current mirror circuit, similarly to the FET M9A, and which acts as another current source I_o .

Here, as mentioned hereinbefore, a ratio of a gate width "W" to a gate length "L" is expressed by "W/L", and the gate width-to-length ratio of the FET M10 to M40 are expressed by " W_{10}/L_{10} ", " W_{20}/L_{20} ", " W_{30}/L_{30} ", and " W_{40}/L_{40} ", respectively. In connection with the gate width-to-length ratio, the FET M10 to M40 has the following relation:

$$(W_{10}/L_{10}) : (W_{20}/L_{20}) = 1 : K$$

$$(W_{30}/L_{30}) : (W_{40}/L_{40}) = K : 1$$

where K is 9.5.

Gates of the FETs M10 and M40 are connected to each other and also connected in common to one of a pair of input nodes for receiving an input signal V_{in} as the mixing signal V_{RF} , and gates of the FETs M20 and M30 are connected to each other and also connected in common to the other of the pair of input node nodes for receiving the input signal V_{in} . Drains of the FETs M10 and M30 are connected to each other so as to receive a drive current I_{10} in common, and drains of the FETs M20 and M40 are connected to each other so as to receive receive a drive current I_{20} in common.

Now, assuming that the four FETs M10 to M40 operate in a saturated regions, and also assuming that $L_1 = L_2 = L_3 = L_4$, respective drain currents I_{d10} , I_{d20} , I_{d30} , and I_{d40} of the four FETs M10 to M40 can be expressed as follows:

$$I_{d10} = \beta(V_{GS10} - V_t)^2 \quad \text{.....(20)}$$

$$I_{d20} = K\beta(V_{GS20} - V_t)^2 \quad \text{.....(21)}$$

$$I_{d30} = K\beta(V_{GS30} - V_t)^2 \quad \text{.....(22)}$$

$$I_{d40} = \beta(V_{GS40} - V_t)^2 \quad \text{.....(23)}$$

where β is the transconductance parameter of the FET M10, and is expressed by $(1/2)\mu \cdot C_{ox}(W/L)$ where μ is an effective

mobility and C_{ox} is a gate oxide film capacitance per unit area;

V_{GS10} , V_{GS20} , V_{GS30} and V_{GS40} a gate-source voltage of the FETs M10 to M40; and

V_t is the threshold voltage.

Therefore, the constant current source and the input voltage V_{in} can be expressed as follows

$$I_{d10} + I_{d20} = I_{d30} + I_{d40} = I_0 \quad \dots\dots(24)$$

$$V_{GS10} - V_{GS20} = V_{GS40} - V_{GS30} = V_{LO} \quad \dots\dots(25)$$

If the above equations (20) to (25) are solved, the following equation can be obtained:

$$I_{d10} - I_{d20} = \begin{cases} \frac{-(1-\frac{1}{K}) \{ (1+\frac{1}{K}) I_0 - 2\beta V_{in}^2 \} + \beta V_{in} (\frac{4}{\sqrt{K}}) \sqrt{(1+\frac{1}{K}) \frac{I_0}{\beta} - V_{in}^2}}{(1+\frac{1}{K})^2} & (-\sqrt{\frac{I_0}{\beta}} \leq V_{in} \leq \sqrt{\frac{I_0}{(K\beta)}}) \\ I_0 & (V_{in} \geq \sqrt{\frac{I_0}{(K\beta)}}) \\ -I_0 & (V_{in} \leq -\sqrt{\frac{I_0}{\beta}}) \end{cases} \quad \dots\dots(26)$$

$$\begin{aligned}
& I_{d30} - I_{d40} \\
= & \left\{ \begin{aligned} & \frac{(1 - \frac{1}{K}) \{ (1 + \frac{1}{K}) I_0 - 2\beta V_{in}^2 \} + \beta V_{in} (\frac{4}{\sqrt{K}}) \sqrt{(1 + \frac{1}{K}) \frac{I_0}{\beta} - V_{in}^2}}{(1 + \frac{1}{K})^2} & (-\sqrt{\frac{I_0}{K\beta}} \leq V_{in} \leq \sqrt{\frac{I_0}{\beta}}) \\ & I_0 & (V_{in} \geq \sqrt{\frac{I_0}{\beta}}) \\ & -I_0 & (V_{in} \leq -\sqrt{\frac{I_0}{K\beta}}) \end{aligned} \right.
\end{aligned}
\tag{27}$$

Therefore,

$$\begin{aligned}
\Delta I_1 &= (I_{d10} + I_{d30}) - (I_{d20} + I_{d40}) \\
&= (I_{d10} - I_{d20}) + (I_{d30} - I_{d40}) \\
= & \left\{ \begin{aligned} & \frac{(\frac{8}{\sqrt{K}}) \beta V_{in} \sqrt{(1 + \frac{1}{K}) \frac{I_0}{\beta} - V_{in}^2}}{(1 + \frac{1}{K})^2} & (|V_{in}| \leq \sqrt{\frac{I_0}{K\beta}}) \\ & \frac{(\frac{4}{\sqrt{K}}) \beta V_{in} \sqrt{(1 + \frac{1}{K}) \frac{I_0}{\beta} - V_{in}^2}}{(1 + \frac{1}{K})^2} + \frac{2(1 - \frac{1}{K}) \beta V_{in}^2}{(1 + \frac{1}{K})^2} \text{sgn}(V_{in}) & (\sqrt{\frac{I_0}{K\beta}} \leq |V_{in}| \leq \sqrt{\frac{I_0}{\beta}}) \\ & + \frac{2(\frac{1}{K})}{1 + \frac{1}{K}} I_0 \text{sgn}(V_{in}) & \\ & 2I_0 \text{sgn}(V_{in}) & (|V_{in}| \geq \sqrt{\frac{I_0}{\beta}}) \end{aligned} \right.
\end{aligned}
\tag{28}$$

By differentiating the above equation (28) by the input voltage V_{in} , the transconductance can be obtained.

$$\frac{d(\Delta I_1)}{dV_{in}}$$

$$= \begin{cases} \frac{8K\sqrt{\beta I_0}}{(K+1)\sqrt{1+K}} \left[\sqrt{1 - \frac{V_{in}^2}{(1+\frac{1}{K})(\frac{I_0}{\beta})}} - \frac{\frac{V_{in}^2}{\{(1+\frac{1}{K})(\frac{I_0}{\beta})\}}}{\sqrt{1 + \frac{V_{in}^2}{\{(1+\frac{1}{K})(\frac{I_0}{\beta})\}}}} \right] & (|V_{in}| \leq \sqrt{\frac{I_0}{K\beta}}) \\ \frac{4K\sqrt{\beta I_0}}{(K+1)\sqrt{1+K}} \left[\sqrt{1 - \frac{V_{in}^2}{(1+\frac{1}{K})(\frac{I_0}{\beta})}} - \frac{\frac{V_{in}^2}{\{(1+\frac{1}{K})(\frac{I_0}{\beta})\}}}{\sqrt{1 + \frac{V_{in}^2}{\{(1+\frac{1}{K})(\frac{I_0}{\beta})\}}}} \right] & \sqrt{\frac{I_0}{K\beta}} \leq |V_{in}| \leq \sqrt{\frac{I_0}{\beta}} \\ + \frac{4(1-\frac{1}{K})\beta V_{in}}{(1+\frac{1}{K})^2} & \\ 0 & (|V_{in}| \geq \sqrt{\frac{I_0}{\beta}}) \end{cases} \dots\dots(29)$$

In the above equation (29), putting $K=9.5$, the obtained transconductance can have a 15% equiripple of the maximum value, and therefore, the linearity can be improved to a maximum degree.

Figure 3 is a graph showing a transconductance of the differential circuit shown in Figure 2.

In addition, if the gate size can be reduced, the size of the FETs can be correspondingly reduced. Therefore, similarly to the conventional unbalanced differential circuit, if the gate length L is the same and the

gate width is K times, gate areas S_{G10} and S_{G20} of the FETs M10 and M20 can be expressed

$$S_G = S_{G10} + S_{G20} = L_{10}W_{10}(1+K) \quad \dots\dots(30)$$

In the embodiment shown in Figure 2, it can be assumed as follows:

$$W_{10}/L_{10} = 1/\sqrt{K} \quad \dots\dots(31)$$

$$W_{20}/L_{20} = \sqrt{K} \quad \dots\dots(32)$$

Therefore, the gate areas S_{G10} and S_{G20} can be expressed as follows:

$$S_G = S_{G10} + S_{G20} = \sqrt{K}W_{10}^2 + \sqrt{K}L_{20}^2 \quad \dots\dots(33)$$

Here, assuming that respective minimum sizes of the gate length L_{10} and the gate width W_{10} are $3\mu\text{m}$, from the equation (30),

$$S_G = 94.5\mu\text{m}^2$$

On the other hand, assuming $W_{10} = L_{20} = 3\mu\text{m}$, from the equation (33),

$$S_G = 55.5\mu\text{m}^2$$

Namely, the gate area can be reduced to 58.7%. This corresponds to $K=5.2$ in the conventional method in the gate length L is the same and the gate width is K times. Namely, the transistor size can be reduced in comparison with $K=9.5$ in the conventional method.

In addition, if the input signal is in the range of $|V_{in}| \leq 0.85V_\mu$ where $V_\mu = (I_0/\beta)^{1/2}$, the transconductance is in the range of -15% from the maximum value, and therefore, a sufficient wide range having a relatively good linearity can be obtained. In conventional matching differential circuit, the transconductance drops to -30% in the range of $|V_{in}| \leq V_\mu$. Accordingly, the linearity can be improved double by restricting the input range by 15%.

In general, the gate length L of the transistors has a relatively large variation of manufacturing. However, when the degree of unbalance is enlarged to $K=9.5$, even if the value of K varies to some extent, if the matching of the device can be ensured, the change of the characteristics is small. For example, the transconductance characteristics in the cases of $K=9$ and $k=10$ are added in Figure 3.

As seen from the above, in the frequency multiplier and mixer circuit in accordance with the present invention, the first differential amplifier constituting the frequency multiplier is composed of a squaring circuit utilizing a squaring characteristics of the FETs, and therefore, a sufficient spurious characteristics can be obtained. Accordingly, the frequency multiplier can be connected to the second differential amplifier constituting the mixer, through the current mirror circuits, but with no filter between the frequency multiplier and the mixer. In addition, external terminals for the frequency multiplier become unnecessary. Therefore, the frequency multiplier and mixer circuit in accordance with the present invention is very suitable to be implemented in the semiconductor integrated circuit.

The invention has thus been shown and described with reference to the specific embodiments. However, it should be noted that the present invention is in no way limited to the details of the illustrated structures but changes and modifications may be made within the scope of the appended claims.

Claims:

1. A frequency multiplier and mixer circuit comprising:
 - a first pair of input terminals for receiving a signal to be frequency-multiplied;
 - a second pair of input terminals for receiving a mixing signal;
 - an output terminal for outputting an output signal;
 - a frequency multiplier circuit composed of a first differential amplifier, which includes a first differential circuit formed of source-coupled first and second field effect transistors having their respective driving powers in a ratio of $K : 1$ where K is a positive real number excluding 1, and a second differential circuit formed of source-coupled third and fourth field effect transistors having their respective driving powers in a ratio of $1 : K$, sources of said first and second field effect transistors being connected in common to a first constant current source, and sources of said third and fourth field effect transistors being connected in common to a second constant current source, gates of said first and third field effect transistors having different driving powers being connected in common to one terminal of said first pair of input terminals, and gates of said second and fourth field effect transistors having different driving powers being connected in common to the other terminal of said first pair of input terminals, drains of said first and fourth field effect transistors having the same driving power being connected to one node of a pair of output nodes, and drains of said second and third field effect transistors having the same driving power being connected to the other node of said pair of output nodes;

a current mirror means having an input current path connected to said one node of said pair of output nodes so as to flow a differential current between said pair of output nodes, and a mirror current path; and

a mixing circuit composed of a second differential amplifier, which includes a pair of inputs connected to said second pair of input terminals, one end of one main current path of two main current paths of said second differential amplifier being connected to said output terminal, the other end of each of said two main current paths being connected in common to said mirror current path of said current mirror means.

2. A frequency multiplier and mixer circuit claimed in Claim 1 further including a first current mirror circuit having an input current path and a mirror current path which are respectively connected between a supply voltage and said one node of said pair of output nodes and between said supply voltage and said other node of said pair of output nodes, and wherein said current mirror means includes a second current mirror circuit having an input current path connected between said supply voltage and said one node of said pair of output nodes and a mirror current path connected at its one end to said supply voltage, and a third current mirror circuit having an input current path connected in series with said mirror current path of said second current mirror circuit, a mirror current path of said third current mirror circuit being connected to the other end of each of said two main current paths of said second differential amplifier.

3. A frequency multiplier and mixer circuit claimed in Claim 2 wherein said second differential amplifier includes a pair of

emitter-coupled bipolar transistors having their respective bases connected to said second pair of input terminals, respectively, emitters of the pair of bipolar transistors being connected in series to said mirror current path of said third current mirror circuit, and a collector of one of said bipolar transistors is connected to said output terminal.

4. A frequency multiplier and mixer circuit claimed in Claim 2 wherein said third current mirror circuit having first and second mirror current paths of the same current capacity, and wherein said second differential amplifier includes a first differential circuit formed of source-coupled fifth and sixth field effect transistors having their sources connected in common to said first mirror current path of said third current mirror circuit, and a second differential circuit formed of source-coupled seventh and eighth field effect transistors having their sources connected in common to said second mirror current path of said third current mirror circuit, a ratio of a gate width-to-length ratio of said fifth field effect transistor to a gate width-to-length ratio of said sixth field effect transistor being 1 : 9.5, and a ratio of a gate width-to-length ratio of said seventh field effect transistor to a gate width-to-length ratio of said eighth field effect transistor being 9.5 : 1, gates of said fifth and eighth field effect transistors being connected in common to one input of said second pair of input terminals, and gates of said sixth and seventh field effect transistors being connected in common to the other input of said second pair of input terminals, drains of said fifth and seventh field effect transistors being connected to each other, and drains of said sixth and eighth field effect transistors being connected to each other.

5. A frequency multiplier and mixer circuit claimed in Claim 1 wherein said first and second constant current sources have the same current capacity, and the driving power of said first and fourth field effect transistors is larger than that of said second and third field effect transistors.

6. A frequency mixer and multiplier circuit substantially as herein described with reference to accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

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Relevant Technical fields

(i) UK Cl (Edition K) H3R: RMB, RMC, RMX

(ii) Int Cl (Edition 5) H03D

Search Examiner

MR S SATKURUNATH

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASES: WPI, EDOC

Date of Search

30 NOVEMBER 1992

Documents considered relevant following a search in respect of claims 1-6

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	GB 1459760 (SONY) - see Figure 5	1
A	EP 0498221 (NEC)	1
-25-		

Category	Identity of document and relevant passages	Relevant to claim(s).

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

EXHIBIT 33

THIRD
EDITION

Microelectronic Circuits

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ABOUT THE COVER

In the background is a processed wafer of silicon on which a large number of identical circuit chips are fabricated. When cut from such a wafer, a chip can be housed in a package such as the one shown here with its cover removed. This single chip is a segmented memory array with a very large number of active devices in a variety of intricate circuit structures. The growing need for efficient and reliable low-cost components such as these underlies the importance of the various circuit design and circuit analysis techniques discussed in this text.

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Engineer
TK
TE67
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Prerequisite

Organization

Exercise 10.32 An analog signal in the range 0 to +10 V is to be converted to an 8-bit digital signal. What is the resolution of the conversion in volts? What is the digital representation of an input of 6 V? What is the representation of an input of 6.2 V? What is the error made in the quantization of 6.2 V in absolute terms and as a percent of the input? as a percent of full scale? What is the largest possible quantization error as a percent of full scale?

Ans. 0.0392 V; 10011001; 10011110; -0.0064 V; -0.1%; -0.064%; 0.196%

10.10 D/A CONVERTER CIRCUITS

Basic Circuit Using Binary-Weighted Resistors

Figure 10.31 shows a simple circuit for an N -bit D/A converter. The circuit consists of a reference voltage V_{ref} , N binary-weighted resistors $R, 2R, 4R, 8R, \dots, 2^{N-1}R$, N single-pole double-throw switches $S_1, S_2, \dots, S_N$, and an op amp together with its feedback resistance $R_f = R/2$.

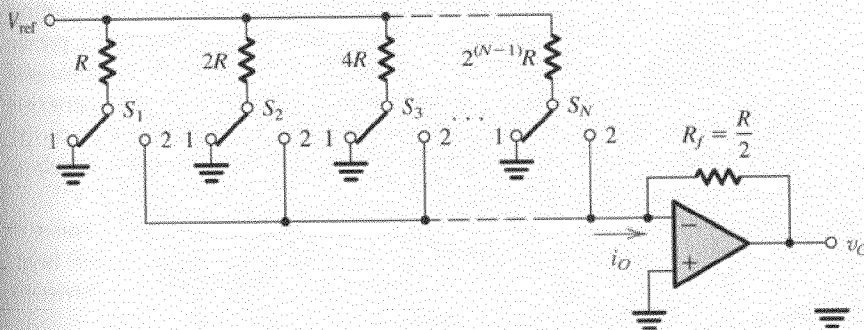


Fig. 10.31 An N -bit D/A converter using a binary-weighted resistive ladder network.

The switches are controlled by an N -bit digital input word D ,

$$D = \frac{b_1}{2^1} + \frac{b_2}{2^2} + \dots + \frac{b_N}{2^N} \quad (10.67)$$

where b_1, b_2 , and so on are bit coefficients that are either 1 or 0. Note that the bit b_N is the **least significant bit (LSB)** and b_1 is the **most significant bit (MSB)**. In the circuit in Fig. 10.31, b_1 controls switch S_1 , b_2 controls S_2 , and so on. When b_i is 0, switch S_i is in position 1, and when b_i is 1 switch S_i is in position 2.

Since position 1 of all switches is ground and position 2 is virtual ground, the current through each resistor remains constant. Each switch simply controls where its corresponding current goes: to ground (when the corresponding bit is 0) or to virtual ground (when the corresponding bit is 1). The currents flowing into the virtual ground add up, and the

sum flows through the feedback resistance R_f . The total current i_O is therefore given by

$$i_O = \frac{V_{\text{ref}}}{R} b_1 + \frac{V_{\text{ref}}}{2R} b_2 + \cdots + \frac{V_{\text{ref}}}{2^{N-1}R} b_N$$

$$= \frac{2V_{\text{ref}}}{R} \left(\frac{b_1}{2^1} + \frac{b_2}{2^2} + \cdots + \frac{b_N}{2^N} \right)$$

Thus

$$i_O = \frac{2V_{\text{ref}}}{R} D \quad (10.68)$$

and the output voltage v_O is given by

$$v_O = -i_O R_f = -V_{\text{ref}} D \quad (10.69)$$

which is directly proportional to the digital word D , as desired.

It should be noted that the accuracy of the DAC depends critically on (1) the accuracy of V_{ref} , (2) the precision of the binary-weighted resistors, and (3) the perfection of the switches. Regarding the third point, we should emphasize that these switches handle analog signals; thus their perfection is of considerable interest. While the offset voltage and the finite on resistance are not of critical significance in a digital switch, these parameters are of immense importance in *analog switches*. The use of FETs to implement analog switches was discussed in Chapter 5. Also, we shall shortly see that in a practical circuit implementation of the DAC the binary-weighted currents are generated by current sources. In this case the analog switch can be realized using the differential-pair circuit, as will be shown.

A disadvantage of the binary-weighted resistor network is that for a large number of bits ($N > 4$) the spread between the smallest and largest resistances becomes quite large. This implies difficulties in maintaining accuracy in resistor values. A more convenient scheme exists utilizing a resistive network called the R - $2R$ ladder.

R - $2R$ Ladders

Figure 10.32 shows the basic arrangement of a DAC using an R - $2R$ ladder. Because of the small spread in resistance values, this network is usually preferred to the binary-weighted scheme discussed above, especially for $N > 4$. Operation of the R - $2R$ ladder is straightforward. First, it can be shown, by starting from the right and working toward the left, that the resistance to the right of each ladder node, such as that labeled X , is equal to $2R$. Thus the current flowing to the right, away from each node, is equal to the current flowing downward to ground, and twice that current flows into the node from the left side. It follows that

$$I_1 = 2I_2 = 4I_3 = \cdots = 2^{N-1}I_N$$

Thus, as in the binary-weighted resistive network, the currents controlled by the switches are binary weighted. The output current i_O will therefore be given by

$$i_O = \frac{V_{\text{ref}}}{R} D$$



Fig. 10.3

A Pract

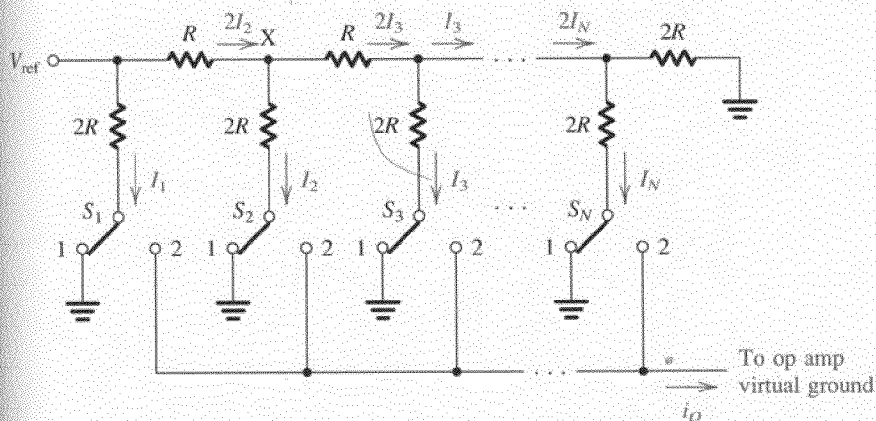


Fig. 10.32 Basic circuit configuration of a DAC utilizing an R - $2R$ ladder network.

A Practical Circuit Implementation

A practical circuit implementation of the DAC utilizing an R - $2R$ ladder is shown in Fig. 10.33. The circuit utilizes BJTs to generate binary-weighted constant currents $I_1, I_2, \dots, I_N$, which are switched between ground and virtual ground of an output summing op amp (not shown). We shall first show that the currents I_1 to I_N are indeed binary weighted, with I_1 corresponding to the MSB and I_N corresponding to the LSB of the DAC.

Starting at the two rightmost transistors, Q_N and Q_{N-1} , we see that if they are matched their emitter currents will be equal and are denoted (I_N/α) . Transistor Q_i is included to provide proper termination of the R - $2R$ network. The voltage between the base line of the BJTs and node N will be

$$V_N = V_{BE_N} + \left(\frac{I_N}{\alpha}\right)(2R)$$

where V_{BE_N} is the base-emitter voltage of Q_N . Since the current flowing through the resistor R connected to node N is $(2I_N/\alpha)$, the voltage between node N and node $(N-1)$ will be

$$V_{N-1} = V_N + \left(\frac{2I_N}{\alpha}\right)R = V_{BE_N} + \frac{4I_N}{\alpha}R$$

Assuming, for the moment, that $V_{BE_{N-1}} = V_{BE_N}$, we see that a voltage of $(4I_N/\alpha)R$ appears across the resistance $2R$ in the emitter of Q_{N-1} . Thus Q_{N-1} will have an emitter current of $(2I_N/\alpha)$ and a collector current of $(2I_N)$, twice the current in Q_N . The two transistors will have equal V_{BE} drops if their junction areas are scaled in the same proportion as their currents, which is usually done in practice.

Proceeding in the above manner we can show that

$$I_1 = 2I_2 = 4I_3 = \dots = 2^{N-1}I_N$$

under the assumption that the EBJ areas of Q_1 to Q_N are scaled in a binary-weighted fashion.

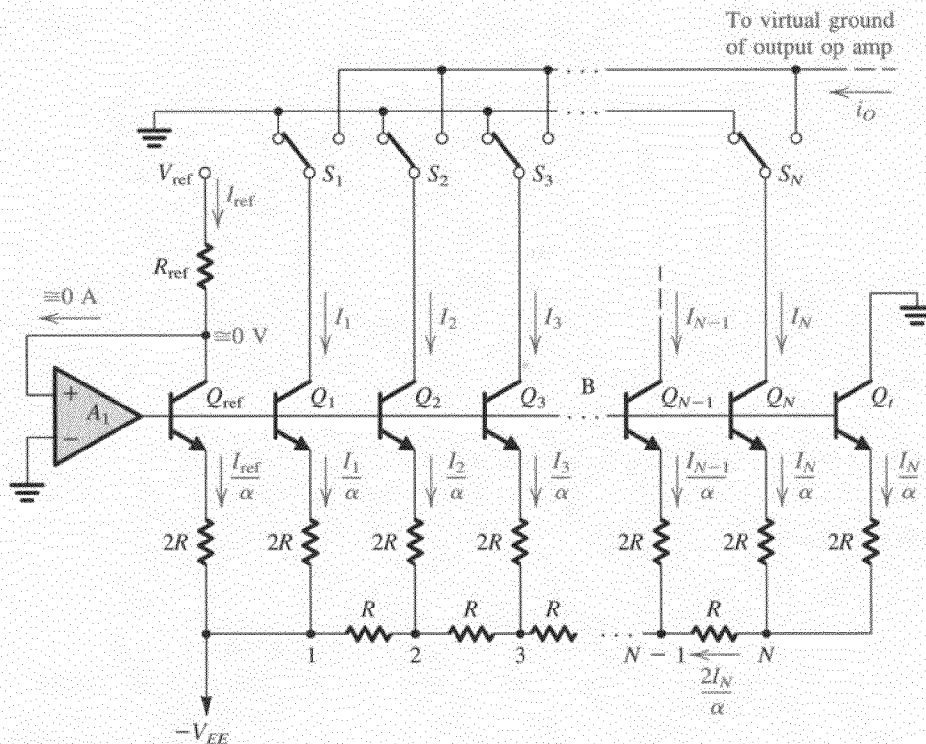


Fig. 10.33 A practical circuit implementation of a DAC utilizing an R - $2R$ ladder network.

Next consider op amp A_1 , which, together with the reference transistor Q_{ref} , forms a negative-feedback loop. (Convince yourself that the feedback is indeed negative.) A virtual ground appears at the collector of Q_{ref} forcing it to conduct a collector current $I_{\text{ref}} = V_{\text{ref}}/R_{\text{ref}}$ independent of whatever imperfections Q_{ref} might have. Now, if Q_{ref} and Q_1 are matched, their collector currents will be equal,

$$I_1 = I_{\text{ref}}$$

Thus, the binary-weighted currents are directly related to the reference current, independent of the exact values of V_{BE} and α . Also observe that op amp A_1 supplies the base currents of all the BJTs.

Current Switches

Each of the single-pole double-throw switches in the DAC circuit of Fig. 10.33 can be implemented by a circuit such as that shown in Fig. 10.34 for switch S_m . Here I_m denotes the current flowing in the collector of the m th bit transistor. The circuit is a differential pair with the base of the reference transistor Q_{mr} connected to a suitable dc voltage V_{bias} , and the digital signal representing the m th bit b_m applied to the base of the other transistor Q_{ms} . If the voltage representing b_m is higher than V_{bias} by a few hundred millivolts, Q_{ms}

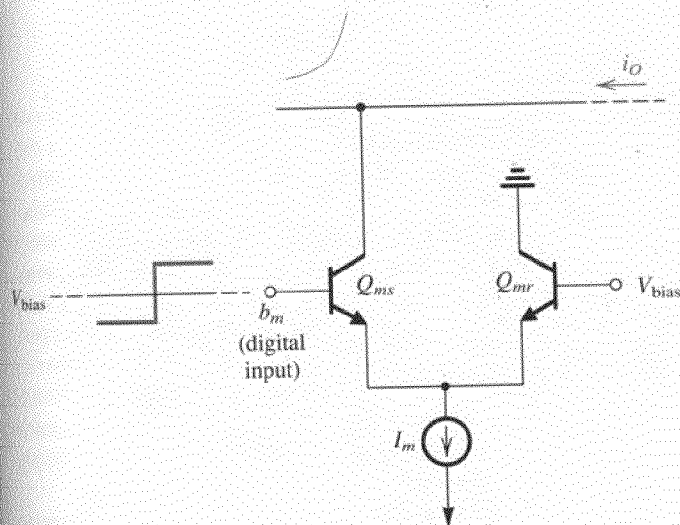


Fig. 10.34 Circuit implementation of switch s_m in the DAC of Fig. 10.33. In a BiCMOS technology, Q_{ms} and Q_{mr} can be implemented using MOSFETs, thus avoiding the inaccuracy caused by the base current of BJTs.

will turn on and Q_{mr} will turn off. The bit current I_m will flow through Q_{ms} and onto the output summing line. On the other hand, when b_m is low, Q_{ms} will be off and I_m flows through Q_{mr} to ground.

The current switch of Fig. 10.34 is simple and features high-speed operation. It suffers, however, from the fact that part of the current I_m flows through the base of Q_{ms} and thus does not appear on the output summing line. More elaborate circuits for current switches can be found in Grebene (1984). Also, in a BiCMOS technology the differential-pair transistors Q_{ms} and Q_{mr} can be replaced with MOSFETs, thus eliminating the base current problem.

Exercises 10.33 What is the maximum resistor ratio required by a 12-bit D/A converter utilizing a binary-weighted ladder?

Ans. 2048

10.34 If the input bias current of an op amp, used as the output summer in a 10-bit DAC, is to be no more than that equivalent to $\frac{1}{4}$ LSB, what is the maximum current required to flow in R_f for an op amp whose bias current is as great as $0.5 \mu\text{A}$?

Ans. 2.046 mA

10.11 A/D CONVERTER CIRCUITS

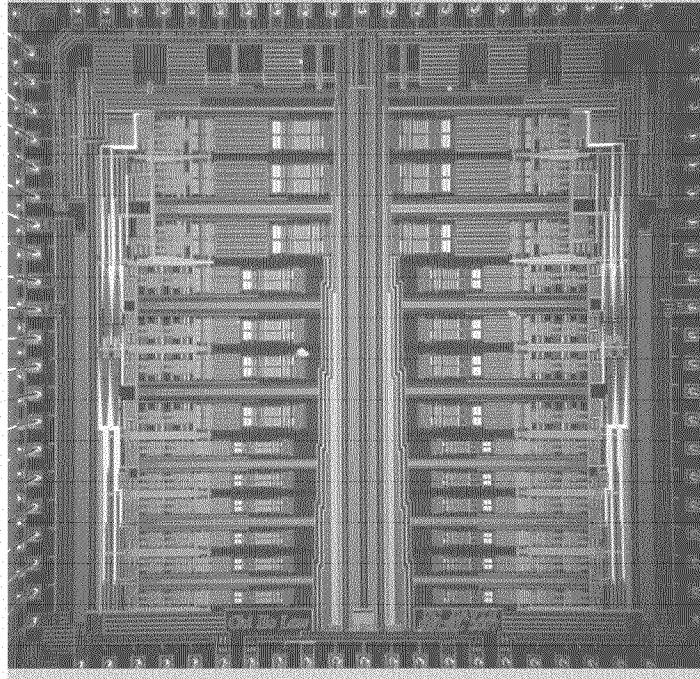
There exist a number of A/D conversion techniques varying in complexity and speed of conversion. In the following we shall discuss two simple but slow schemes, one complex (in terms of the amount of circuitry required) but extremely fast method, and finally a method particularly suited for MOS implementation.

EXHIBIT 34

ANALYSIS AND DESIGN OF ANALOG INTEGRATED CIRCUITS

Paul R. Gray ■ Paul J. Hurst ■ Stephen H. Lewis ■ Robert G. Meyer

Fifth Edition



ANALYSIS AND DESIGN OF ANALOG INTEGRATED CIRCUITS

Fifth Edition

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base region. Estimate the punch-through voltage in the following way. When the base depletion region includes the entire base, charge neutrality requires that the number of ionized acceptors in the depletion region in the base be equal to the number of ionized donors in the depletion region on the collector side of the base. [See (1.2).] Therefore, when enough voltage is applied that the depletion region in the base region includes the whole base, the depletion region in the collector must include a number of ionized atoms equal to Q_B . Since the density of these atoms is known (equal to N_D), the width of the depletion layer in the collector region at punch-through can be determined. If we assume that the doping in the base N_A is much larger than that in the collector N_D , then (1.15) can be used to find the voltage that will result in this depletion layer width. Repeat this problem for the standard device, assuming a V_{BE} measured at 560 mV. Assume an electron diffusivity $\bar{D}_n$ of $13 \text{ cm}^2/\text{s}$, and a hole mobility $\bar{\mu}_p$ of $150 \text{ cm}^2/\text{V}\cdot\text{s}$. Assume the epi doping is 10^{15} cm^{-3} . Use $\epsilon = 1.04 \times 10^{-12} \text{ F/cm}$ for the permittivity of silicon. Also, assume ψ_o for the collector-base junction is 0.55 V.

2.12 An MOS transistor biased in the active region displays a drain current of $100 \mu\text{A}$ at a V_{GS} of 1.5 V and a drain current of $10 \mu\text{A}$ at a V_{GS} of 0.8 V. Determine the threshold voltage and $\mu_n C_{ox} (W/L)$. Neglect subthreshold conduction and assume that the mobility is constant.

2.13 Calculate the threshold voltage of the p -channel transistors for the process given in Table 2.1. First do the calculation for the unimplanted transistor, then for the case in which the device receives the channel implant specified. Note that this is a p -type implant, so that the effective surface concentration is the difference between the background substrate concentration and the effective concentration in the implant layer.

2.14 An n -channel implanted transistor from the process described in Table 2.1 displays a measured output resistance of $5 \text{ M}\Omega$ at a drain current of $10 \mu\text{A}$, biased in the active region at a V_{DS} of 5 V. The drawn dimensions of the device are $100 \mu\text{m}$ by $7 \mu\text{m}$. Find the output resistance of a second device on the same technology that has drawn dimensions of $50 \mu\text{m}$ by $12 \mu\text{m}$ and is operated at a drain current of $30 \mu\text{A}$ and a V_{DS} of 5 V.

2.15 Calculate the small-signal model parameters of the device shown in Fig. 2.74, including g_m , g_{mb} , r_o , C_{gs} , C_{gd} , C_{sb} , and C_{db} . Assume the transistor is biased at a drain-source voltage of 2 V and a drain current of $20 \mu\text{A}$. Use the process parameters that are specified in Table 2.4. Assume $V_{SB} = 1 \text{ V}$.

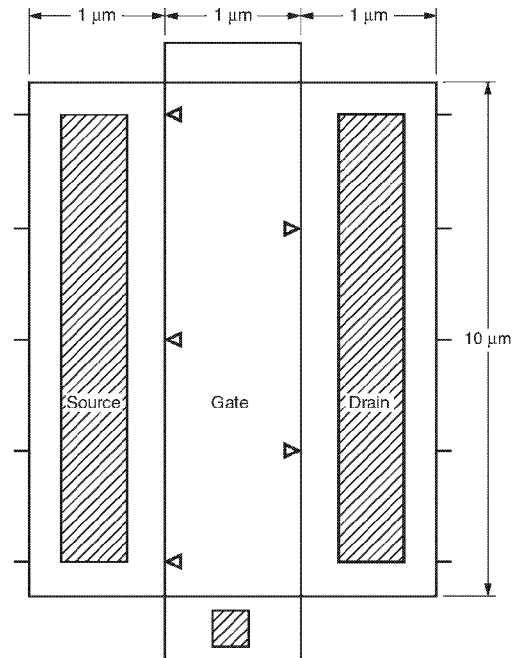


Figure 2.74 Transistor for Problem 2.15.

2.16 The transistor shown in Fig. 2.74 is connected in the circuit shown in Fig. 2.75. The gate is grounded, the substrate is connected to -1.5 V , and the drain is open circuited. An ideal current source is tied to the source, and this source has a value of zero for $t < 0$ and $10 \mu\text{A}$ for $t > 0$. The source and drain are at an initial voltage of $+1.5 \text{ V}$ at $t = 0$. Sketch the voltage at the source and drain from $t = 0$ until the drain voltage reaches -1.5 V . For simplicity, assume that the source-substrate and drain-substrate capacitances are constant at their zero-bias values. Assume the transistor has a threshold voltage of 0.6 V .

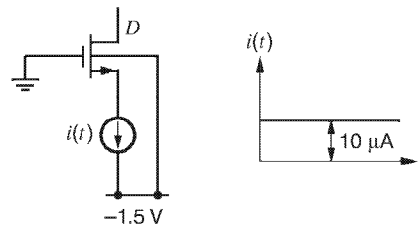


Figure 2.75 Circuit for Problem 2.16.

2.17 Show that two MOS transistors connected in parallel with channel widths of W_1 and W_2 and identical channel lengths of L can be modeled as one equivalent MOS transistor whose width is $W_1 + W_2$ and whose length is L , as shown in Fig. 2.76. Assume the transistors are identical except for their channel widths.

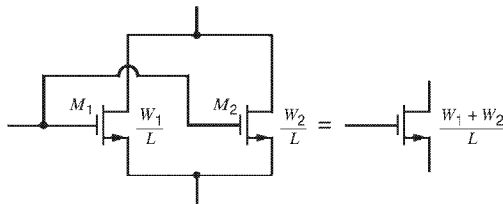


Figure 2.76 Circuit for Problem 2.17.

2.18 Show that two MOS transistors connected in series with channel lengths of L_1 and L_2 and identical channel widths of W can be modeled as one equivalent MOS transistor whose width is W and whose length is $L_1 + L_2$, as shown in Fig. 2.77. Assume the transistors are identical except for their channel lengths. Ignore the body effect and channel-length modulation.

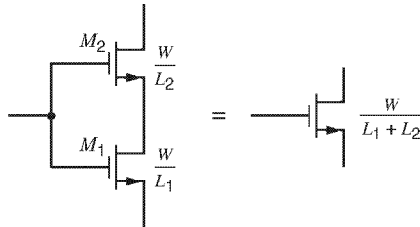


Figure 2.77 Circuit for Problem 2.18.

2.19 An integrated electronic subsystem is to be fabricated, which requires 40,000 square mils of silicon area. Determine whether the system should be put on one or two chips, assuming that the fabrication cost of the two chips is the only consideration. Assume that the wafer-fab cost is \$100.00, the packaging and testing costs are \$0.60, the die-fab yield is 0.9, and the final-test yield is 0.8. Assume the process used follows curve *B* in Fig. 2.68. Repeat the problem assuming yield curve *A*, and then yield curve *C*. Assume a 4-inch wafer.

2.20 Determine the direct fabrication cost of an integrated circuit that is 150 mils on a side in size. Assume a wafer-fab cost of \$130.00, a package and testing cost of \$0.40, a die-fab yield of 0.8, and a final-test yield of 0.8. Work the problem for yield curves *A*, *B*, and *C* in Fig. 2.68. Assume a 4-inch wafer.

2.21(a) A frequently used empirical approximation for the yield of an IC process as a function of die size is

$$Y_{ws} = \exp(-A/A_0)$$

where A is the die area and A_0 is a constant. Using Fig. 2.68, determine approximate values of A_0 for each of the three processes shown. Use the point on the curve at which the yield is e^{-1} to determine A_0 . Plot the yield predicted by this expression and compare with the curves shown in Fig. 2.68.

(b) Use the expression derived in (a), together with the gross-die-per-wafer curves shown in Fig. 2.69, to develop an analytical expression for the cost of silicon per unit area as a function of die size, Y_{df} , Y_{ft} , C_p , and C_w for each of the three processes *A*, *B*, and *C*.

2.22 Calculate the small-signal model parameters g_m , r_o , C_{gs} , and C_{gd} for a NMOS transistor. Assume the transistor operates in the active region with $I_D = 100 \mu\text{A}$, $V_{DS} = 1 \text{ V}$, $V_{BS} = 0 \text{ V}$, $W = 0.9 \mu\text{m}$, and $L = 0.2 \mu\text{m}$. Use the transistor model data in Table 2.5.

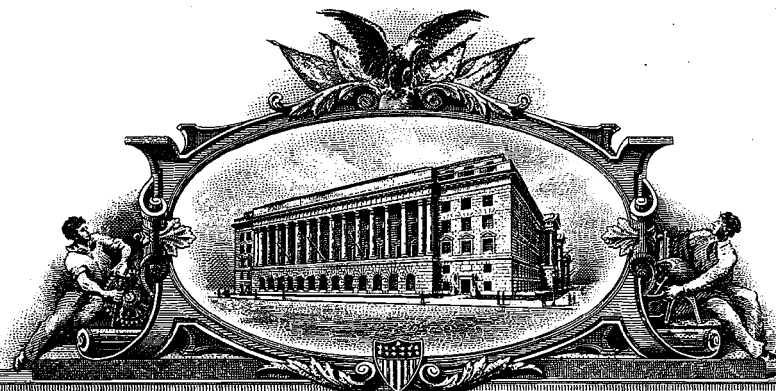
2.23 Calculate the small-signal model parameters g_m , r_o , C_{gs} , and C_{gd} for a NMOS transistor. Also calculate the gate-leakage current I_G . Assume the transistor operates in the active region with $I_D = 100 \mu\text{A}$, $V_{DS} = 1 \text{ V}$, $V_{BS} = 0 \text{ V}$, $W = 0.5 \mu\text{m}$, and $L = 0.1 \mu\text{m}$. Use the transistor model data in Table 2.6.

REFERENCES

1. A. S. Grove. *Physics and Technology of Semiconductor Devices*. Wiley, New York, 1967.
2. R. S. Muller and T. I. Kamins. *Device Electronics for Integrated Circuits*. Wiley, New York, 1986.
3. E. M. Conwell. "Properties of Silicon and Germanium," *Proc. IRE*, Vol. 46, pp. 1281–1300, June 1958.
4. J. C. Irvin. "Resistivity of Bulk Silicon and of Diffused Layers in Silicon," *Bell System Tech. Journal*, Vol. 41, pp. 387–410, March 1962.
5. R. W. Russell and D. D. Culmer. "Ion-Implanted JFET-Bipolar Monolithic Analog Circuits," *Digest of Technical Papers, 1974 International Solid-State Circuits Conference*, Philadelphia, PA, pp. 140–141, February 1974.
6. D. J. Hamilton and W. G. Howard. *Basic Integrated Circuit Engineering*. McGraw-Hill, New York, 1975.
7. Y. Tamaki, T. Shiba, I. Ogiwara, T. Kure, K. Ohyu, and T. Nakamura. "Advanced Device Process Technology for 0.3 μm Self-Aligned Bipolar LSI," *Proceedings of the IEEE Bipolar Circuits and Technology Meeting*, pp. 166–168, September 1990.
8. M. Kurisu, Y. Sasyama, M. Ohuchi, A. Sawairi, M. Sigiyaama, H. Takemura, and T. Tashiro.

EXHIBIT 35

IW 7413949



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FILING DATE: May 08, 2000

PATENT NUMBER: 6,711,211

ISSUE DATE: March 23, 2004

**By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office**



W. Montgomery
W. MONTGOMERY
Certifying Officer

Office Action Summary

Application No.

09/566,020

Applicant(s)

LAINEMA, JANI

Examiner

Nhon T Diep

Art Unit

2613

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-43 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05/08/2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4. 6) ☐ Other:

DETAILED ACTION

Claim Objections

1. Claims 27 and 40 are objected to because of the following informalities: Claim 27, line 2: Please change "segmentaiton" to --segmentation--; and claim 40, line 1: Please change "en encoder" to --an encoder--. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claims 1-3, 5-16, 18-22, 31 and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhang et al in the article titled "Image Sequence Coding Using Multiple-Level Segmentation and Affine Motion Estimation, 12/1997.

Zhang et al discloses video codec using multiple-level segmentation and affine motion compensation comprising the same segmenting a piece of current video information into macroblocks (fig. 2, each of the foreground and background segments is divided into macroblocks); defining a certain number of macroblock segmentations for segmenting a macroblock into blocks (page 1706, right column, lines 18-21); defining for each available macroblock segmentation at least one available prediction method, each of which prediction methods produces prediction motion coefficients for block within the macroblock, resulting in a certain finite number of available macroblock-segmentation – prediction-method pairs (since the examiner interprets that each pairs of

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macroblock-segmentation – prediction-method can have a different segmentation and the same prediction method and further more, since Zhang et al does not mention each macroblock-segmentation has a corresponding prediction-method which is different for each different macroblock-segmentation and therefore Zhang et al, page 1706, right column, lines 18-21 meets the limitation as claimed); selecting for a macroblock one of the available macro-block-segmentation – prediction-method pairs, and segmenting the macroblocks and producing prediction motion coefficients for the blocks within the macroblock using the selected macroblock-segmentation – prediction-method pairs (fig. 2, ME, MC, Coefficients) as specified in claims 1 and 31; wherein the at least one of the available prediction methods defines the prediction motion coefficients for a block within the macroblock to be derived from the motion coefficients of only one prediction block and a first and the second prediction block or to be derived from the motion coefficients of only one prediction block within the macroblock (page 1706, right column, lines 18-25) as specified in claims 2-3 and 5; the prediction block to be used in producing prediction motion coefficients for a block is defined as a block comprising a certain predetermined pixel, whose location is defined relative to the block; the location of a predetermined pixel for a first block is different from the location of a predetermined pixel for a second block; the number of prediction per block is at lost a certain number in any of the macroblock-segmentation – prediction-pairs; or is at most three; a block comprising a certain predetermined pixel, whose location is defined relative to the block; or upper most pixel adjacent from the left, the leftmost pixel superjacent and the pixel corner with the upper right-hand pixel of the block; the macroblock and the blocks

resulting from the macroblock segmentations are quadrilateral; rectangular; or other different segmentations; the macroblock-segmentation of neighboring macroblocks affects the selection of the available macroblock (fig. 5-6 and page 1707, line 16 – page 1709, 7th line from the bottom of right column) as specified in claims 6-16; one macroblock-segmentation – prediction method pair is defined for each available macroblock-segmentation (page 1706, right column, lines 18-21, it is inherently that these information would be transmitted to the decoding side for decoding coded video images) as specified in claims 18-20; estimating the motion of the blocks (global motion vector), modeling the motion of the blocks and representing the motion coefficients; using a translational motion model; (page, 1704, paragraph II – page 170, line 14) as specified in claims 21-22, storage device (inherently included) as specified in claim 39.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 26 and 33-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al.

As applied to claims 1 and 31 above, it is noted that Zhang et al does not particularly disclose that (a) a reversed process (decoding process) of the encoding process as cited in claims 26, 33 and 34; and (b) a computer program for performing encoding and decoding processes as specified in claims 35-38.

With regard to (a): The examiner contends that any ordinary skilled level in the art would find it obvious to built a decoder which would perform a reversed process as of the encoding process as taught by Zhang et al to retrieve images for display.

With regard to (b): Official Notice is taken with regard to the well known method of using computer program element to run either or both of the encoding and decoding processes. Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to modify the system of Zhang et al by using the well known computer program element to perform motion compensated encoding and decoding of the encoded video information. Doing so would help to improve the speed and at the same time reducing cost associated with the above processes.

6. Claims 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al, in view of prior art disclosed in the Background of the Invention, page 8, lines 8-10.

As applied to claim 3, it is noted that Zhang et al does not particularly disclose that the prediction motion coefficient for a block are derived from a median of the motion coefficients of at least a first prediction block and a second prediction block as specified in claim 4. The prior art as disclosed in the Background of the Invention teaches that prediction motion coefficients are typically formed by calculating the median surrounding, already transmitted motion coefficients. Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to modify the system of Zhang et al by using the well known means of deriving a prediction motion

coefficients by calculating the median surrounding, already transmitted motion coefficients. Doing so would help to obtain more accurate coefficients.

7. Claims 17, 23-25, 27-30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al, in view of prior art disclosed in the Background of the Invention, page 8, lines 8-10 and prior art figures 1-2.

As applied to claims 1, 21 and 26 above, it is noted Zhang et al does not particularly disclose that the selection of the macroblock-segmentation – prediction method pair is based on a minimizing a cost function which includes at least a measure of a reconstruction error relating to a macroblock-segmentation – prediction-method pair and a measure of an amount of information required to indicate the macroblock-segmentation – prediction-method pair and to represent the difference motion coefficients of the blocks within the macroblock as specified in claims 17 and 23; and reconstructing the motion of the block, determining a piece of prediction information, determining a piece of prediction error video information, coding the piece of prediction error video information and transmitting information about the prediction error coefficients to a decoder as specified in claims 24-25 and 32 or a decoder for decoding encoded information transmitted from the encoder as specified in claims 27-30. Background of the Invention, page 7, lines 28 – page 8, line 6 teaches that the decision on segmentation is typically carried out by estimating a cost of each alternative macroblock segmentation and by choosing the smallest one and that Lagrange cost function which links a measure of the reconstruction error with a measure of bits needed for transmission using a Lagrange multiple. Therefore, it would have been obvious to

one of ordinary skilled in the art at the time the invention was made to modify the system of Zhang et al by applying the teaching of Prior art mentioned above and also from prior art figures 1-2 to select the macroblock-segmentation – prediction method pair based on a minimizing a cost function which includes at least a measure of a reconstruction error relating to a macroblock-segmentation – prediction-method pair and a measure of an amount of information required to indicate the macroblock-segmentation – prediction-method pair and to represent the difference motion coefficients of the blocks within the macroblock and to reconstruct the motion of the block, to determine a piece of prediction information and a piece of prediction error video information, to code the piece of prediction error video information and to transmit information about the prediction error coefficients to a decoder and obviously to built a decoder capable of receiving these information transmitted by the encoder and to decode these information. Doing so would help to obtain a cost effective encoding-decoding system.

8. Claims 40-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al, in view of Malkamaki et al (US 5,563,895).

As applied to claim 31 above, it is noted that Zhang et al does not particularly disclose a mobile station comprising an encoder and decoder and a network element which is a network element of a mobile telecommunication network comprising an encoder as specified in claims 40-43. Malkamaki et al teaches the using of encoder to compress data for transmitting to the users' ends and to decode data for in a mobile phone network. Therefore, it would have been obvious to one of ordinary skilled level in

the art at the time the invention was made to use the encoder and decoder system in a mobile phone network as taught by Malkamaki et al. Doing so would help to reduce the demand for bandwidth transmission.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Yang et al (US 5,453,799) discloses unified motion estimation.

b. Nakajima (US 5,412,435) discloses an interlace video signal motion compensation prediction system.

c. Lainema et al (US 6,526,096) discloses a video coding system for estimating a motion vector field by using a series of motion estimators of varying complexity.

d. Hassan (US 6,031,826) discloses a fast associated control channel technique for satellite communications.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nhon T Diep whose telephone number is 703-305-4648. The examiner can normally be reached on m-f.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris S Kelley can be reached on 703 305-4856. The fax phone numbers for the organization where this application or proceeding is assigned are 703 87209314 for regular communications and 703-872-9314 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 305-2600.

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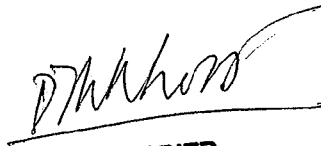

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PRIMARY EXAMINER

Image Sequence Coding Using Multiple-Level Segmentation and Affine Motion Estimation

Kui Zhang, Mirosław Bober, *Associate Member, IEEE*, and Josef Kittler, *Member, IEEE*

Abstract—A very low bit-rate video codec using multiple-level segmentation and affine motion compensation is presented. The translational motion model is adequate to motion compensate small regions even when complex motion is involved; however, it is no longer capable of delivering satisfactory results when applied to large regions or the whole frame. The proposed codec is based on a variable block size algorithm enhanced with global motion compensation, inner block segmentation, and a set of motion models used adaptively in motion compensation. The experimental results show that the proposed method gives better results in terms of the bit rate under the same PSNR constraint for most of the tested sequences as compared with the fixed block size approach and traditional variable block size codec in which only translational motion compensation is utilized.

Index Terms—Codecs, data compression, motion compensation, video coding.

I. INTRODUCTION

IN a low-bit-rate video codec, block-based approaches still play an important role because of their simplicity and relatively easy implementation in real time. Variable block size coding [1], [2] which adaptively changes the block size according to different motion patterns and the shape of moving objects could deliver a better performance in terms of PSNR and bit rate than that of a fixed block size codec. However, the artifacts present in the decoded sequence are more apparent and annoying in a variable block size codec because of the use of larger block sizes, which is especially visible around the motion boundaries. To improve the coding quality in such regions, various motion segmentation methods have been proposed [3]–[5]. For example, the algorithm presented by Lai *et al.* [3] is based upon the assumption that regions moving independently have different gray levels, and can be segmented by gray-level thresholding. Such an approach is very efficient since the motion boundary can be recovered from the reconstructed frame on the receiver side, and there is no bit-rate overhead for the boundary coding. However, it fails in highly textured regions or regions exhibiting low contrast. Moccagatta *et al.* [4] proposed a method in which motion segmentation was accomplished by an exhaustive search for the motion boundary and object motions with the objective of

minimizing the prediction error energy (equivalent to mean-square error). However, their approach is computationally demanding, and does not appear to be amenable to real-time implementation at the present hardware technology level. Moreover, only a translational motion model was used in the above approaches, and this could result in a large prediction error when a complex motion is involved in a large block or region. This may force the codec to split blocks or regions into smaller ones even if no motion boundary is present, which leads to a decline in coding efficiency.

Another important issue in very low bit-rate video coding is how to deal with the global motion caused by camera movement. Such motion can usually be modeled by a perspective projection transformation applied to large background areas. For such types of sequences, using motion compensation with a translational motion model will result in excessive bit-rate overhead. To improve the coding efficiency and the reconstructed image quality, one has to use complex motion models. Various efforts have been made to use such models for motion-compensated prediction [6], [7]; however, their success seemed to be hampered by the problem of reliable and computationally efficient estimation of complex (e.g., affine) motion parameters. The main reason is that other nonstationary objects may bias the estimation of the global motion. Another complication is due to the fact that estimation of a complex motion requires a search in a high-dimensional space, which is computationally expensive. Here, we employed an advanced motion estimation algorithm which utilizes a Hough-transform-based technique for parallel motion estimation and segmentation [8], [5] to estimate the affine motion parameters. To improve the efficiency of the motion compensation stage, we propose a video codec with a layered structure, inner block segmentation, and affine motion-compensated prediction. Such a combination delivers high-quality reconstruction of image sequences at low bit rates. With the improved motion-compensated prediction, the motion-compensated error is greatly reduced, and it may either be neglected or needs fewer bits to encode. The codec takes advantage of the simplicity of the block-based algorithms while maintaining the good coding efficiency of segmentation-based algorithms. Experimental results confirm the improved performance when compared to existing techniques and standards.

II. MULTIPLE-LEVEL SEGMENTATION

The motion segmentation of an image is carried out in several stages. First, a global motion estimation and segmentation is performed to separate background and foreground

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objects. If the background is not stationary, the global motion compensation is applied to the whole frame so that the background is stabilized. Second, moving objects are separated by foreground/background segmentation. Third, quadtree decomposition is used to get a rough segmentation of the motion region. Finally, inner block segmentation is performed wherever a motion boundary falls into a block.

A. Motion Estimation and Segmentation

Some sequences may involve camera movement, and the background will not be stationary. Depending on the pattern of camera motion in three-dimensional (3-D) space and the relative position, the motion of the background in the image plane may consist of translation, rotation, scaling, or a combination of the above deformations. Such motion can be efficiently described by an affine motion model

$$\begin{aligned} u(x, y) &= a_1x + a_2y + a_3 \\ v(x, y) &= a_4x + a_5y + a_6 \end{aligned} \quad (1)$$

where u, v are components of the displacement vector at a pixel location (x, y) and $\vec{a} = (a_1, \dots, a_6)$ are the estimated affine motion parameters. Note that while u, v depend on the pixel location in the image plane, the parameters a_i are constant.

Since it is likely that objects moving independently may exist within the region of interest, which in this case is the entire image, the estimator should cope well with multiple motions. Naturally, the usual requirements of robustness to noise and illumination changes also apply. Standard estimation techniques such as block matching, which minimize the mean-square error (MSE) or the sum of absolute gray-level differences (SAGD) between original block and motion-compensated block, break down or give biased estimates when applied to a region with multiple motions. They are also sensitive to changes of illumination and noise.

To solve this problem, we use a novel approach to motion estimation and segmentation which performs these two functions simultaneously. It is conceptually based on the Hough transform, and uses robust statistics [8]. As in a classical Hough transform, our algorithm finds the set of motion parameters $\vec{a}$ which receives the greatest support from all pixels. Thus, rather than minimizing the MSE error, we maximize the support measure H defined by a robust redescending kernel ρ

$$H(\vec{a}) = \sum_{x, y \in \text{region}} -\rho(I_0(T_{\vec{a}}(x, y)) - I_1(x, y)) \quad (2)$$

where I_0 and I_1 are the intensity in the reference and consecutive frame, respectively, and $T_{\vec{a}}(x, y)$ is the position of a pixel at location (x, y) after affine transformation with motion parameter vector $\vec{a}$. In the experiments, the Tukey redescending kernel was used. Fig. 1 shows the shapes of: (a) the standard quadratic kernel used in block matching and (b) the Tukey biweight kernel. The X axis corresponds to the value of the motion-compensated pixel difference divided by a scale parameter. A median absolute deviation scale estimate

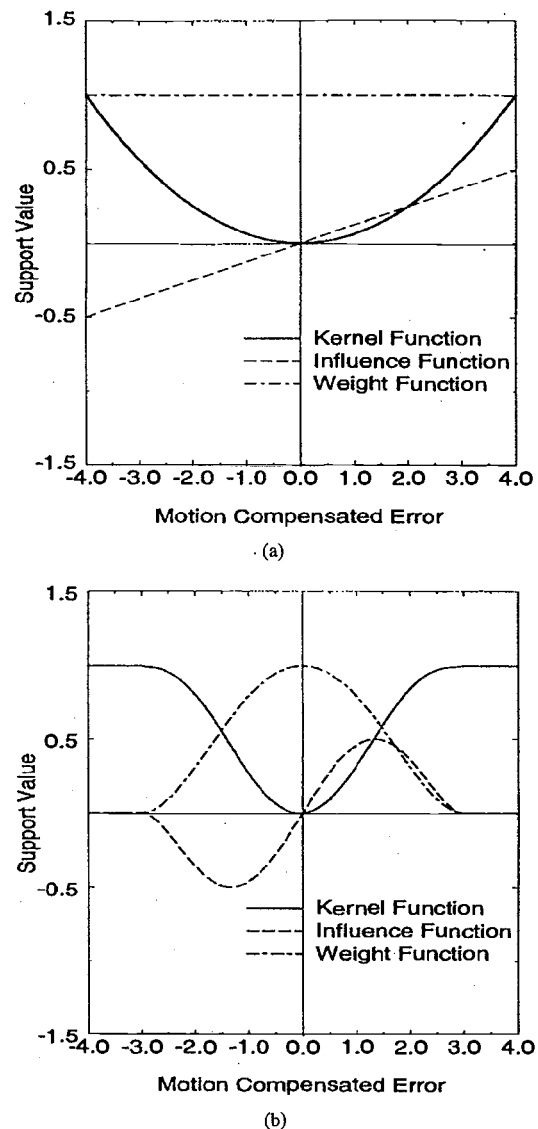


Fig. 1. Quadratic and robust redescending kernels.

is used; it is calculated from the set of values of motion-compensated pixel differences for the region. The Y axis shows the support given to the motion parameters from a pixel.

The main idea behind this approach is that, during iterative estimation of the motion parameters of a dominant moving object, outliers (e.g., pixels belonging to other moving objects or for which noise is significant) are ignored. This is because the redescending kernel weights down the strength of the vote from pixels for which the motion-compensated frame difference is large (compared to the value of the scale parameter, which is frame-dependent). Fig. 1 also shows influence and weight functions for each kernel; note that while the weight function is constant for the quadratic kernel, it is redescending for the Tukey kernel. Thus, by applying our technique, we not only obtain a more accurate motion estimate, but also

objects. If the background is not stationary, the global motion compensation is applied to the whole frame so that the background is stabilized. Second, moving objects are separated by foreground/background segmentation. Third, quadtree decomposition is used to get a rough segmentation of the motion region. Finally, inner block segmentation is performed wherever a motion boundary falls into a block.

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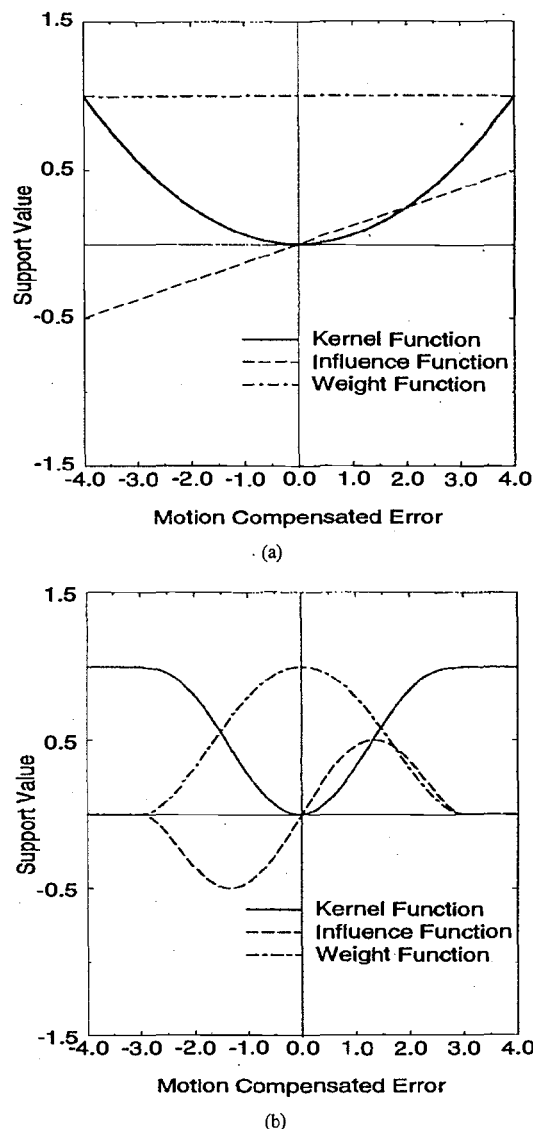


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perform motion segmentation in parallel with estimation of motion parameters.

In principle, any number of objects moving independently may be segmented, but for simplicity, we assume up to two moving objects within any one block. This assumption holds well in practice due to the variable size block structure used in the quadtree decomposition procedure, which tends to split regions with more than two objects. When global motion estimation and segmentation are involved, only background motion is of interest, and therefore, all foreground moving objects can be treated as outlier regions. As the motion algorithm locks onto the dominant moving object, it may return the motion of the foreground object if it is larger than the background region, for example, like the "Suzie" sequence.

B. Foreground/Background Segmentation

Segmentation into foreground and background regions uses the algorithm presented in [9] for motion/stationary segmentation. For sequences with stationary background, a simple segmentation based on change detection can be used. For sequences with moving background, an extended change detection method which uses global motion-compensated frame difference is used so that the background motion is taken into account. Since pixel values in a well-motion-compensated frame difference usually correspond to noise (barring occluded/uncovered regions), the Gaussian distribution is a good approximation for their distribution. It is assumed that pixels in the transformed frame difference image belonging to the background region have values falling into $[-\delta, \delta]$ with a probability $P(\delta)$ expressed as

$$P(\delta) = \frac{1}{\sigma\sqrt{2\pi}} \int_{-\delta}^{\delta} e^{-(x^2/2)\sigma^2} dx = \frac{2}{\sigma\sqrt{2\pi}} \int_0^{\delta} e^{-(x^2/2\sigma^2)} dx. \quad (3)$$

Therefore, an intensity value threshold δ_T can be chosen so that $P(\delta_T)$ is greater than or equal to a predefined probability value P_{bg} . To calculate the threshold δ_T , we first calculate the histogram of absolute pixel values $H(i)$, $i = 0, 1, 2, \dots, 255$ and obtain the probabilities as

$$p_i = \frac{1}{M} H(i) \quad (4)$$

where M is the number of pixels in the image. Then the value of δ_T can be decided by fulfilling the equation

$$\sum_{i=0}^{\delta_T-1} p_i < T_{bg} \leq \sum_{i=0}^{\delta_T} p_i. \quad (5)$$

We can use δ_T as the threshold for change detection. After the change detection, we obtain a binary image on which morphological open-close operations are performed to eliminate isolated small segments. Finally, a contour-linking algorithm is applied to pixels marked as foreground pixels to form the final foreground/background segmentation.

For video conference sequences, a heuristic threshold map is used to further improve the segmentation result [10].

C. Quadtree Decomposition

In our approach, a variable block size motion compensation technique is modified so that multiple motions within a block can be taken into account. Although more than two moving objects could be considered, in the following discussion, we confine ourselves to at most two different motions per block. Initially, the image is divided into equal size blocks with a maximum block size of $K \times K$ pixels. Then each of the blocks is processed by the decomposition procedure shown in Fig. 2. The procedure is divided into two branches: a background block processing branch which deals with blocks positioned in the background region, and a foreground block processing branch which finds the quadtree decomposition and/or the motion boundary within blocks. The repartitioning of foreground blocks provides a motion-compensated prediction of a quality governed by the threshold E_t which is determined dynamically by the spatial property of the pixels within the block. For a given block, it may be motion compensated by one (single-motion mode), two (dual-motion mode with inner block segmentation), four (split), or more than four (further decomposition) motion vectors. In the event that no satisfactory motion compensation can be made even with the smallest block size (which may happen in an occluded/uncovered region), the block will be spatially encoded using the same technique as for residual error coding.

Note that in the decomposition procedure, motion estimation is only applied to the blocks in the foreground region. Thus, the computational load is reduced as the motion estimation procedure is one of the most time-consuming parts of the algorithm. It can also be noted that the foreground/background segmentation does not need to be very accurate because any wrongly positioned block creates a relatively large global motion compensation error, and thus is corrected in the foreground processing branch.

As we pointed out at the beginning of this paper, the translational motion model can be used in small regions to reduce the bit-rate overhead. A set of motion models consisting of two, four, and six parameters is applied adaptively according to the size of block in the decomposition procedure. The larger the block size, the more complex the motion model that will be used. Such an arrangement gives a good compromise between the quality of motion compensation and coding efficiency.

III. IMPLEMENTATION ISSUES

In our implementation, some standard compression techniques have been borrowed such as Huffman coding for lossless compression of symbols, DCT for texture coding, buffer contents regulation (rate control) based on the adjustment of frame rate and quantization steps for DCT coefficients, etc. We also introduce some new ideas specifically designed for the proposed codec which are described below in greater detail.

A. Motion Boundary Coding

If the dual-motion mode is chosen in the quadtree decomposition procedure, the motion boundary within the block has to be encoded. One of the most commonly used methods

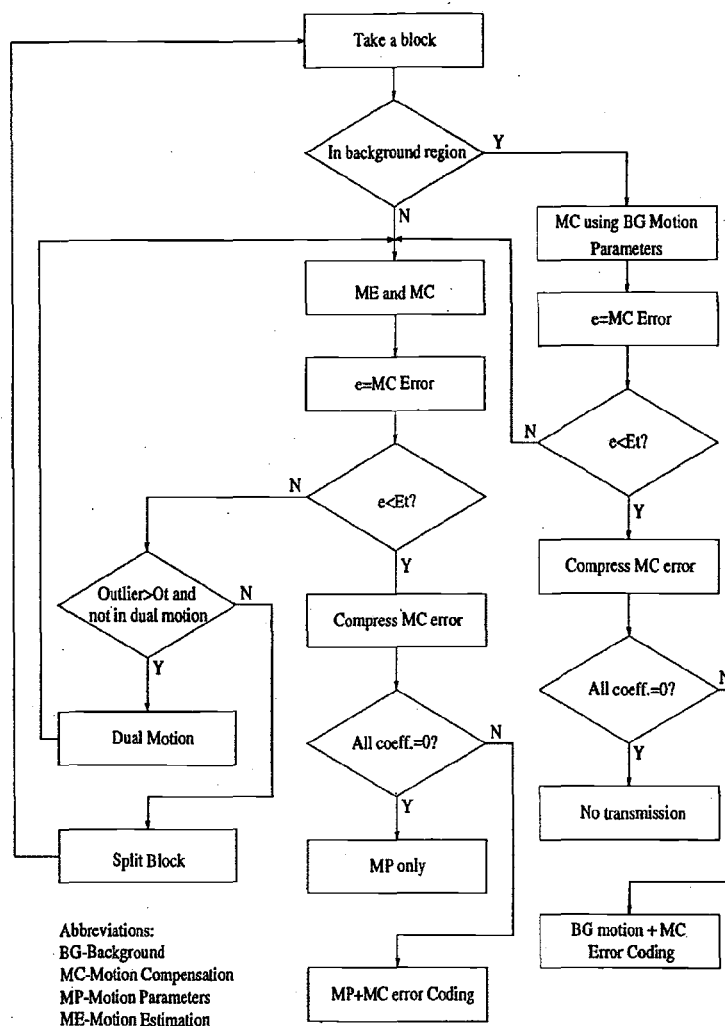


Fig. 2. Extended quadtree decomposition.

to encode object boundaries is the chain code. It is able to describe accurately the shape of any area. However, the bit rate required for chain codes is high. For the four-link chain code, under certain constraints, the theoretical lower bound is $\log_2(1 + \sqrt{2}) = 1.27$ per node [11] (after arithmetic coding). However, in our application, the motion boundary need not be encoded to a very high accuracy since the prediction error can be spatially encoded. What we need is a low-bit-overhead approach which can give reasonable accuracy.

In order to have a compact description of the motion boundary within a block, we assume that it can be approximated by a straight line. This assumption works well in practice. Fig. 3 shows the representation of the motion boundary within a block. Three parameters are used to encode the line representing an object boundary: the intersection point X_0 , the line direction Θ (e.g., the angle between the line and the base of the block), and the intersection side of the block. Calculation shows that it is more economical (in terms of bit rate) to code

a boundary than to split the block and to code the motion parameters of each subblock. Furthermore, such an approach also gives a better approximation of the real motion boundary; thus, a better reconstruction can be obtained with less artifacts. The line-fitting algorithm uses a segmentation map provided by the robust Hough motion estimation and segmentation algorithm. As an example, Fig. 4(a) shows a region around the head of the "salesman" and the corresponding motion segmentation after line fitting is shown in Fig. 4(b). Note that our approach works equally well for motion boundaries that do not coincide with intensity edges, as opposed to methods based on gray-level segmentation. However, this is at the expense of extra bits used for coding of the boundary line.

B. Motion Field Coding

Because of the use of foreground/background segmentation, the motion field coding uses different techniques for background regions and foreground regions. For background blocks

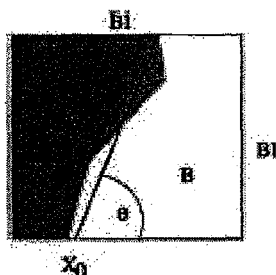


Fig. 3. Line approximation of motion boundary.

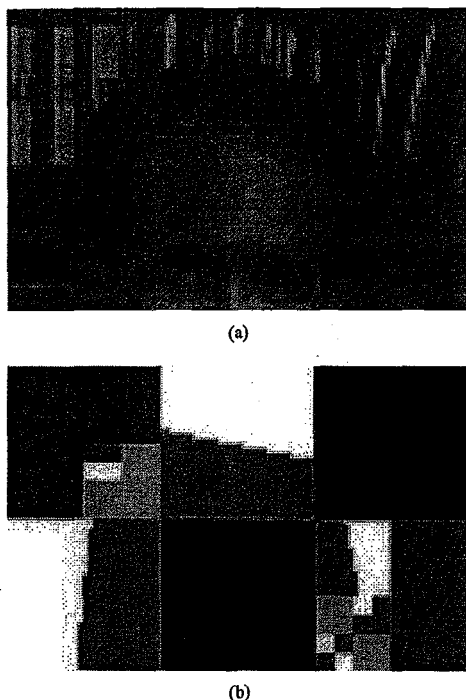


Fig. 4. Segmentation around the head of "salesman."

TABLE I
PERCENTAGE OF ZERO MOTION BLOCKS

Sequence Name	Zero motion blocks (%)
Miss America	42.4
Salesman	92.1
Claire	72.3
Mother and Daughter	83.7

which take about 40–90% of the total block number (Table I), the run-length coding technique is applied to efficiently encode the block status. For the foreground blocks, an interblock prediction and differential coding technique are used to encode the motion parameters.

In real-world sequences, a foreground moving object undergoing coherent movement often consists of a number of

blocks. It is very likely that two neighboring blocks have the same motion vectors. If a block under consideration, say B_c , has exactly the same velocity as one of its neighboring blocks, there is no need to transmit the velocity. It is sufficient to indicate which of the neighbors moves with the same motion. The blocks are processed from left to right, and from top to bottom, so only neighboring blocks located above and to the left are considered. The main difficulty is that blocks may have different sizes. To overcome this problem, all velocities are mapped onto the finest grid, called the basic grid, corresponding to the image divided into blocks of the minimal size (basic blocks). Each of the basic blocks is indexed, relative to the block under consideration. The number of such blocks is

$$N_{Bc} = 2 \frac{L_c}{L_{\min}} \quad (6)$$

where $L_{\min}$ is the side length of the basic block in pixels, while L_c denotes the side length of the block under consideration B_c . The procedure selects the basic neighboring block with an index $k \in [1, N_{Bc}]$ that minimizes the error criterion ϵ for the block B_c

$$\epsilon(B_c, B_{Bk}) \leq \epsilon(B_c, B_{Bj}); \quad \forall i, j \in [1, N_{Bc}]. \quad (7)$$

Fig. 5 shows possible examples of relations between block B_c and its neighboring blocks.

To encode the indexes of basic blocks, we use a variable length code which is based on the fact that the decomposition structure of blocks on the top and to the left of the current block is known on the receiver side. We use the following rules to create the variable length code.

- In a pair of blocks, the top one is assigned a 0, and the bottom one is assigned a 1; the left one is assigned a 1, and the right one is assigned a 0.
- If two basic blocks belong to the same level decomposition, they should have the same code.

Fig. 6 gives two examples of variable length codes in which the decomposition of neighboring blocks is given. In Fig. 6(a), the variable length codes for the basic blocks are

1, 1, 1, 1 (left)
011, 010, 00, 00 (top).

In Fig. 6(b), the variable length codes for the basic blocks are

11, 10 (left)
0, 0 (top).

It can be seen that if the size of the block on the top and to the left of the block being processed is equal to or greater than the size of the block being processed, only one bit is needed to encode the neighboring index. In the worst case, it uses the same number of bits as fixed length coding.

In the event that the above procedure fails to find the same motion velocity from the neighboring blocks, a differential coding is used to reduce the redundancy. The reference velocity takes the median of the velocity of the first basic block to the left, the velocity of the first basic block on the top, and the velocity of the first basic block on the top-right corner. The velocity difference is encoded using variable length coding.

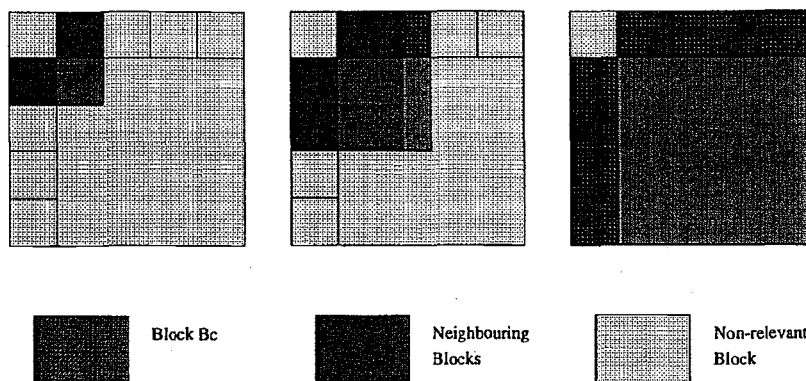
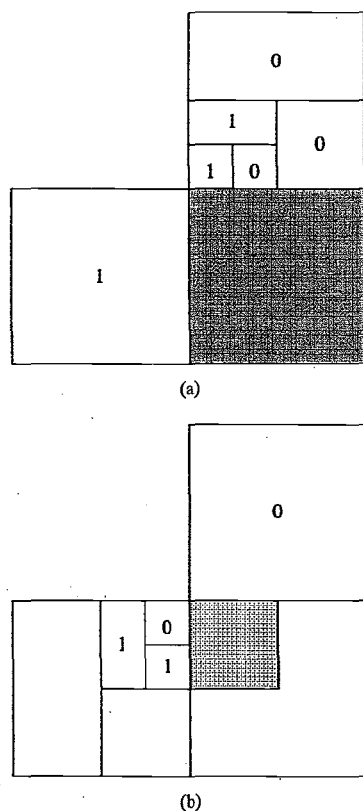
Fig. 5. Relation between the block B_c and its neighboring blocks.

Fig. 6. Example of variable length code for neighboring block coding.

C. Forced Updating (Deblur Intracoding)

Because of the low-pass filtering effect of subpixel accuracy motion compensation and the accumulation of inverse DCT mismatch error for intercoded block, the sharpness of the image is lost in the process of repetitive application of motion compensation or motion compensation with residual error coding. To remedy this problem, intracoding has to be applied after a certain number of intercodings. This is called forced updating in standards such as ITU-T H.261 and H.263 [12],

[13] where each macroblock is coded in the INTRA mode at least once every 132 times when coefficients are transmitted for this macroblock. However, the update pattern is not defined in the standard. There are normally two different approaches for applying the intracoding. The first one applies intracoding to the whole frame at regular intervals. This approach not only restores the sharpness of the image, but can also recover any block which has been erroneously motion compensated due to transmission errors or for any other reason. The drawback is that the bit-rate overhead is high, and this may contribute to the buffer overflow. Consequently, a larger buffer is required to accommodate bursts in the bit stream. The second solution is to apply intracoding at regular intervals to the regions which have been motion compensated. For sequences with stationary background, this approach significantly reduces the bit overhead in sending intracoded regions. However, for sequences with nonstationary background, there is no difference between this approach and the previous one.

Here, we propose a new approach based on the fact that only blocks which were motion compensated a certain number of times after the last intracoding need to be intracoded. A motion compensation counter is used for each smallest block in this scheme. For a given block, any intracoding during the coding process will reset its motion compensation counter so that unnecessary intracoding is avoided. Whenever the value of the counter is greater than a given threshold, an intracoding is forced for that block. Because usually only a small percentage of blocks is motion compensated repeatedly, the overall overhead for extra intracoding is reduced. It also has the advantage that a more evenly distributed bit stream will be created as compared to the other two schemes discussed earlier. The only disadvantage is the potential loss of robustness to transmission errors, and therefore a channel coding may be required to increase error resilience.

IV. EXPERIMENTAL RESULTS

The effectiveness of affine motion compensation was tested using a set of MPEG-4 CIF test sequences. Fig. 7(a) and (b) shows the average PSNR and average bit rate (7.5 Hz frame rate) using the proposed algorithm, the algorithm presented in [9] (VSBM), and H.261 [12], [14], respectively.

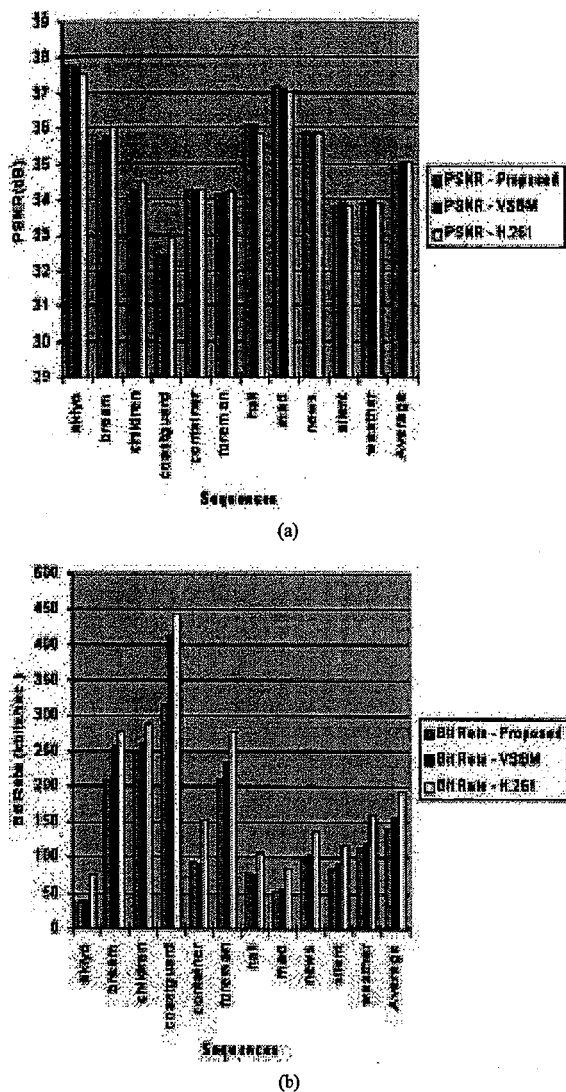


Fig. 7. Average results for tested sequences. (a) PSNR. (b) Bit rate.

The VSBM presented in [9] has almost the same structure as the algorithm presented in this paper, except that it uses a translational motion model on all block layers, and there is no global motion estimation and segmentation stage to stabilize the background motion. Results of H.261 were obtained using a $p \times 64$ implementation as presented in [14].

From Fig. 7(b), we noticed that for sequences with global motion and large local motion like "bream," "coastguard," and "foreman," the proposed method gains most in bit rate due to both improved motion-compensated prediction and the multiple-layer structure. For sequences with stationary background which exhibit large and complex local motion like "children," "mother and daughter," "news," "silent," and "weather," the proposed algorithm also gains in bit rate from the use of the affine motion compensation. However, for sequences with stationary background and small motion like "Akiyo," "container," and "hall," the bit rate is slightly higher

than VSBM, which uses only a translational motion model. This is caused by a small bit overhead introduced by the additional motion parameters used by the affine motion model. Overall, the bit rate (on average) is reduced by 40% as compared to H.261 and by 9.2% as compared to VSBM. The average overall PSNR of the proposed algorithm is slightly lower than that of VSBM and H.261 (0.026 and 0.057 dB, respectively). An interesting phenomenon is that for sequences with stationary background and small motion, the proposed algorithm gives higher PSNR than VSBM and H.261. This may imply that the codec still benefits from the use of the complex motion model and by improved motion prediction, and thus achieves a higher PSNR. (The bit rate is slightly higher than that of VSBM, but still lower than that of H.261.)

Fig. 8 shows a comparison of the PSNR and bit rate for the proposed algorithm and H.261 using the "Akiyo" sequence without the bit-rate control. The PSNR in Fig. 8(a) shows that the proposed algorithm has a less turbulent PSNR than that of the H.261, which has two peaks when the intraframe coding is applied to the entire frame (with the rate control, there will be two valleys around this point). Because of the use of the motion compensation counter and the distributed deburring intramode, the proposed algorithm has a more stable bit rate than H.261, which also has two peaks around the deburring intrapoint [Fig. 8(b)].

The performance comparison of the proposed codec and the upcoming H.263 standard is shown in Table II. The Telenor tmn-1.5 implementation is used (H.263). In our approach, both H.261 type variable length coding table for DCT coefficients (run level + EOB) and H.263 type variable length coding table for DCT coefficients (run level last) are used as indicated by MACC-2D (use H.261 table) and MACC-3D (use H.263 table), respectively. The compressed file size is used as the measurement for coding efficiency for all algorithms. It can be seen that both implementations of the proposed codecs have a smaller average file size than the H.263 implementation. It also shows that the H.263 type VLC table has a slightly better performance than the H.261 type VLC table. A close inspection of the test results reveals that the H.263 implementation performs slightly better in sequences with stationary background and moderate motion than the proposed one, whereas the proposed codec outperforms H.263 on sequences with camera movement or severe motion. The PSNR's for the Y component of the three codecs are compared in Table III. It can be seen that on all sequences, the proposed codec gives a higher PSNR than the H.263 implementation. On average, the proposed codec has a 0.2 dB improvement in PSNR over the H.263 implementation.

In order to evaluate the benefits of the motion segmentation, we compare the algorithm with its variant in which motion segmentation is inhibited (one motion mode per block). MPEG-4 QCIF test sequences were used, and the rate control was disabled. In Table IV, we give the average PSNR and bit rates for all 15 tested sequences. It can be seen that the proposed algorithm gives a higher PSNR on all 15 tested sequences and a lower bit rate on 11 sequences. On average, the proposed algorithm gives a 0.2 dB higher PSNR and 2.2 kbit/s lower bit rate.

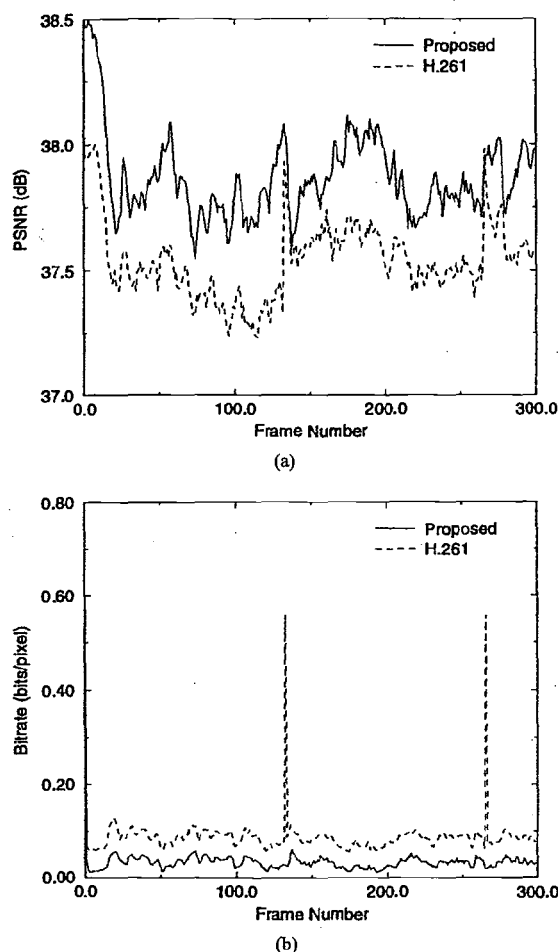


Fig. 8. Comparative results for the "Akiyo" sequence. (a) PSNR. (b) Bit rate.

To measure the effectiveness of the motion compensation (MC), the total number of bits spent on encoding motion-compensated errors (DCT-P bits) and the total number of blocks to be spatially coded (SPCB) were calculated. It is known that for a well-motion-compensated frame, the number of bits spent on MC errors is small. If multiple motions exist within a block, one normally needs more bits to encode the MC errors or sometimes the block has to be spatially encoded. The comparison of results is shown in Table V. From Table V, it can be seen that the proposed algorithm always gives better motion compensation in terms of DCT-P bits and SPCB. On the other hand, a better prediction does not necessarily mean a lower bit rate: The bit rates for the "carphone," "mad," "silent," and "Suzie" sequences are higher than the bit rates achieved by a variant of the algorithm with motion segmentation disabled. Further investigation showed that the increased overhead to encode the partition parameters (the line) and the extra motion parameters can sometimes eliminate the benefits from better motion prediction. Table VI gives the comparison of the total number of bits spent on motion-related parameters (MC bits, including partition parameters, motion model, and motion

TABLE II
COMPARISON OF COMPRESSED FILE SIZE FOR CIF SEQUENCES

Sequence	Compressed File Size		
	H.263	MACC-2D	MACC-3D
akiyo	56181	58642	56633
bream	296973	298470	298598
bus	474225	433323	436779
calendar	391352	376034	366209
children	371172	370023	373976
coastguard	469348	461827	456267
container	125923	130239	124331
foreman	296115	286493	283195
hall	108342	110483	109982
mad	74629	75854	75236
news	143217	143655	142350
silent	130078	129147	129899
td	192950	188272	191072
weather	167214	168401	167091
Average	235551	230776	229401

TABLE III
COMPARISON OF PSNR FOR CIF SEQUENCES

Sequence	PSNR (dB)		
	H.263	MACC-2D	MACC-3D
akiyo	37.50	37.72	37.72
bream	35.15	35.57	35.57
bus	31.91	31.95	31.95
calendar	30.33	30.40	30.40
children	33.90	34.07	34.07
coastguard	32.31	32.47	32.47
container	34.04	34.21	34.21
foreman	33.88	34.11	34.11
hall	35.74	36.00	36.00
mad	36.85	37.19	37.19
news	35.63	35.82	35.82
silent	33.70	33.82	33.82
td	36.30	36.65	36.65
weather	33.81	33.90	33.90
Average	34.36	34.56	34.56

parameters) and the gain from improved motion compensation (MC gain). The gain is calculated by subtracting the total number of bits (MC + DCT-P) used by the proposed technique from the number of bits used by the version without motion segmentation:

$$MC_{\text{gain}} = (MC + DCT-P)_{\text{proposed}} - (MC + DCT-P)_{\text{No Seg.}} \quad (8)$$

TABLE IV
AVERAGE PSNR AND BIT RATE FOR TESTED SEQUENCE

Sequence	PSNR (dB)		Bit Rate (kbps)	
	proposed	No Seg.	proposed	No Seg.
Akiyo	36.05	35.91	15.75	16.66
Bream	34.45	34.03	102.48	110.22
Carphone	34.05	33.93	53.83	53.16
Children	32.22	32.04	126.31	138.83
Coastguard	32.03	31.89	108.16	111.51
Container	33.98	33.84	30.28	31.22
Foreman	33.46	32.75	90.64	91.77
Hall	35.09	34.86	28.64	30.83
Mad	35.52	35.31	25.98	24.58
News	34.14	33.97	45.39	47.83
Salesman	33.16	33.05	24.35	25.93
Silent	33.64	33.52	44.46	43.30
Suzie	35.54	35.23	46.33	42.18
Td	35.02	34.76	88.31	89.25
Weather	32.35	32.18	52.67	61.05
Average	34.05	33.82	60.65	62.84

From Tables IV and VI, it can be seen that for those sequences with higher bit rates, the gain from motion is negative. However, the gain does not take into account that improved MC reduces the number of bits used for intrablock coding. In the sequence "Td," the negative gain is compensated by the reduced number of intracoded blocks. The overall bit rate for this sequence is still improved. We also notice that the proposed algorithm performs very well with hybrid natural and synthetic sequences (class E) such as "bream," "children," and "weather." Most of the sequences in this group involve a highly textured background, with dominant high-spatial-frequency contents. Such textured regions are very sensitive to any failure in motion compensation.

V. CONCLUSION

In this paper, we presented an algorithm which combines robust motion segmentation and motion prediction with variable size block coding. The algorithm introduces a new way to solve the motion boundary segmentation problem, and exploits an interblock prediction and variable length coding scheme which can effectively reduce the bit rate without sacrificing image quality.

The experimental results are encouraging: under the same PSNR constraint, the proposed algorithm can achieve a lower bit rate than a standard variable block size codec in which only the translational motion model is used. The algorithm can achieve a significantly lower bit rate than H.261. It also achieves a lower bit rate (in terms of compressed files size) and higher PSNR than tmn-1.5 implementation of H.263. The gain from better motion prediction and motion segmentation is also evaluated. The results suggest that for the majority

TABLE V
TOTAL NUMBER OF DCT-P BITS AND SPCB

Sequence	DCT-P Bits		SPCB	
	proposed	No Seg.	proposed	No Seg.
Akiyo	98692	124512	0	9
Bream	869627	1114346	4	63
Carphone	531890	667634	27	179
Children	1242046	1479153	0	61
Coastguard	902410	1095300	0	104
Container	221026	247931	0	22
Foreman	560295	823161	20	150
Hall	217075	278053	1	2
Mad	123681	170353	6	29
News	341390	441591	24	56
Salesman	249507	333490	0	32
Silent	269663	372868	12	94
Suzie	110855	154934	5	29
Td	659397	840949	302	518
Weather	442232	583644	0	22

TABLE VI
TOTAL NUMBER OF BITS SPENT ON MOTION-RELATED PARAMETERS AND GAINS FROM MOTION PREDICTION

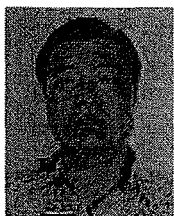
Sequence	MC Bits		MC Gain (bits)
	proposed	No Seg.	
Akiyo	29902	14072	9990
Bream	234465	80720	90974
Carphone	285639	91328	-58567
Children	153358	44191	127940
Coastguard	258549	94634	28975
Container	59240	35141	2806
Foreman	377800	118335	3401
Hall	54037	22885	29826
Mad	104571	42602	-15297
News	105491	34843	29553
Salesman	88811	31323	26495
Silent	168212	47267	-17740
Suzie	106819	40903	-21837
Td	256881	70837	-4492
Weather	66537	20717	95592

of sequences, improved motion prediction and segmentation mean improved image quality (higher PSNR) and improved coding efficiency (lower bit rate). However, the gain in coding efficiency could be negative for some sequences because of the overhead to encode extra motion and partition parameters. The experiment reveals that the gain in coding efficiency from improved motion prediction and segmentation is proportional to the spatial complexity of the sequence being encoded.

Consequently, a sequence classifier could be useful to ensure the best result for all sequences.

REFERENCES

- [1] J. W. Kim and S. U. Lee, "On the hierarchical variable block size motion estimation technique for motion sequence coding," in *SPIE Proc., Visual Commun. Image Processing '93*, Innsbruck, Austria, vol. 2094, Oct. 1993, pp. 372-383.
- [2] Y. B. Yu, M. H. Chan, and A. G. Constantinides, "Low bit rate video coding using variable block size model," in *ICASSP-90, Int. Conf. Acoust., Speech, Signal Processing*, Albuquerque, NM, Apr. 1990, pp. 2229-2232.
- [3] M. Lai and N. G. Kingsbury, "Coding of image sequences using variable size block matching and vector quantization with gray-level segmentation and background memory," in *ICIP-92, Int. Conf. Image Processing*, Singapore, Sept. 1992.
- [4] I. Moccagatta, F. Dufaux, and M. Kunt, "Motion field segmentation and coding by means of vector quantization," in *PCS'93, Picture Coding Symp.*, Lausanne, Switzerland, Mar. 1993, p. 4.1.
- [5] K. Zhang, M. Bober, and J. Kittler, "Robust motion estimation and multistage VQ for sequence compression," in *ICIP-94, Int. Conf. Image Processing*, Austin, TX, vol. II, Nov. 1994, pp. 452-456.
- [6] G. Bozdagi, A. M. Tekalp, and L. Onural, "3-D motion estimation and wireframe adaptation including photometric effects for model-based coding of facial image sequences," *IEEE Trans. Circuits Syst. Video Technol.*, vol. 4, pp. 246-256, Aug. 1994.
- [7] H. G. Musmann, P. Pirsch, and H. Grallert, "Advances in picture coding," *Proc. IEEE*, vol. 73, pp. 523-548, Apr. 1985.
- [8] M. Bober and J. Kittler, "A Hough transform based hierarchical algorithm for motion segmentation and estimation," in *4th Int. Workshop Time-Varying Image Processing and Moving Object Recognition*, 1993, pp. 335-342.
- [9] K. Zhang, M. Bober, and J. Kittler, "Variable block size video coding with motion prediction and motion segmentation," in *SPIE Proc., Digital Video Compression: Algorithms and Technologies 1995*, San Jose, CA, vol. 2419, pp. 62-70.
- [10] ———, "Motion based image segmentation for video coding," in *ICIP-95, Int. Conf. Image Processing*, Washington, DC, vol. III, pp. 476-479.
- [11] M. Eden and M. Kocher, "On the performance of a contour coding algorithm in the context of image coding Part I: Contour segment coding," *Signal Process.*, no. 8, pp. 381-386, 1985.
- [12] ITU-T, Recommendation H.261, *Video Codec for Audiovisual Services at p x 64 kbits*, Int. Telecommun. Union, 1994.
- [13] ITU-T, Draft ITU-T Recommendation H.263, *Video Coding for Low Bitrate Communication*, Int. Telecommun. Union, July 5, 1995.
- [14] A. C. Hung, *PVRG-P64 CODEC 1.1*, 1994.

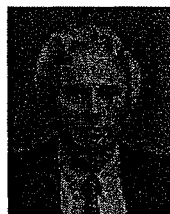


Kui Zhang received the B.Eng. degree in telecommunication engineering in 1982 and the M.Eng. degree in digital communications in 1985, both from the Nanjing Institute of Posts and Telecommunications, Nanjing, China.

He is presently a doctoral student at the Centre for Vision, Speech and Signal Processing, University of Surrey, U.K., and holds a Research Fellow post in EUC Project Acts-SCALAR. His research interest includes low-bit-rate video coding, motion analysis, and knowledge-based systems.

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Josef Kittler (M'74) graduated from the University of Cambridge, U.K., in electrical engineering in 1971, where he also received the Ph.D. degree in pattern recognition in 1974 and the Sc.D. degree in 1991.

He joined the University of Surrey, U.K., in 1986, where he is a Professor in charge of the Centre for Vision, Speech and Signal Processing at the School of Electronic Engineering, Information Technology and Mathematics. He has worked on various theoretical aspects of pattern recognition and computer vision with applications, including automatic inspection, navigation, personal identity verification, ECG diagnosis, remote sensing, robotics, speech recognition, and document processing. He has coauthored the book *Pattern Recognition: A Statistical Approach* (Prentice-Hall).

Dr. Kittler is a member of the editorial boards of *Pattern Recognition Journal*, *Image and Vision Computing*, *Pattern Recognition Letters*, *Pattern Recognition and Artificial Intelligence*, and *Machine Vision and Applications*.

CHECKLIST FOR PROCESSING NEW APPLICATIONS

SERIAL

79/ 566,020

INSTRUCTIONS:

1. Make a checkmark beside each item IF verified.
2. If corrections are required, write notes to the examiner or supervisor on reversed side.

1. FACE OF THE FILE

- ☒ 1. Printed and stamped serial number match bar code label.
- ☒ 2. Filing Date present.
- ☒ 3. Class/Subclass present
- ☒ 4. Applicant(s) name present.
- ☒ 5. Total no. of drawings present.
- ☒ 6. Total no. of claims present.
- ☒ 7. Total no. of ind. Claims present
- ☒ 8. Filing fee received present
- ☒ 9. Mailing address present
- ☒ 10. Title of invention present

2. CENTER OF THE FILE

A. DRAWINGS

- ☒ 1. None (go to B)
- ☒ 2. Serial No. present & correct on each sheet.
- ☒ 3. No. of sheets entered on line 1 of contents

B. SMALL ENTITY STATEMENT

- ☒ 1. None & not recorded on face of file (Go to C)
- ☒ 2. Statement present
- ☒ 3. Small entity recorded on face of file

C. DECLARATION OR OATH

- ☒ 1. Title matches face of file and specification
- ☒ 2. Declaration phrase present (I hereby declare all)
- ☒ 3. (Original and first inventor or inventors ...) Phrase present.
- ☒ 4. (Reviewed and understand the contents of the application including claims...) Phrase present.
- ☒ 5. (Acknowledge duty to disclose Information in accordance with 1.56(a)...) Phrase present.
- ☒ 6. Residence, citizenship, post office Address of all applicants present
- ☒ 7. Signed by all applicants
- ☒ 8. Less than 3 months before filing date, Or less than 6 months after filing date.

D. CLAIMS (as filed)

- ☒ 1. Completed form 1360 and 875
- ☒ 2. Circle ind claims on the Index of
- ☒ 3. Draw line under the last claim number On the Index of Claims.

E. SPECIFICATION

- ☒ 1. Serial no. Present and correct
- ☒ 2. Specification in permanent ink.
- ☒ 3. Brief description of each drawing figure.
- ☒ 4. No missing or duplicate pages.
- ☒ 5. No holes punched in text.

F. ABSTRACT

- ☒ 1. None (go to G)
- ☒ 2. Serial no. Present and correct
- ☒ 3. Abstract on separate page.
- ☒ 4. 25 lines or less.
- ☒ 5. One paragraph ONLY

G. PTO-1556

- ☒ 1. Present.

H. PRE-AMENDMENTS

- ☒ 1. None (go to I)
- ☒ 2. Enter on contents of file wrapper.
- ☒ 3. Instruction to cancel claims.
- ☒ 4. Claims canceled on Index of Claims.
- ☒ 5. Instruction to add claims.
- ☒ 6. Circle new independent claims on the Index of Claims.
- ☒ 7. Draw line under the new last claim number on Index of Claims.
- ☒ 8. Complete forms 1360 and 875.

I. PTO-948

- ☒ 1. Present.

3. RIGHT SIDE OF FILE

- ☒ 1. PALM File Data sheet present.
- ☒ 2. Transmittal letters present.
- ☒ 3. Forms 1360 and 875 present/entered
- ☒ 4. Miscellaneous Papers present/entered.
- ☒ 5. Petitions to Make Special present.
- ☒ 6. Drawing prints present (2 copies)

FEES

- ☒ 1. Correct filing fee paid.
- ☐ 2. Excess claims fees paid:
 - ☐ a. Excess total claims more than 20.
 - ☐ b. Excess independent claims more than 3.
 - ☐ c. First multiple dependent claim fee paid.
- ☐ 3. Miscellaneous paper fee paid.

FINAL STEPS

- ☒ 1. Sign and date center of filewrapper under flap.
- ☐ 2. Docket to examiner.

NOTES TO SUPERVISOR:

NOTES TO EXAMINER:

SIGNATURE OF PREPARER:

Carlynn Dene

DATE:

10-25-02

PATENT APPLICATION FEE DETERMINATION RECORD

Effective December 29, 1999

Application or Docket Number

09/51/60238

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
FOR	NUMBER FILED	NUMBER EXTRA
BASIC FEE		
TOTAL CLAIMS	43 minus 20 = *	23
INDEPENDENT CLAIMS	6 minus 3 = *	3
MULTIPLE DEPENDENT CLAIM PRESENT		

SMALL ENTITY TYPE ☐ OR

OTHER THAN SMALL ENTITY

RATE	FEE	RATE	FEE
	345.00		690.00
X\$ 9=		X\$18=	414
X39=		X78=	534
+130=		+260=	
TOTAL		TOTAL	1338

* If the difference in column 1 is less than zero, enter "0" in column 2

CLAIMS AS AMENDED - PART II

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**
Independent	*	Minus	***
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM			

SMALL ENTITY OR

OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE	RATE	ADDITIONAL FEE
X\$ 9=		X\$18=	
X39=		X78=	
+130=		+260=	
TOTAL ADDIT. FEE		TOTAL ADDIT. FEE	

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**
Independent	*	Minus	***
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM			

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X39=		X78=	
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AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**
Independent	*	Minus	***
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM			

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X39=		X78=	
+130=		+260=	
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* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

**MULTIPLE DEPENDENT CLAIM
FEE CALCULATION SHEET
(FOR USE WITH FORM 170-579)**

SERIAL NO.

566 020

FILING DATE

5-8-10

CLAIMS

	AS FILED		AFTER 1st ALLOCATION		AFTER 2nd ALLOCATION									
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282	238 239		ND ↓ ND
348	394.1 401.1 417.1 418.1		ND ↓ ↓ ↓
1104N	7/12 11/02 11/04		ND ↓ ND
update search	10/27/03		ND

INTERFERENCE SEARCHED			
Class	Sub.	Date	Exmr.
375	240.24	10 Oct 03	ND

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	Date	Exmr.
HOWARD BRITTON		ND

(RIGHT OUTSIDE)

ISSUE SLIP STAPLE AREA (for additional cross references)

POSITION	INITIALS	ID NO.	DATE
FEE DETERMINATION	<i>LA</i>	<i>12192</i>	<i>5/17/00</i>
O.I.P.E. CLASSIFIER			<i>5/22/00</i>
FORMALITY REVIEW	<i>LA</i>	<i>827</i>	<i>07-05-07</i>
RESPONSE FORMALITY REVIEW	<i>LA</i>	<i>60105</i>	<i>9-18-07</i>

INDEX OF CLAIMS

✓ Rejected N Non-elected
 = Allowed I Interference
 - (Through numeral)... Canceled A Appeal
 + Restricted O Objected

Claim	Date
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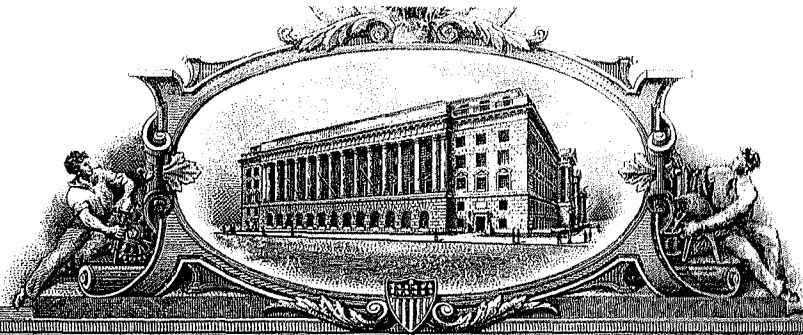
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EXHIBIT 36



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USE OF CONFIGURATIONS IN DEVICE WITH MULTIPLE CONFIGURATIONS

FIELD OF THE INVENTION

The invention relates to arranging use of configurations in devices with multiple configurations, more specifically to arranging access control into configuration data sets manageable by one or more external management devices.

BACKGROUND OF THE INVENTION

As different data processing devices, such as mobile stations, become more complex, the significance of device management becomes more pronounced. Devices require several different settings, such as settings related to Internet access points, and it is arduous and difficult for a user to set them manually. To solve this problem, device management solutions have been developed so that the administrator of a company's information system or a teleoperator can set an appropriate configuration in the device. Device management generally refers to actions by which a person not using the device can change the configuration of the device; for instance change the settings or even a protocol used by the device. In addition to device-specific settings, it is also possible to transmit user-specific data, such as user profiles, logos, ringing tones, and menus with which the user can personally modify the settings of the device, or the modification takes place automatically in connection with device management.

One of the device management standards is OMA (Open Mobile Alliance) DM (Device management), which is partly based on the SyncML (Synchronization Markup Language) protocol. For instance, a personal computer (PC) may act as a device management server in a device management protocol, and a mobile station as a device management client. The items managed in the device management client are arranged as management objects. The management objects are entities that can be managed by server management commands in the device management client. The management object can for instance be a number or a large entity, such as a background image or a screensaver. In OMA device management, the management objects are arranged in a management tree.

Some typical manageable items comprise operator specific connection settings, for instance GPRS (General Packet Radio Service) connection settings. By OMA DM procedures, these operator specific sets of settings,

which may also be referred to as configurations, in a user terminal device can be maintained by an operator controlled management server. For instance, WAP (Wireless Application Protocol) settings for using WAP services of a service provider may be provisioned as a configuration context for the terminal device.

Some managed items may comprise user specific and controlled information, such as screen savers and ringing tones. Further, the device may be used for accessing a corporate information system, for instance a file system, intranet pages and an e-mail system therein. For this purpose the device needs to comprise one or more configurations for arranging access to these corporate information system services. For security purposes it is desirable for corporate IT personnel to be able to control these settings. Therefore, a device may comprise multiple configurations from different managing parties and it should be possible to enable access to a specific configuration only for an authorized management party. In accordance with the OMA DM protocol, specified in OMA specification "*SyncML Device Management Protocol*", version 1.1.2, 12 December 2003, 41 pages, in the set-up phase of a management session, a management server is authenticated on the basis of credentials received from the management server. Further, as illustrated in OMA specification "*SyncML Management Tree and Description*", version 1.1.2, 2 December 2003, 44 pages, a node of a management tree may be specified by an access control list (ACL) comprising a list of identifiers and access rights associated with each identifier. As described in Chapter 7.7.1, the access rights granted by ACL define management server identifiers authorized to get, add, replace, and/or remove a node. Thus, different access rights may be given to various device management servers, and device management commands from non-entitled management servers are not performed on the management tree. However, besides a capability to control access of management servers to nodes of a management tree, a general need further exists to limit the use of the configurations in the device. For instance, companies wish to control terminals used for accessing company IT services in a better way in order to protect corporate data and services.

BRIEF DESCRIPTION OF THE INVENTION

A method, a device management system, data processing devices, and a computer program product are now provided, which are characterized by what is stated in the independent claims. Some embodiments of the invention are described in the dependent claims.

According to an aspect of the invention, a device with multiple configuration data sets comprises access control information originated and/or controlled by an external managing entity for defining a right of an application to access a configuration data set. The access control information is checked in response to an indication from an application requiring access to a configuration data set. If the application is, on the basis of the access control information, entitled to access the configuration data set, access to the configuration data set is arranged for the application.

The term "configuration data set" generally refers to a set of data comprising configuration information having direct or indirect effect on one or more functions of the device or an application in the device. For instance, the configuration data set may comprise an IP address or a domain name of a server on the basis of which a connection is arranged from the device.

The invention makes it possible to control access of applications to configuration data. More particularly, access rights may be specified and/or controlled by an external entity. A device may comprise multiple configuration data sets with different access control properties. For instance, a configuration data set specifying access settings for a corporate information system may be controlled by configuration management software operated by corporate IT personnel.

According to an embodiment, at least one service context is stored in the device, wherein the service context comprises at least the configuration data set. Access to the service context is allowed for the application on the basis of the access control information only if the application is, by the external managing entity, predetermined in access control information associated with the service context. Various usage contexts, possibly comprising also non-settings related data, such as user related data stored by an application in the device, may then be provided in the device.

BRIEF DESCRIPTION OF THE FIGURES

The invention is now described in greater detail by means of some embodiments and with reference to the attached drawings, in which

Figure 1 illustrates a management system,

Figure 2 illustrates a device with multiple configurations,

Figure 3 illustrates a method according to an embodiment of the invention; and

Figures 4a and 4b illustrate a method according to an embodiment of the invention.

DETAILED DESCRIPTION OF SOME EMBODIMENTS OF THE INVENTION

One embodiment of the invention will be described in the following in a system supporting OMA device management; it should, however, be noted that the invention can be applied to any device management system in which configurations in a managed device may be managed by an external management entity.

Figure 1 illustrates a networked system. A network server or a PC typically serves as a server S. For instance, a mobile station, PC, laptop computer, a PDA (Personal Digital Assistant) device, or a module thereto may serve as a terminal TE. In the following embodiments, it is assumed that for device management, the terminal TE serves as a device management client and the server S as a device management server. The server S can manage several clients TE.

In the first example of Figure 1 clients TE and management servers S are connected to a local area network LAN. A client TE connected to the network LAN comprises a functionality, such as a network card and software controlling data transmission, for communicating with the devices in the network LAN. The local area network LAN can be any kind of local area network and TE can also be connected to the server S through the Internet typically using a firewall FW. The terminal TE can also be connected to the local area network LAN wirelessly through an access point AP.

In the second example, the client TE communicates with the server S through a mobile network MNW. A terminal TE connected to the network MNW comprises a mobile station functionality for communicating wirelessly with the network MNW. There may also be other networks, such as a local area network LAN, between the mobile network MNW and the server S. The

mobile network MNW can be any wireless network, for instance a network supporting GSM services, a network supporting GPRS (General Packet Radio Service) services, a third-generation mobile network, such as a network according to the network specifications of 3GPP (3rd Generation Partnership Project), a wireless local area network WLAN, a private network, or a combination of several networks. In addition to the examples above, many other device management configurations are also possible, such as a management connection between terminals TE or a direct management connection between the terminal TE and server S by using a wireless or a wired connection with no other network elements.

The terminal TE and the server S comprise memory, a user interface, I/O means for data transmission, and a central processing unit comprising one or more processors. The memory has a non-volatile portion for storing applications controlling the central processing unit and for other information to be stored, and a volatile portion to be used in temporary data processing.

Computer program code portions executed in the central processing unit can cause the server S to implement the inventive means for establishing and managing service contexts in the terminal TE, some embodiments of which are illustrated in connection with Figure 4a. Computer program code portions executed in the central processing unit of the terminal TE can cause the terminal TE also to implement the inventive means for arranging configurations into the terminal and for arranging use of configurations in the terminal TE, some embodiments of which are illustrated in connection with Figures 2, 3, 4a, and 4b. It is to be noted that one or more entities may carry out the inventive functions. For instance, some of the features illustrated in Figure 3 are carried out by a specific access controller in the terminal TE, whereas some other features are carried out by an application in the terminal TE. The computer program can be stored on any storage medium, from which it can be loaded into the memory of the device TE; S running the computer program. The computer program can also be loaded through the network by using a TCP/IP protocol stack, for instance. It is also possible to use hardware solutions or a combination of hardware and software solutions to implement the inventive means. A chip unit or some other type of module for controlling the device TE and/or S may, in one embodiment, cause the device TE and/or S to perform the inventive functions. A data structure comprising service context specific information can be transferred over a data transmission network, for instance,

from the server S to the terminal TE and stored in the memory of the terminal TE.

In one embodiment, the terminal TE and the server S are arranged to support the OMA device management (DM). The terminal TE serving as an OMA device management client comprises a client agent functionality that takes care of functions related to the management session in the client. The server S serving as a device management server comprises a server agent or a server master functionality managing the management session. However, it is to be noted that the application of these functionalities is not limited to any specific devices, and it is even possible that the client and server functionalities are implemented in a single physical device. One or more management trees stored in the memory of TE represents the manageable objects in the terminal TE. The management tree is made up of nodes and it defines at least one management object formed of one or more nodes or at least one parameter of a node. The node can be an individual parameter, a subtree or a data collection. The node may comprise at least one parameter that may be a configuration value or a file, such as a background image file in the node. The contents of the node can also be a link to another node. Each node can be addressed by a uniform resource identifier (URI). An authorized device management server can add (dynamic) and change contents of nodes in the management tree.

Figure 2 illustrates a terminal TE environment 200 with multiple configurations. The environment 200 is provided with one or more service contexts 203. A service context 203 may be regarded as an area in the terminal TE to which access is controlled. Hence, information stored in a service context specific storage area in the terminal TE may specify or form the service context 203. In one embodiment service contexts 203 represent different configurations in the terminal TE used for accessing services, for instance an Internet access service. As illustrated by arrows from the service context 203, a service context 203 representing a configuration may comprise certificates 206, settings 205, and/or some other type of data 208 specific to the service context. As illustrated in Figure 2, information belonging to a service context 203 may be stored in multiple storage locations, or in a single storage position. For instance, a service context 203 may comprise or be associated with sensitive user data 208 stored in a file system 207, settings 205 and certificates 206 stored in a central repository 204, which may be a specific storage for service

context information. Data 208 belonging to a service context 203 may be any data received in the terminal TE or originated by an application 202. For instance, a user may enter a calendar entry which is stored as data 208 belonging to the service context 203.

A secure execution environment 201 may control access to service context 203 information, and storage positions comprising service context contents may be secured. Although not shown in Figure 2, the execution environment 201 may comprise an access controller arranged to control access to service context information. An external management entity, in one embodiment of a service context manager 211, may grant rights for applications 202 to access information belonging to a service context 203. Access control information (ACI) 212 originated and/or controlled by the external management entity (211) may be stored in the terminal TE for defining rights to access service contexts 203. Further, the execution environment 201 may attend to securing data transfer between the application 202 authorized to access the service context 203 and one or more storage positions comprising the service context information. In one embodiment, at least some security services are arranged by an operating system of the terminal TE.

Applications 202 may be executed inside the secure execution environment 201 of the terminal environment 200. Access to one or more service contexts 203 is arranged for an application 202 in order to initiate a service for a user of the terminal TE, if the access control information 212 enables this. This access control information 212 may be defined in many ways in the terminal TE. For instance, a file identifying entities entitled to access a service context 203 may be stored in the terminal TE, and the terminal TE is arranged to provide access to the service context 203 only for entities directly or indirectly identified in the file. The access control information 212 could be defined in terminal TE as parameters for a software component implementing service context access control functions, for instance. Thus, the terminal TE is provided with access control rules for defining entitlement to access a service context 203. The access control information file may be a list of application identifiers or a list of application source identifiers. However, instead of or in addition to application identifiers, the access control information could specify access control information of other entities in the terminal TE, such as application groups or application execution environments. The access control information 212 may be service context or service context group specific. For instance,

access control information 212 may comprise a plurality of different profiles for corporate access, tailored for different usage situations. In one embodiment, this administrative access control information 212 belongs to the service context information.

In accordance with an embodiment, a certificate 206 of an application 202 is checked in order to reliably define an identifier associated with the application 202. On the basis of this identifier, the terminal TE is then arranged to check whether or not the application 202 is entitled to access the service context 203. These certificates 206 may be stored within service context information (for instance the certificate 206 in the central repository 204) and/or outside the service context 203, for instance within application 202 data in the file system 207. The certificate 206 is associated with at least one application 202 in the terminal TE. The certificate 206 has been issued and digitally signed by a trusted third party, such as a general certification authority or an application developer, to prove the integrity and source of the associated application 202. The certificate 206 could be obtained for the terminal TE separately from the access control information 212, for instance during installation of application, or it may even form a part of the service context information or access control information from the managing entity. It is to be noted that the certificate 206 may in one embodiment be acquired during the access control procedure for checking the right of the application 206 to access certain service context 203. The certificate 206 may include at least some of the following: a name of the certificate holder, a serial number, an expiration date, a copy of the certificate holder's public key, and the digital signature of the issuer so that a recipient can verify that the certificate is authentic.

As also illustrated by the broken lines in Figure 2, the service contexts 203 may be managed by the external authorized managing entity 211. This may mean that some or all of the information belonging to the service context 203 may be read, added, modified, and/or removed by the external managing entity 211. In one embodiment, the OMA DM is applied to managing service contexts 203. At least some of the service context 203 information may be stored in a management tree, which is modified by a device management agent on the basis of device management commands from an OMA device management server (S).

Figure 3 illustrates a method of an embodiment for using service contexts in terminal TE. In step 301, there may be a need to initiate a service

by an application 202 such that the application 202 requires information stored under one or more service contexts 203 for service set-up, or for some other purpose. This need typically arises based on a user input, but a service may also be initiated based on some other trigger, such as a command from an external device. Service contexts 203 available for the service may be checked in step 302. If the check 302, 303 reveals more than one available service context 203, a preferred service context 203 is selected 305. For instance, the terminal TE may store a preference list indicating the service contexts 203 in a preference order. A default service context 203 could be selected in step 305. Otherwise, an available service context 203 is selected 304. The application 202, or an application manager, may be adapted to perform steps 301 to 305. Although not shown in Figure 3, it is to be noted that the service context selection procedure may involve prompting a user of the terminal TE to select a service context and/or to confirm the selection of the service context.

The method then proceeds to step 306, wherein access to a selected service context is requested or a need to access the service context specific data is otherwise indicated. On the basis of access control information 212 from and/or controlled by a managing entity, it is checked 307 whether the application 202 is authorized to access the service context 203. The relevant access control information 212 may be obtained from the memory of the TE, or in one embodiment the terminal TE may be arranged to request and receive access control information from an external entity, such as the external managing entity 212. The managing entity may be the service context manager 211 or some other entity, for instance an entity that has issued the certificate 206. If the application 202 is not authorized, access for the application 202 is denied 308 to the service context 203.

According to an embodiment, step 307 comprises two sub-steps. First, a certificate 206 associated with the application 202 requiring access to the service context 203 is checked. By checking the certificate 206 it is possible to ensure the integrity and/or source of the application 202. In a second sub-step, an identifier obtained from the application's 202 certificate 206 is compared with identifiers in predetermined access control information 212. An application source identifier from the certificate 206 may in one embodiment be compared in the second sub-step with predetermined application source identifiers in the access control information 212. The access control information 212 in the present embodiment specifies those applications, groups of applications

or application sources that are authorized to use the service context 203. Thus, if the identifier from the certificate 206 of the application 202 can be found in the access control information 212, the application is authorized.

If the application 202 is authorized on the basis of a check 307, the application may access 309 information associated with the service context 203, and the application 202 may then initiate 310 the service on the basis of the associated service context information.

In one embodiment, the service context 203 comprises or is associated with settings required for arranging a connection from the terminal TE to one or more network resources for accessing a service. Thus, the application 202 may in step 310 establish a connection using these settings. These settings could specify access to corporate intranet resources, such as an email server and an email account. However, also many other services exist for which the service context 203 may be used.

In an embodiment, the terminal TE comprises access controlled application (specific) data 208 belonging to or associated with a service context 203 such that access to the application data 208 is arranged only for applications 202 authorized by the external managing entity 211. This application data 208 is typically user related and stored by an application 202 in the terminal TE on the basis of a user input. In step 310 the application data 208, such as a file comprising corporate e-mails, may be displayed and possibly further processed by an application 202 (an e-mail client application in this example).

A service context 203 may be selected or defined when using an application 202. A service context 203 may be selected when an application 202 is activated and/or when new contents are to be specified as service context information. For instance, when an e-mail application is activated, the user selects a desired profile or e-mail account, whereby a service context associated with the profile or e-mail account is also selected. Thus, when the application 202 later requires access to service context 203 information, steps 302 to 305 are unnecessary but information in the associated service context 203 may be used, for instance for establishing a connection to a remote e-mail server. In another embodiment, a service context 203 may be specified for a user data item, such as an e-mail message. This service context 203 could be selected in connection with storing of a data item. For instance, when the user has finished preparing an e-mail item and selects to store the item, available service contexts 203 (for the e-mail application) are shown to the user. The

user may then select the service context 203 with which the data item is to be associated and thus possibly the storage position of the data item, and the data item is stored accordingly. Later, the data item may be used as any other service context 203 specific data, i.e. access to the data item is allowed only for authorized applications 202.

In one embodiment, access to the service contexts 203 is controlled (steps 307 to 309) by a security procedure in the secure execution environment 201, such as a specific access controller entity. It is also feasible that the execution environment 201 checks 303 and selects 304, 305 a service context 203 for the application 202. A specific service context selector may be provided in the secure execution environment 201.

In another embodiment, service contexts 203 available for the application 202 requiring access to the service context 203 are checked already in step 302. In this embodiment, only service contexts 203 for which the certificate of the application 202 allows access (or for which the application has access authorization by some other means) are considered for the service. In this embodiment, access to a service context 203 is attempted only by authorized applications 202 and unnecessary requests are thus avoided.

Figures 4a and 4b illustrate a method for establishing and/or modifying a service context 203 in the terminal TE by the server S according to an embodiment. In Figure 4a, features of the server S functioning as the device management server are illustrated. In step 401, a need exists to create a new service context 203 and/or to modify an existing service context 203 in the managed terminal device TE. In another embodiment, a need exists to add or modify access control information 212 related to a service context 203.

A device management session is then arranged 402 between the device management server functionality in the server S and the device management client functionality in the terminal TE. Conventional OMA DM session establishment functions illustrated in the OMA specification "*SyncML Device Management Protocol*", version 1.1.2, 12 December 2003, 41 pages, may be utilized.

Service context related information, for instance connection settings 205, and/or access control information 212, are specified 403 in one or more device management commands. In the present embodiment, at least some of the service context information in the device management command(s) is ad-

dressed to one or more service context specific device management tree nodes. The management command is transmitted 404 to the terminal TE.

Figure 4b illustrates functions in the terminal TE receiving service context related information. In step 410, a device management command is received from a device management server (S). The service context related data, including access control information, may be stored in the terminal TE. More specifically, in step 411 the device management client in the terminal TE defines the required actions on the basis of the received device management command. The device management tree in the terminal TE may then be modified by the new and/or modified information related to the service context 203. For instance, a new node may be added with an ACL list defining the server S as being the only authorized device management server to modify the node. It is to be noted that the management tree may only serve as a view to the managed information, whereby the managed information may be stored outside the management tree.

If the service context 203 is created for the first time and device management has not been provisioned for the terminal TE, OMA client provisioning methods may be used first to initiate and configure the device management before service context specific management commands. Thus, in steps 402 and 410, a connection for arranging provisioning may be utilized.

The management tree may comprise one or more nodes for access control information 212, even if the access control information 212 is not part of the service context 203. In a manner similar to that illustrated above, by utilizing a device management command addressed to a node for access control information 212, it is possible to arrange the modification, deletion, or addition of access control information 212. Thus, an external managing entity may easily change the access control configuration in the managed device TE. It is to be noted that Figures 4a and 4b are only exemplary. For instance, the device management command could be formed before the establishment of the management session. In one embodiment, a service context 203 may be created or modified by an authorized party in the terminal TE, for instance a user. Similar procedures as already illustrated in connection with Figure 3, steps 306-309 may be utilized when accessing service context information. It is thus unnecessary to apply device management mechanisms to modify service context 203 information.

In one embodiment, the service context manager 211 or a service provider, in the embodiment of Figure 4a the server S, may check that a suitable service context is in place and/or used appropriately in the terminal TE. The service provider may thus check that correct settings are in place and only applications from a trusted source are used. This check could be implemented by using OMA DM GET commands to the nodes comprising this service context data. This embodiment may be implemented after steps 404 and 412 or at some other point of time, for instance after receiving a service request from an application 202 in the terminal TE.

In steps 402, 403, 410, and 411, it is possible to utilize the mechanisms of the device management protocol and the messages defined for it; for a more detailed description of the OMA device management protocol and other commands, for instance, reference is made to the OMA specification "*SyncML Device Management Protocol*", version 1.1.2, 12 December 2003, 41 pages, and the OMA specification "*SyncML Representation Protocol Device Management Usage*", version 1.1.2, 12 June 2003, 39 pages.

In accordance with an embodiment, the contents of a service context 203 may be associated with different access control rules and/or access right levels on the basis of the access control information 212. In a further embodiment, different access rules are applied to different portions of the service context 203. For instance, settings 205 of the service context 203 specifying a connection to a corporate email server may be read (by an application 202 authorized to access the service context 203) but not modified, whereas access to data 208 in a file system 207 associated with the service context 203 may be both read and modified. In this embodiment, the contents of service contexts 203 may be differentiated in respect of access control.

Some exemplary rules that may be applied as the above-illustrated embodiment are: right to read (all or only a specific part of the service context data), right to remove, and right to add. The access control rules and/or right levels may be specified within the access control information 212 or some other storage. In one embodiment, access policies are specified by XACML (Extensible Access Markup Language). If OMA DM is applied, access control lists may be specified in a management tree for determining one or more external device management servers authorized to access associated service context related data, i.e. the external management entities may be specified by OMA DM access control lists.

In an alternative or complementing embodiment, different access control rules are associated with different users of the service contexts 203 on the basis of the access control information 212. In this embodiment, it is possible to apply different access rights for different applications 202 and users of the terminal TE, for instance. As an example, a service context 203 (or part thereof) may be set to be modifiable only by the user of or the subscriber to the terminal TE and an external managing entity originating and/or controlling the service context 203.

In one embodiment, the user of or the subscriber to the terminal TE is always entitled to remove or delete service contexts 203 from the terminal TE. Since a service context 203 is required for obtaining a service, the terminal TE cannot be used for accessing the service after the service context 203 has been deleted. Thus no full control needs to be given for any administrator 211 of a service context 203, and users do not have to give up a right to control their terminals. No service context needs to be forced to any terminal but the user/subscriber may wish to use a service and therefore accept a service context into the terminal TE. Since the service context 203 itself may be set to be modifiable only by the authorized management entity (211), it is possible to prevent access of the user to modify the service context 203.

In a further embodiment, a capability to inform the authorized managing entity 211 about user deleted service contexts 203 is provided. A feature or application 203 handling deletion of a service context 203 on the basis of a user input may be configured to transmit a message to the authorized managing entity 211 informing about the deletion of the service context 203 from the terminal TE. In another embodiment, the authorized managing entity 211 is configured to check the service contexts 203 (which it is authorized to view) in the terminal TE in order to detect deleted ones. For instance, periodic checks may be performed by OMA DM procedures on the nodes comprising service context data.

It should be noted that the embodiments described above could also be applied in any combination thereof. It is apparent to a person skilled in the art that while technology advances, the basic idea of the invention can be implemented in many different ways. The invention and its embodiments are thus not restricted to the examples described above, but can vary within the scope of the claims.

CLAIMS

1. A method for a device management system for arranging use of configurations in a device with multiple configuration data sets manageable by one or more external managing entities, and a plurality of applications, **characterized** in that the system comprises access control information originated and/or controlled by an external managing entity for defining a right to access a configuration data set, the method comprising:

checking the access control information in response to an indication from an application requiring access to a configuration data set, and

in response to the application being, on the basis of the access control information, entitled to access the configuration data set, arranging access to the configuration data set for the application.

2. A method as claimed in claim 1, **characterized** in that at least one service context is stored in the device, wherein the service context comprises at least the configuration data set and whereby access to the service context is allowed for the application on the basis of the access control information if the application is, by the external managing entity, predetermined in access control information associated with the service context.

3. A method as claimed in claim 1, **characterized** by arranging selection of a configuration data set for the application in response a plurality of configuration data sets being available for the application.

4. A method as claimed in any one of the preceding claims, **characterized** by arranging a service by the application on the basis of at least part of the configuration data set.

5. A method as claimed in any one of the preceding claims, **characterized** by arranging the configuration data set and/or the access control information thereon into the device by:

establishing a device management session or a connection for arranging provisioning between a device management server of the external managing entity and the device,

transmitting the configuration data set and/or the access control information by the device management session or the connection for provisioning, and

storing the configuration data set and/or the access control information in the device.

6. A device management system comprising a device management server and a device management client to be managed, the device management system being arranged to manage at least one device management client by means of a management structure comprising at least one node, **characterized** in that the system is arranged to store access control information originated and/or controlled by an external managing entity for defining a right to access a configuration data set,

the system is arranged to check the access control information in response to an indication from an application requiring access to a configuration data set,

in response to the application being, on the basis of the access control information, entitled to access the configuration data set, the system is arranged to provide the application with access to the configuration data set, and

the system is arranged to arrange a service by the application on the basis of at least part of the configuration data set.

7. A data processing device for a device management system, the device comprising means for storing multiple configuration data sets manageable by one or more external managing entities, and a plurality of applications, **characterized** in that the data processing device comprises:

memory for storing access control information for defining a right to access a configuration data set,

means for checking the access control information in response to an indication from an application requiring access to a configuration data set, and

means for arranging access to the configuration data set for the application in response to the application being, on the basis of the access control information, entitled to access the configuration data set.

8. A data processing device as claimed in claim 7, **characterized** in that the data processing device is arranged to check the access con-

trol information in response to a request from the application to access the configuration data set.

9. A data processing device as claimed in claim 7 or 8, **characterized** in that the data processing device comprises means for arranging a service by the application on the basis of at least part of the configuration data set.

10. A data processing device as claimed in any one of claims 7 to 9, **characterized** in that at least one service context comprising at least the configuration data set is stored in the data processing device, and

the data processing device is arranged to allow the application to access the service context on the basis of the access control information if the application is authorized on the basis of access control information associated with the service context.

11. A data processing device as claimed in claim 10, **characterized** in that the service context further comprises user related data stored by an application of the data processing device.

12. A data processing device as claimed in any one of claims 7 to 11, **characterized** in that the configuration data set comprises settings required for arranging a connection from the device to one or more network resources for accessing a service, and

the data processing device is arranged to establish a connection to one or more network resources on the basis of the settings.

13. A data processing device as claimed in any one of claims 7 to 12, **characterized** in that the data processing device comprises means for arranging selection of a configuration data set for the application in response a plurality of configuration data sets being available for the application.

14. A data processing device as claimed in any one of claims 7 to 13, **characterized** in that data transfer between the application authorized to access the configuration data set and a storage position comprising the configuration data set is secured.

15. A data processing device as claimed in any one of claims 7 to 14, **characterized** in that access to a configuration data set is controlled on the basis of comparison between predetermined identifiers in the access control information and an identifier in a certificate associated with the application and certifying a source of the application.

16. A data processing device as claimed in any one of claims 7 to 15, **characterized** in that the data processing device comprises a device management client according to an OMA device management standard, and

the data processing device is arranged to add and/or modify a configuration data set on the basis of a device management command from a device management server to a node of a management tree in the data processing device.

17. A data processing device for a device management system, the data processing device comprising means for transmitting management commands to a managed device, **characterized** in that

the data processing device comprises means for controlling access control information for defining a right of an application in the managed device to access a configuration data set in the managed device.

18. A data processing device as claimed in claim 17, **characterized** in that the data processing device is arranged to establish a device management session with the managed device,

the data processing device is arranged to form a device management command addressed to a node representing the access control information and/or the configuration data set in a management tree of the managed device, and

the data processing device is arranged to transmit the device management command to the managed device.

19. A data processing device as claimed in claim 17 or 18, **characterized** in that the data processing device is a device management server according to the OMA device management standard.

20. A computer program product downloadable into a memory of a data processing device, **characterized** in that the computer program product comprises a computer program code which, when executed in a processor of the data processing device, causes the data processing device to:

check access control information for defining a right to access a configuration data set in response to an indication from an application requiring access to a configuration data set, and

in response to the application being, on the basis of the access control information, entitled to access the configuration data set, arrange for access to the configuration data set for the application.

1/3

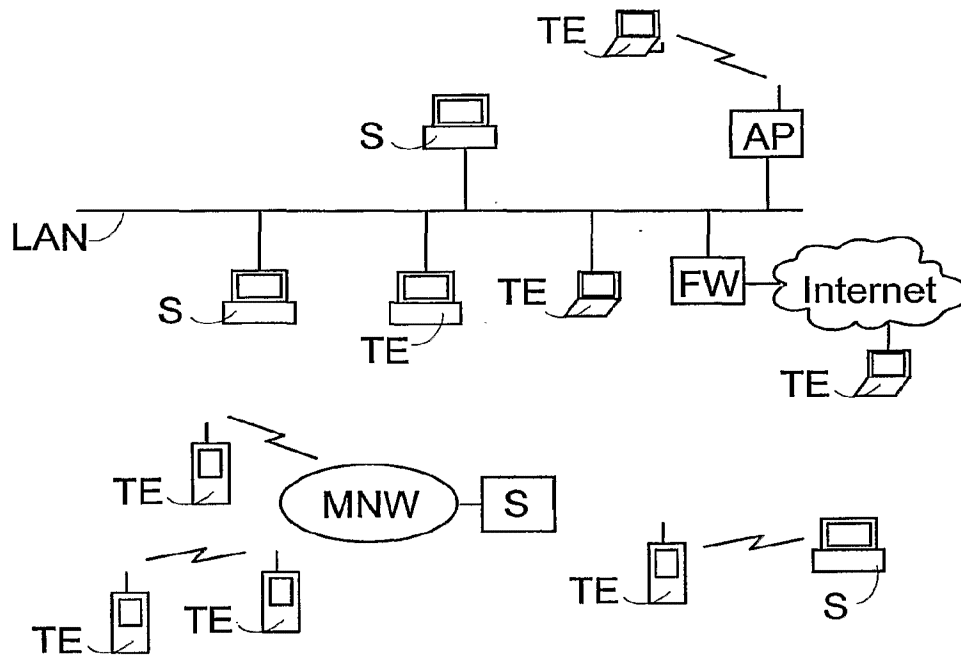


Fig. 1

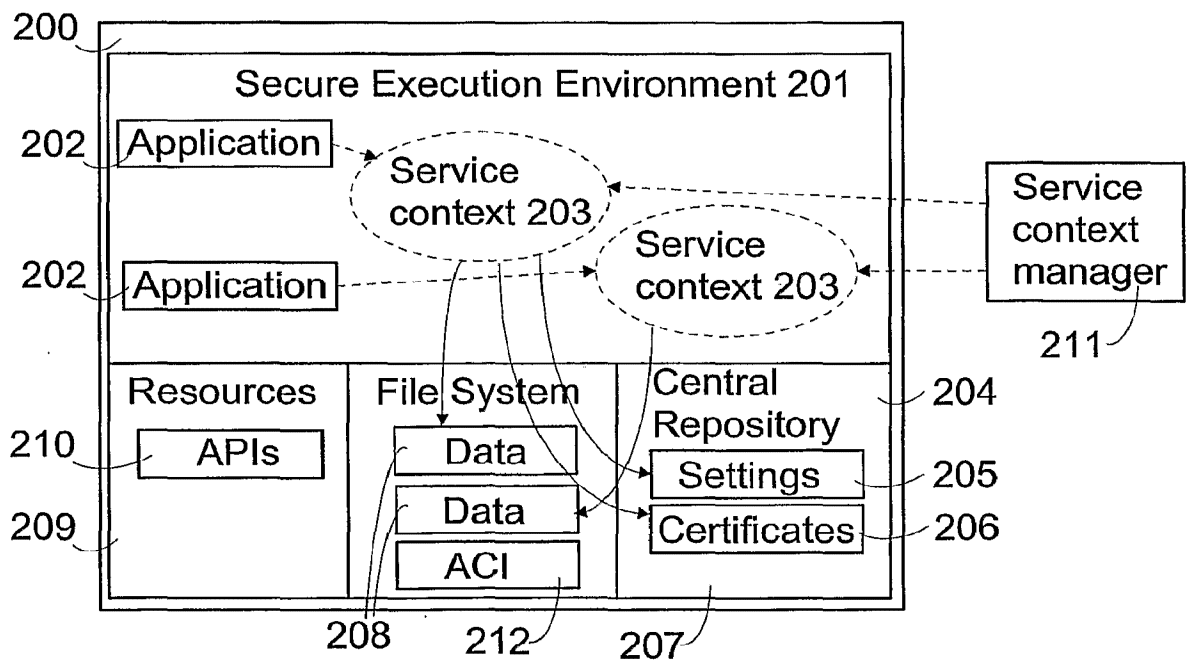


Fig. 2

2/3

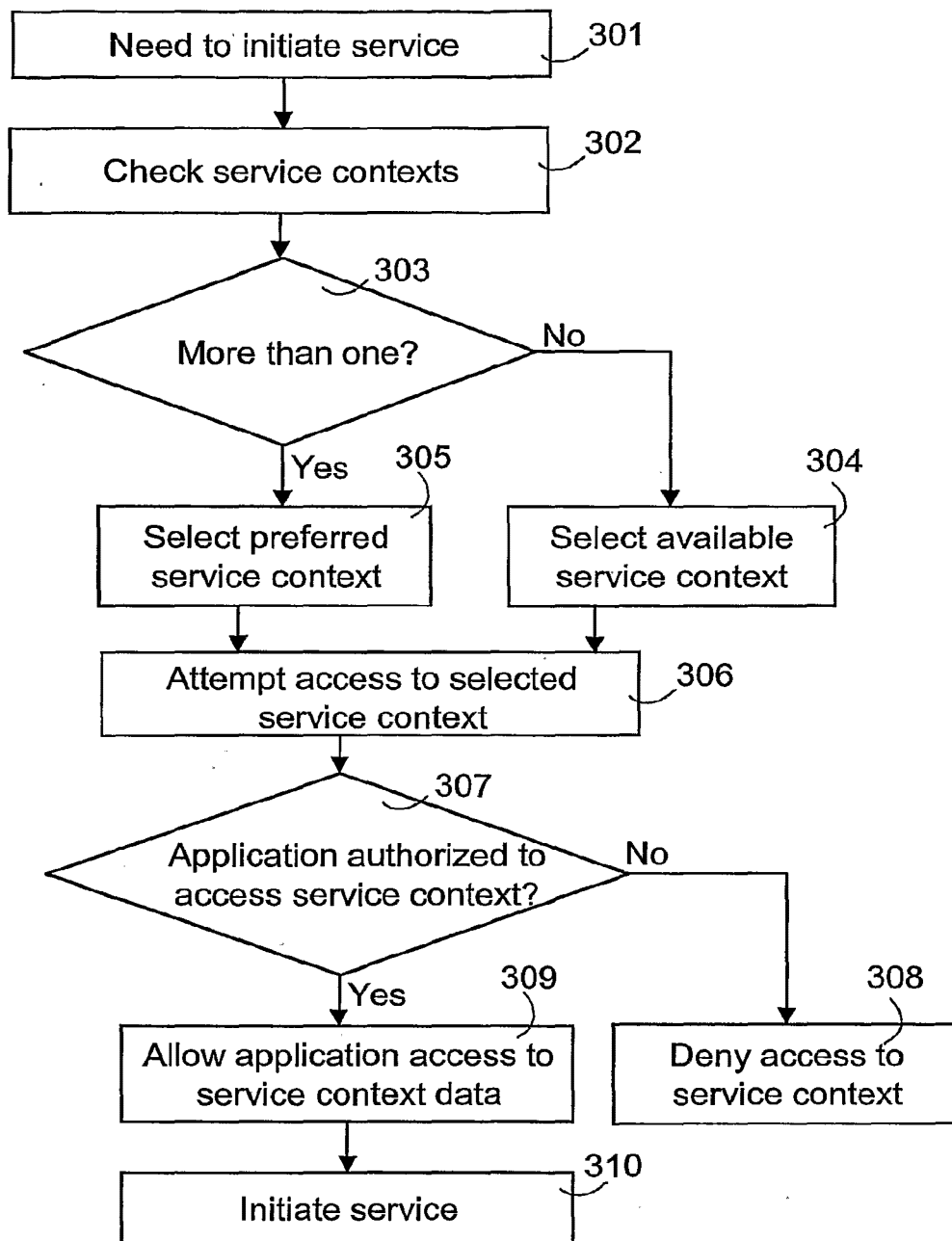


Fig. 3

3/3

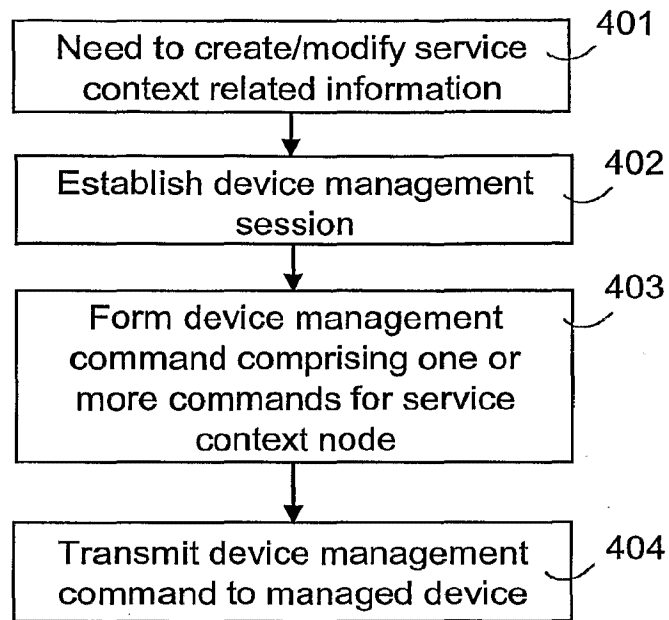


Fig. 4a

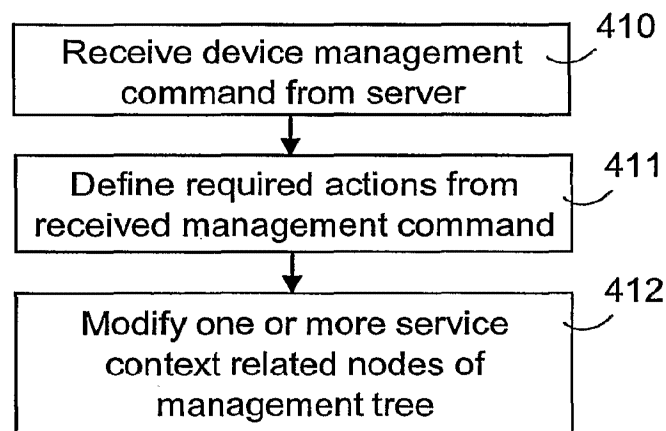
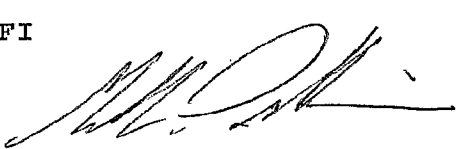
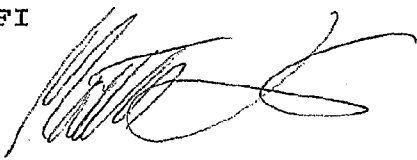


Fig. 4b

VIII-2-1	Declaration: Entitlement to apply for and be granted a patent Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate: Name (LAST, First)	in relation to this international application NOKIA CORPORATION is entitled to apply for and be granted a patent by virtue of the following:
VIII-2-1(i)		NOKIA CORPORATION is entitled as employer of the inventor, PULKKINEN, Markku
VIII-2-1(i)		NOKIA CORPORATION is entitled as employer of the inventor, LINDROOS, Martti
VIII-2-1(i)x)	This declaration is made for the purposes of:	all designations except the designation of the United States of America

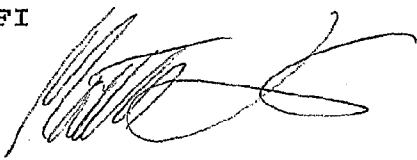
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VIII-4-1-1-6	Date: (of signature which is not contained in the request, or of the declaration that is corrected or added under Rule 26ter after the filing of the international application)	22.3.2005

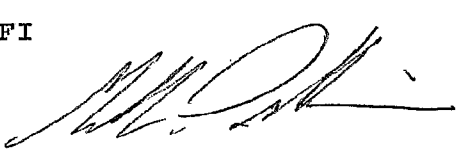
VIII-4-1-2-1	Name (LAST, First)	LINDROOS, Martti
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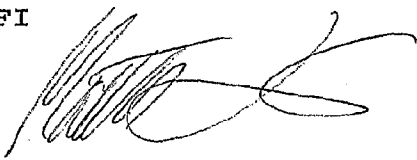
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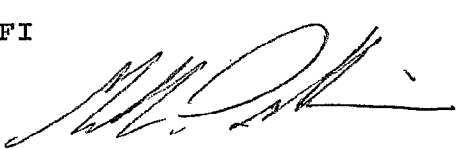
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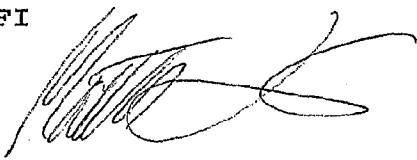
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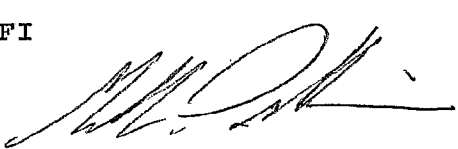
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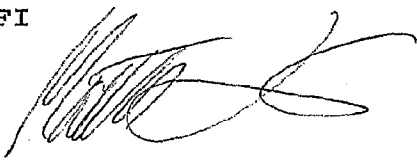
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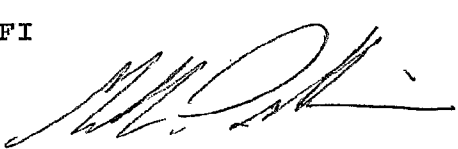
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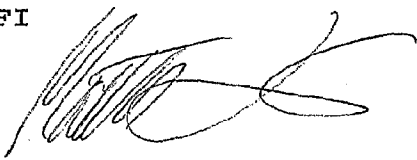
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11/794,421	06/27/2007	Markku Pulkkinen	KOL.238.WUS	9508
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Hollingsworth & Funk 8500 Normandale Lake Blvd., Suite 320 Minneapolis, MN 55437			EXAMINER NAGEL, PATRICK A	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 11/794,421	Applicant(s) PULKKINEN ET AL.	
	Examiner PATRICK NAGEL	Art Unit 2448	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2007 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) ☒ Notice of References Cited (PTO-892) | 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) ☐ Notice of Informal Patent Application |
| 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>01/19/2009, 08/23/2007</u> . | 6) ☐ Other: _____ |

DETAILED ACTION

1. This Office Action is in response to the preliminary amendment filed 06/27/2007.
2. Claims 1-20 are amended.
3. New claims 21-26 are added.
4. No claims are cancelled.
5. Claims 1-26 are pending in the application.
6. Claims 1-26 are rejected.

Information Disclosure Statement

7. The information disclosure statements (IDS) submitted on 08/23/2007 & 01/19/2009 are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements are being considered by the examiner.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1-6, 8-15, 17-18, 20-23 & 25-26 are rejected under 35 U.S.C. 102(b) as being anticipated by US Pat. Pub. No.: 2004/0123147 by White (hereinafter White).
10. ***As per claim 1***, White teaches: **a method for a device management system for arranging use of configurations in a device with multiple configuration data sets manageable by one or more external managing entities (para. [0015]), and a plurality of applications (Fig. 1, applications 106), the system comprising access control information originated and/or controlled by an external managing entity for defining a right to access a configuration data set (para. [0015]), the method comprising: checking the access control information in response to an indication from an application requiring access to a configuration data set (Para. [0019]), and in response to the application being, on the basis of the access control information, entitled to access the configuration data set, arranging access to the configuration data set for the application (para. [0019]).**
11. ***As per claim 2***, claim 1 is incorporated and White further teaches: **wherein at least one service context is stored in the device (para. [0015]), the service context comprising at least the configuration data set (para. [0016]), and access to the service context is allowed for the application on the basis of the access control information if the application is, by the external managing entity, predetermined in access control information associated with the service context (para. [0019], teaching that authorized**

persons may configure the preferences by accessing a dedicated provider configuration application).

12. ***As per claim 3***, claim 1 is incorporated and White further teaches:
wherein selection of a configuration data set is arranged for the application in response a plurality of configuration data sets being available for the application (Fig. 6).
13. ***As per claim 4***, claim 1 is incorporated and White further teaches:
wherein a service is arranged by the application on the basis of at least part of the configuration data set (Fig. 7, block 720).
14. ***As per claim 5***, claim 1 is incorporated and White further teaches:
wherein the configuration data set and/or the access control information thereon is/are arranged into the device by: establishing a device management session or a connection for arranging provisioning between a device management server of the external managing entity and the device, transmitting the configuration data set and/or the access control information by the device management session or the connection for provisioning, and storing the configuration data set and/or the access control information in the device (Fig. 5).
15. ***As per claim 6***, White teaches: **a device management system comprising a device management server and a device management client to be managed (Fig. 1), wherein the device management system is arranged**

to manage at least one device management client by means of a management structure comprising at least one node (Fig. 1, preferences node 108), the system is arranged to store access control information originated and/or controlled by an external managing entity for defining a right to access a configuration data set (para. [0015]), the system is arranged to check the access control information in response to an indication from an application requiring access to a configuration data set (para. [0019]), in response to the application being, on the basis of the access control information, entitled to access the configuration data set, the system is arranged to provide the application with access to the configuration data set (para. [0019]), and the system is arranged to arrange a service by the application on the basis of at least part of the configuration data set (Fig. 7).

16. ***As per claim 7*, White teaches: a data processing device for a device management system, the device comprising memory for storing multiple configuration data sets manageable by one or more external managing entities for storing access control information for defining a right to access a configuration data set (Fig. 2), where in the data processing device is configured to check the access control information in response to an indication from an application, of a plurality of applications, requiring access to a configuration data set (para. [0019]), and the data processing device is configured to arrange access to the configuration data set for the**

application in response to the application being, on the basis of the access control information, entitled to access the configuration data set (para. [0019]).

17. ***As per claim 8***, claim 7 is incorporated and White further teaches:
wherein the data processing device is arranged to check the access control information in response to a request from the application to access the configuration data set (para. [0019]).
18. ***As per claim 9***, claim 7 is incorporated and White further teaches:
wherein the data processing device is configured to arrange a service by the application on the basis of at least part of the configuration data set (Fig. 7, block 720).
19. ***As per claim 10***, claim 7 is incorporated and White further teaches:
wherein at least one service context comprising at least the configuration data set is stored in the data processing device, and the data processing device is arranged to allow the application to access the service context on the basis of the access control information if the application is authorized on the basis of access control information associated with the service context (para. [0015]).
20. ***As per claim 11***, claims 7 & 10 are incorporated and White further teaches: **wherein the service context further comprises user related data stored by an application of the data processing device (para. [0016]).**

21. ***As per claim 12***, claim 7 is incorporated and White further teaches:
wherein the configuration data set comprises settings required for arranging a connection from the device to one or more network resources for accessing a service, and the data processing device is arranged to establish a connection to one or more network resources on the basis of the settings (Fig. 4, block 304 & para. [0028]).
22. ***As per claim 13***, claim 7 is incorporated and White further teaches:
wherein the data processing device is configured to arrange selection of a configuration data set for the application in response a plurality of configuration data sets being available for the application (Fig. 6, slider 602).
23. ***As per claim 14***, claim 7 is incorporated and White further teaches:
wherein data transfer between the application authorized to access the configuration data set and a storage position comprising the configuration data set is secured (Fig. 5, authentication 500 & encoded message 508).
24. ***As per claim 17***, White teaches: a **data processing device for a device management system, the data processing device comprising: means for transmitting management commands to a managed device, and means for controlling access control information for defining a right of an application in the managed device to access a configuration data set in the managed device** (para. [0019]).

25. ***As per claim 18***, claim 17 is incorporated and White further teaches:

wherein the data processing device is arranged to establish a device management session with the managed device (Fig. 5, block 500), the data processing device is arranged to form a device management command addressed to a node representing the access control information and/or the configuration data set in a management tree of the managed device (Fig. 5, blocks 504 & 506), and the data processing device is arranged to transmit the device management command to the managed device (Fig. 5, blocks 508, 510).
26. ***As per claim 20***, White teaches: **a data storage medium storing a computer program product downloadable into a memory of a data processing device, the computer program product comprising computer program code which, when executed in a processor of the data processing device, causes the data processing device to: check access control information for defining a right to access a configuration data set in response to an indication from an application requiring access to a configuration data set (para. [0019]), and in response to the application being, on the basis of the access control information, entitled to access the configuration data set, arrange for access to the configuration data set for the application (para. [0019]).**
27. ***As per claim 21***, claim 20 is incorporated and White further teaches: **the computer program product comprising computer program code for**

checking the access control information in response to a request from the application to access the configuration data set (Fig. 7, block 720).

28. ***As per claim 22***, White teaches: an **apparatus comprising: a transmitter for transmitting device management commands to a managed device** (Fig. 1, showing wireless communication to a managed device), **a controller for controlling access control information for defining a right of an application in the managed device to access a configuration data set in the managed device** (para. [0019]).

29. ***As per claim 23***, claim 22 is incorporated and White further teaches: **wherein the apparatus is arranged to establish a device management session with the managed device, the apparatus is arranged to form a device management command addressed to a node representing the access control information and/or the configuration data set in a management tree of the managed device** (para. [0019]), **and the apparatus is arranged to transmit the device management command to the managed device** (Fig. 5, block 508).

30. ***As per claim 25***, White teaches: **an apparatus comprising: means for storing multiple configuration data sets manageable by one or more external managing entities, and a plurality of applications** (Fig. 6), **means for storing access control information for defining a right to access a configuration data set, means for checking the access control information**

in response to an indication from an application requiring access to a configuration data set (para. [0019]), and means for arranging access to the configuration data set for the application in response to the application being, on the basis of the access control information, entitled to access the configuration data set (para. [0019]).

31. ***As per claim 26***, claim 25 is incorporated and White further teaches:
wherein the apparatus is configured to allow access to a service context stored in the device and comprising at least the configuration data set for the application on the basis of the access control information if the application is, by an external managing entity, predetermined in access control information associated with the service context (para. [0019]).

Claim Rejections - 35 USC § 103

32. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

33. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over White in view of US Pat. No. 6,272,632 to Carman et al. (hereinafter Carman).

34. ***As per claim 15***, claim 7 is incorporated and White further teaches:
wherein access to a configuration data set is controlled on the basis of comparison between predetermined identifiers in the access control information and an identifier [...] associated with the application and certifying a source of the application (para. [0019]).
35. White does not explicitly teach the identifier **in a certificate**. In an analogous art, however Carman teaches an identifier **in a certificate**. See Carman, Fig. 10. It would therefore have been obvious to one of ordinary skill in the art at the time the invention was made to adapt the access control system of White with the certificate of Carman to arrive at the invention as claimed. The motivation for the combination would be to store the identifier in certificate form in the manner of Carman.
36. Claim 16, 19 & 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over White in view of "Official Notice".
37. ***As per claim 16***, claim 7 is incorporated and White further teaches: **the data processing device comprising a device management client [...] (Fig. 1), and the data processing device is arranged to add and/or modify a configuration data set on the basis of a device management command from a device management server to a node of a management tree in the data processing device** (para. [0019]).

38. White does not explicitly teach the device management client **according to an OMA device management standard**. However, the examiner takes official notice of ubiquitous and universally known OMA device management standards. It would therefore have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the access control system of White into an OMA device management standard.

39. **As per claim 19**, claim 17 is incorporated and White further teaches: **wherein the data processing device is a device management server [...]** (Fig. 1).

40. White does not explicitly teach the device management server **according to the OMA device management standard**. However, the examiner takes official notice of ubiquitous and universally known OMA device management standards. It would therefore have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the access control system of White into an OMA device management standard.

41. **As per claim 24**, claim 22 is incorporated and White further teaches: **wherein the apparatus is configured to provide a device management server [...]** (Fig. 1).

42. White does not explicitly teach the device management server **according to the OMA device management standard**. However, the examiner takes

official notice of ubiquitous and universally known OMA device management standards. It would therefore have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the access control system of White into an OMA device management standard.

Conclusion

43. Any inquiry concerning this communication or earlier communications from the examiner should be directed to PATRICK NAGEL whose telephone number is (571)270-3895. The examiner can normally be reached on 10:00AM - 8:30PM Monday-Thursday.
44. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Firmin Backer can be reached on (571)272-6703. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2448

45. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Patrick A. Nagel/
Patent Examiner
Art Unit 2448

/Aaron Strange/
Primary Examiner, Art Unit 2448

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this day, a true and correct copy of the foregoing document was served by the indicated means to the persons at the addresses below:

The Honorable Lisa R. Barton Acting Secretary U.S. INTERNATIONAL TRADE COMMISSION 500 E Street, S.W., Room 112 Washington, DC 20436	Via Electronic Filing (EDIS) and Hand Delivery (2 copies) by Noon the next Business Day
Administrative Law Judge	
The Honorable Theodore R. Essex Administrative Law Judge U.S. International Trade Commission 500 E Street, S.W., Room 317 Washington, DC 20436	Via Hand Delivery and via email to tamara.foley@usitc.gov
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Dated: September 23, 2013

/s/ Kaitlyn Houston
Kaitlyn Houston